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Industrial Organization Theory and Developing Economies

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1. Agenda

There are two broad ways in which industrial organization and development economics relate to each other. First, industrial organization, being more advanced in terms of techniques of analysis, provides a readymade box of tools for some branches of economics relevant to developing societies. This potential is increasingly recognized and there is an emergent literature, which applies ideas from game theory and industrial organization to problems of agrarian relations (see, e.g., Bell, 1989; Dutta, Ray and Sengupta, 1989; Basu and Bell, 1991), international debt modelling (see Bulow and Rogoff, 1989; Basu, 1991; Deshpande, 1993), technology transfer and trade (Marjit, 1990; Kabiraj and Marjit, 1993) and other fields. In some cases the availability of these instruments of analysis have actually influenced the research agenda.

Secondly, industrial organization in the context of a developing nation raises issues and concerns which are, frequently, distinct from those raised in industrialized nations. Thus there is a case for constructing industrial organization models for developing nations. Research in India on agricultural economics has raised a variety of novel theoretical issues which have led to the creation of new concepts, categories and theories. An example is "factor-market interlinkage". Micro-empirical studies of Indian agrarian relations (e.g., Bardhan and

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Rudra, 1978) suggested that in backward agrarian markets the contracts struck between agents in different markets were often interlinked. Thus a labourer may agree to work for a landlord subject to his being able to get credit from the landlord when the need arises, thereby interlinking the labour and credit markets.

Unfortunately, the literature--both empirical and theoretical--on industry in developing countries has not been equally enlightening. Thus in India a student of economics goes through models of oligopoly and studies inter-firm interaction, paying scant respect to the fact that the strategic thinking that goes on in Indian industry is not so much between firms as between the firm and the government. That is, the game is often between the box-wallah and the babu. Yet the modelling of such interactions has been woefully meagre. While there is now an emerging literature on macro-industrialization issues (e.g., Ahluwalia, 1985), micro studies are still in their nascency.

Similarly, in India students study sophisticated models of entry deterrence where firms use limit pricing, excess capacity or capital precommitments as instruments to ward off potential competitors (see, e.g., Dixit, 1980; Basu and Singh, 1990). Experience suggests that in India incumbent firms usually deter entry by influencing government policy and decisions. Until recently, before investing every investor was expected to seek the prior approval of the Ministry of Industry; before importing capital goods, he had to obtain a license from the Chief Controller of Imports and Exports; before raising funds for his project, he needed permission from the Controller of Capital

Issues in the Ministry of Finance; before actually starting production, he had to again to go the Ministry of Industry to obtain an industrial license (Mohan, 1992)[1]. An influential incumbent could tactfully lobby with government at any of these stages and prevent the entry of rivals. So if one were to study entry-deterrence in India one would have to analyse how deterrence can be achieved by using the government as a mediator. The absence of such analyses shows that the industrial economics taught in India has not been adequately rooted in the Indian context.

This paper does not try to fill the lacunae in the literature by developing any new theory. It tries to provide an overview of the links between industrial economics and the concerns of developing economies. Instead of presenting a sweeping survey, I take up a few illustrative examples from the literature and then go on to highlight some open problems and issues.

Industrial organization has been one of the fastest growth areas of economics during the last one or two decades. As the theory of extensive-form games advanced, so did industrial economics which has increasingly been founded on game theory. What often gets overlooked is that in industrial economies both theory and empirical research have progressed in tandem, providing nourishment for each other. Much of the early motivation for theoretical work came from the empirical studies of the 'American school', best characterized by the work of Bain (1956). And in recent years there has once again been a revival of empirical research (see surveys by Schmalensee, 1989, and

Bresnahan, 1989). However the empirical research is almost entirely rooted in the experience of industrialized nations.

One major fall-out of this has been that economists in industrialized nations have been involved in practical, real-world issues like industrial legislation and industrial policy making. In India, on the other hand, the drafting and execution of laws concerning the industry have been left to lawyers and public personalities, in general. This is true for, for instance, the Monopolies and Restrictive Trade Practices Act, (MRTP) 1969, or the Foreign Exchange Regulation Act, (FERA) 1973, as is evident even on a cursory reading of these Acts.

All these suggest that the scope for research in the area of industrial organization in the context of developing economies is enormous. The purpose of this chapter is to give the reader a glimpse of this scope and to provoke an agenda for research.

I shall begin by discussing the link between, on the one hand, poverty and, on the other, industrial structure and policy, a link that has generally been overlooked by researchers. In developing countries, poverty has been an important area of research (see Dreze and Sen, 1989, and its bibliography). In industrialized nations, industrial organization is one of the most researched areas within economics. In a recent paper Atkinson (1994) has shown that there is an important link between these two areas. I shall start by sketching Atkinson's model in section 2 because it illustrates several ideas at one go. It shows how standard industrial organization models, suitably moulded, can be of relevance to the special concerns of developing economies. It shows how market structure can

influence welfare in unusual ways.

The stage having been set, I go on, in Sections 3, 4 and 5 to illustrate how modern methods of industrial economics can be applied to issues of special interest to less developed countries. The important idea of interlinkage which emerged out of the development literature can be understood in terms of the theory of nonlinear pricing in industry. Section 3 discusses this. This has important implications for the drafting and execution of antitrust legislation which has not been fully grasped by the lawmaker and perhaps also the economist. These implications are drawn out in section 4. In section 5, I describe 'market fragmentation' which is the heart of the problem of markets in less developed economies (Bardhan, 1984). In constructing models of fragmented markets it is, however, not necessary to start from scratch. As has been shown in Basu and Bell (1991) (see, also, Mishra, 1991), the recent literature on switching costs in industrial economics provides a readymade structure which can be adapted easily for analysing market fragmentation. This is illustrated in the next section.

Section 6 picks up on the neglected theme of strategic interaction between the babu and the boxwallah, mentioned at the outset of this chapter. I recount some of the initial research efforts in this area and emphasize themes which need further analysis.

Section 7 consists of concluding remarks.

As mentioned earlier, one consequence of the paucity in India of indigenous theoretical advances in industrial economics is that the quality of legislation pertaining to industry and,

more generally, economic activity leaves much to be desired. Whereas the legislative aspects are carefully drafted, there has been no effort to ensure that the laws promote economic efficiency, growth and even equity. The impact on efficiency and equity of a new legislation, after all the dust settles and the economy reaches an equilibrium, may be very different from what is the immediate impact of a new law. To understand the former requires familiarity with the principles of economics. It is not surprising that despite so much sound and fury India's record on the fronts of both efficiency and equity remain poor. Fortunately, as a consequence of the government's announcement of a New Industrial Policy on 24 July 1991 and the continuing economic reforms in India, awareness has begun to build up that the success of the reforms requires us to rewrite some of our laws pertaining to industry and labour[2]. Throughout this paper I weave in comments on economic legislation in the hope that this will provoke thought and debate in this field and thereby provide some of the intellectual back up needed for redrafting our industrial laws.

2. Industrial Policy and Poverty

"The poorest people in developing nations lie outside the market" is an observation that one hears often enough. But is it true that at times the market eludes the poor? What market structure is more likely to do this? Atkinson's (1993) recent analysis illustrates how one can get some answers to these questions by suitably adapting some fairly standard models of industrial economics (e.g. Gabszewicz and Thisse, 1979; Shaked

and Sutton, 1983).

To understand Atkinson's model, suppose there are workers whose marginal productivity (I shall refer to this as natural wage) range from $\underline{w}$ up to $\bar{w}$, where $\bar{w} > \underline{w}$. The workers are uniformly distributed on $[\underline{w},\bar{w}]$. Assume that there are $\bar{w} - \underline{w}$ workers. Productivity being the only distinguishing mark of a worker, I shall refer to a worker by his productivity. In other words I follow the obnoxious practice of calling a person whose marginal productivity is 100 dollars as "100 dollars".

Assume that if a person $w \in [\underline{w}, \bar{w}]$ could buy a bicycle, his wage earned would rise from w to (1+h)w, where $h > 0$. Figure 1 illustrates a line, OH from which represents w multiplied by h.

Figure 1 somewhere here.

Hence if a cycle costs p units, only those individuals w such that

$$hw \geq p$$

will buy cycles.

Suppose the cost of producing a cycle is c. If $h\underline{w} < c$ then it is not worth providing cycles to some individuals. But this exclusion happens in an obvious way. In order to focus on the more interesting case, I shall throughout assume

$$h\underline{w} > c$$

This is the case illustrated in Figure 1.

Consider first the case of perfect competition in the cycle market. The price of a cycle would drop to c and all $\bar{w} - \underline{w}$ individuals would get to own a cycle.

Next consider a monopolist manufacturer of bicycles who has to set one price for all his customers. It is immediately obvious from Figure 1 that the monopolist will set price, p^*, as follows:

$$p^* = c + \frac{1}{2}[h\bar{w} - c] = \frac{1}{2}[h\bar{w} + c]$$

And his profit in equilibrium, π^*, is given by:

$$\pi^* = (\frac{1}{2}[h\bar{w} + c] - c)(\bar{w} - \frac{1}{2}[\bar{w} + \frac{c}{h}])$$

$$= \frac{1}{4}(h\bar{w} - c)(\bar{w} - \frac{c}{h}) = \frac{1}{4h}(h\bar{w} - c)^2$$

which is equal to the area EFGJ.

Observe that in this equilibrium all individuals whose natural wage is below $p^*/h = \frac{1}{2}(\bar{w} + \frac{c}{h})$ is excluded from the cycle market. Thus it is in the monopolist's interest to exclude the poor people from the market. Since a cycle is a step towards better living, in this model it is the poorest people who are denied the opportunity for a better life. The number of individuals excluded, e^*, from the market is given by:

$$e^* = (\frac{1}{2})(\bar{w} + \frac{c}{h}) - \underline{w}$$

Let w^* be the critical natural wage such that exactly those below w^* are excluded from the market. Then

$$w^* = \frac{p^*}{h} = (\frac{1}{2})(\bar{w} + \frac{c}{h})$$

It is instructive now to do some comparative statics exercises. Suppose a group of $\bar{\bar{w}} - \bar{w}(>0)$ rich migrants come into this society, whose natural wage varies uniformly from $\bar{w}$ to $\bar{\bar{w}}$. What happens to the local people?

Clearly the critical wage w^* now rises to $(1/2)(\bar{\bar{w}}+c/h)$. Hence more local people are now excluded from the cycle market and, therefore, remain impoverished.

The model can be given more structure and subjected to more analysis (see Atkinson, 1993). Instead of pursuing that line here, let me draw the readers attention to one interesting feature. Suppose the monopolist is allowed to freely discriminate between buyers. I have called such a monopolist an extortionate monopolist in Basu (1984). Then it will be in the interest of the monopolist to charge consumer w a price of hw. His profit will be KLMG and no consumer would be excluded from the market. Hence an extortionate monopoly and a competitive industry share a common feature--they do not exclude consumers from the market or, to state it more generally so as to apply to cases where $hw < c$, they do not exclude any customer who values the good more than the marginal cost of production.

This gives us a lead into the subject matter of the next section which is concerned with nonlinear pricing and extortionate monopolies. The observations in the above paragraph will be more transparent once the reader has read through the next section. The next section is also of general interest to developing economies because nonlinear pricing is the essential theoretical idea underlying interlinkage.

3. Nonlinear Pricing, Interlinkage and Antitrust

Interlinkages between factor markets have many explanations (see, e.g., Braverman and Stiglitz, 1982; Basu, 1987). One view of this, first suggested by Bardhan (1984) is that "interlinkage" is a form of nonlinear pricing, and, hence, standard industrial economics can shed light on this new concept relevant to developing economies.

To understand this, consider an economy with n labourers. Each can produce an output of q units. They have access to a competitive labour market where the prevailing wage equals the marginal product of labour, that is, q. For credit however they can turn to only one landlord. The need for credit arises for many reasons. Here, for the sake of simplicity, it will be assumed that there are two periods and wages are paid in period 2. In period 1 a labourer has to borrow to finance consumption. If a labourer receives a loan of L units in period 1 and has to pay it back in period 2 with interest, at a rate of i, and he gets a wage of w units, his consumption stream in the two periods is given by (L, w-(1+i)L). The utility that he gets from this is given by

$$u = u(L,\ w-(1+i)L), \quad u_1 > 0, \quad u_2 > 0 \qquad (1)$$

The function is assumed to be strictly concave and differentiable. It is being assumed that all workers have the same preference. To find the labourer's demand function for loans we have to solve the following problem:

$$\max_{L} u(L,\ w-(1+i)L)$$

By solving this we get the amount of loan demanded by a labourer as a function of w and i:

$$L = L(w,i) \qquad (2)$$

Now consider the moneylender who has a monopoly in the credit market. It is assumed that he has access to the organised credit market where the interest rate is r. Hence the opportunity cost to the moneylender of giving credit in the rural sector is r. We shall begin by assuming that the moneylender cannot discriminate between loans in terms of interest rate. He has to fix an interest rate, i, which he cannot then vary across borrowers or loans. If he acts like a traditional monopolist he will, confronted by the demand curve for loans, lend up to the point where the marginal revenue equals the marginal cost of lending which, in this model, is r. He will then set i above r in the usual way.

He can however earn a larger profit if he uses his monopoly power in the credit market to offer joint deals in the credit and labour markets. By insisting that a person must be his employee in order to get his credit and by paying his employees less than the wage rate in the competitive labour market, he can emulate a two-part tariff monopolist and extract the entire surplus from the labourers.

Suppose the moneylender-landlord offers a package, (w,i). If a worker accepts this he has to work for the landlord for a

wage of w and he can take as much credit as he wishes at an interest rate i. Assume the workers accept this package. Then the landlord's profit, π, is given by

$$\pi(w,i) = n\{q - w + (i - r)L(w,i)\} \qquad (3)$$

Remember that each worker produces q units of output and confronted with (w,i) takes a loan of L(w,i), as specified in (2). We shall refer to n(q - w) as the production income and n(i-r)L(w,i) as the usurious income of the moneylender-landlord.

Note that if a labourer rejects the offer (w,i), he can always flee to the labour market where he gets a utility of $u(0,q) = \bar{u}$. This will be referred to as the reservation utility of the labourer. Clearly, then, the landlord, in designing his offer to the labourers, has to ensure that they get at least as much as their reservation utility. Hence the landlord's problem is:

$$\underset{(w,\, i)}{Max}\ \pi(w,\, i)$$

subject to $u(L(w,i),\ w - (1+i)L(w,i)) \geq \bar{u}$.

Solving this we get (w,i), and by using (2) we can then solve for L. Let the solution of this exercise be denoted by $(w^*, i^*, L^*) \equiv E^*$. E^* is, therefore, the equilibrium in this model. This completes the description of our basic model.

A geometric characterization of E^* is easy using a technique developed in Basu (1987). First check that in Figure 3, we may treat the worker's reservation indifference curve qe as the

landlord's total revenue curve with the figure turned upside down. To see this, suppose the moneylender-landlord offers a loan of L units in period 1. Then the maximum money that he can take away in period 2 is clear eL'. Otherwise the labourer would reject the landlord's offer. Hence the revenue earned by lending L is eL'. If he lends L units to a labourer, the cost of this is (1 + r)L. Hence if we draw a line through q with a slope of 1 + r, we could think of it as the total cost curve facing the landlord. His optimum is given by point e where the slope of the reservation indifference curve equals 1 + r. Hence the landlord should offer a wage of w, as shown in Figure 2, and set i equal to r. His profit from each labourer is given by qw in figure 2 and his total profit is this quantity multiplied by n.

Viewed in this manner several standard theorems on interlinkage are easily understood. In this model all labourers get the same utility and each labourer gets as much utility as he would have got if he did not transact with the monopolist-moneylender and went to the labour market instead. The only difference is that he would be at point e in one case and q in the other. This is known in the literature as the 'utility equivalence theorem'.

Let us define the rural interest rate as <u>usurious</u> if i exceeds r. Note that in the above simple model the landlord would not charge usurious interest rates. However this should not be equated with an absence of 'exploitation', for this landlord extracts more from the labourers than a traditional monopolist-moneylender.

Figure 2 somewhere here

In this model, interlinkage is an outcome of monopoly in one market. Interlinkage enables the landlord to extract the consumer's surplus from those who take credit from him, or to use legal jargon (Bowman, 1957), it enables him to exercise "leverage". In some early literature, and occasionally even now (Wharton, 1962; Bhardwaj, 1974), it has been argued that interlinkage gives landlords greater power than monopoly. In a model such as the above, this is an ambiguous observation because whatever earnings of the landlord can be attributed to interlinkage can, in turn, be attributed to monopoly.

We have thus shown that if the lender is perfectly extortionate (i.e. he is able to extract all consumer's surplus of each borrower above the reservation utility) then the interest rate will be non-usurious. Further, in this case the market outcome can be shown to be Pareto efficient. This is an important property with significant implications for antitrust law. Hence it is a claim that is worth proving formally. But before doing so let me quickly clarify what is nonlinear about the pricing scheme used by the moneylender-landlord above. If a consumer faces a fixed price per unit so that for buying n units he has to spend n times what he has to spend to buy one unit, then we say that he faces a linear price schedule.

Figure 3 somewhere here

In figure 3, the line OA depicts a linear price schedule. A nonlinear pricing scheme is--pardon me if there is no surprise in this--any price schedule which is not linear. Line OB depicts a nonlinear price schedule where to buy 2n units costs less than twice as much as for n units.

Why is the interlinked credit market an example of nonlinearpricing? Suppose the horizontal axis in figure 3 represents the number of units of credit taken by the borrower. Note that in the above scheme to be able to borrow anything the borrower must first take a cut in wage (thus he has to pay an entry fee) and then he can borrow as much as he wishes at a fixed interest rate. Hence the price schedule consists of the point 0 and then the line CD. It is discontinuous at 0 and it is therefore a case of nonlinear pricing.

4. Antitrust Legislation and Economic Efficiency

Let me now return to the issue of monopoly equilibrium and Pareto efficiency. This is at the same time simple and widely misunderstood. Indeed, a considerable amount of policymaking and the drafting and implementation of antitrust legislation has been marred by such misunderstandings.

Most countries have enacted antitrust laws in some form or the other. With its Sherman Act, 1890, Clayton Act, 1914, Robinson-Patman Act, 1936, and many more, the U.S. has some of the most sophisticated legislation for deterring monopoly and encouraging competition. In Britain the first legislation against monopolistic industrial practices was enacted by the

Labour government in 1948 when it passed the Monopolies and Restrictive Practices (Inquiry and Control) Act. Under this act the Monopolies and Restrictive Practices Commission was established. Its powers are more limited than the U.S. Federal Trade Commission because it has no power to initiate an inquiry (for discussion, see, e.g., Guenault and Jackson, 1960, and Rowley, 1966). In India the Monopolies and Restrictive Trade Practices Act, 1969, is the main legislation for the control of monopolistic practices, though its efficacy has often been questioned (see, e.g., Chandra, 1977, Paranjape, 1986). Nevertheless, the motivation behind the British and the Indian acts is very similar to the antitrust laws of the U.S. The basic motivation behind all this legislation comes from a belief that monopoly is generally inefficient. This belief was there even before the analysis of monopoly was available in any reasonable form.

Drawing on my recent work (Basu, 1993), let me show that though some forms of monopoly are inefficient (in the sense of leading to Pareto suboptimal equilibria), the most extortionate forms of monopoly are not inefficient. This seems paradoxical at first sight; and it is not surprising that lawyers have not appreciated it--or, to use more legally precise language, have not shown evidence of appreciating it.

Since antitrust laws try to prevent some of the most extortionate practices associated with monopolies, the claim in the above paragraph would simply that such laws cannot be justified on grounds of efficiency. The justification would have to lie in equity and fairness.

Let me begin by demonstrating why the standard, textbook monopolist is indeed inefficient. To do this formally we need to use a general equilibrium model. The simplest model for such an analysis is a 2 x 2, pure-exchange economy in which the entire initial endowment of good X is owned by agent 1 and the entire endowment of Y belongs to 2. Agent 2 is a monopolist; so he sets the price. Agent 1 is a competitor (we could also think of agent 1 being actually a group of a large number of identical consumers), which essentially means that he is a price-taker.

Figure 4 somewhere here

Much of this information is depicted in the Edgeworth box shown in Figure 4. The endowment point is e and agent 1's offer curve is eE. A traditional monopolist will clearly set price so that the budget constraint of agent 1 is eA. Hence, equilibrium occurs at B, where agent 2's indifference curve, I, is tangential to the offer curve. B is clearly a Pareto sub-optimal point. Hence a traditional monopoly indeed leads to inefficiency. This explains the basis of the resentment against monopoly.

However, as we have already seen, the traditional, textbook monopolist is a fairly philanthropic character in relation to the possibilities open to him. So let us check the welfare properties of an extortionate monopolist. Let me here interpret an extortionate monopolist not simply as someone charging a two-part tariff but, more generally as a monopolist who extorts all the consumer's surplus from agent 2--perhaps by making a take-it-or-leave-it offer. In other words, the extortionate monopolist

never makes an offer better than the minimum acceptable to agent 1. Hence he chooses a point on eũ, which is 1's indifference curve going through point e. From 2's point of view the best point on eũ is D, where 2's indifference curve, I', is tangential to eũ. Agent 2 can attain this equilibrium through several mechanisms, such as the two-part tariff discussed in the previous section or take-it-or-leave-it offers which entails 2 offering a deal such as "give me so many units of good A and I will give you so many units of B and if you do not accept this deal then we do not trade at all."

Quite obviously D lies on the contract curve (not shown) in the Edgeworth box and is a Pareto optimal point. So if a monopolist becomes more extortionate, the equilibrium changes from being sub-optimal to optimal (i.e., point B to point D)! Hence extortionate monopolistic practices should not be ruled out by law on grounds of their creating inefficiencies--or at least such an argument would require us to conjure up much more sophisticated scenarios. At the stage it seems that the justification for antitrust policies has to be based on grounds of equity. This is not impossible to construct because in the efficient monopoly equilibrium, that is, at D, the competitive buyers are exactly as well off as at e. Trade with the monopolist confers no benefit on them. Pareto optimality is achieved by the monopolist appropriating the entire benefit from trade. This, some may argue, is evidence of lack fairness in trade.

I have here stayed away from considerations of dynamic efficiency. The above conclusion, for instance, can be

reinforced by arguing that once we bring in innovations and long-run profits into the picture the price-discriminating monopolist may invest even more because he can capture all the rents from an innovation. While information constraints may prevent him from acting like a perfect discriminator, he still has advantage over competitive firms which have no power to extricate rents. However, the argument in the dynamic case gets complicated once we bring in the possibility of adverse selection. In such a case the efficiency of a monopolist could depend critically on the nature of property rights conferred by the nation's laws (Basu, 1989; Singh, 1994). A second complication arises if instead of considering a monopoly we analyse an oligopoly and vary the number of firms to check the effects of concentration on innovation. The answers become extremely sensitive to the assumptions and no one-line conclusion is possible (Loury, 1979; Reinganum, 1989).

The Indian antitrust legislation, as embodied in MRTP 1969, distinguishes between monopolistic and restrictive trade practices[3]. As in the case of America's Robinson-Patman Act, 1936, our MRTP rules out certain kinds of nonlinear pricing schemes on the ground that these are restrictive trade practices. In the light of the above analysis we should recognize that monopolistic practices create inefficiencies; but these inefficiencies do not necessarily get exacerbated by allowing monopolists to indulge in certain restrictive practices which are open to them by virtue of their monopoly power. In fact some of these practices, like nonlinear pricing may actually increase efficiency. Thus if such practices are to be prevented by law

this cannot be justified on the usual ground of monopolistic inefficiency.

5. Fragmented Markets and Switching Costs

The efficiency of markets depends a lot on the ability of goods and services to flow freely from one region to another and between agents. Yet for more than one reason such flows may be restricted not only between countries because of tariffs and transportation costs but also within a country, because of market 'fragmentation'. An important and well-known reason why markets in developing countries are even more far removed from the ideal world of perfect competition than markets in industrialized countries is that these are allegedly 'fragmented'. To understand the nature of such fragmentation is an important step towards policy changes which enables a freer flow of goods and services.

What is often not always appreciated is that while markets can be fragmented because of lack of information or natural switching costs, it can also be the outcome of the absence of an effective law for enforcing contracts. One reason why a rural landlord would not lend money to an unknown person and an urban landlord hesitates to rent his apartment for a limited duration to an unknown person is that neither can be sure of being able to prevent default or a reneging on the terms of the contract. The rural borrower may not repay the loan and the urban tenant may not quit. In brief, these people hesitate to transact outside a limited circle of friends and acquaintances or friends of friends. The upshot is a fragmented market. But before one

can talk of laws for correcting this, it is important to understand exactly what market fragmentation means? How can we model it and subject it to closer scrutiny and empirical analysis? This section attempts to answer these questions.

One possibility is to treat a fragmented market as one broken up into several small isolated markets. For want of a better model, this has been widely used (see e.g., Bardhan, 1984, and Basu, 1987). This reduces to a standard monopoly analysis, where instead of having one monopolist we have to think of a scenario with n monopolistic islands.

It was however argued in Basu and Bell (1991) that this is not an accurate formalization of the more complicated idea of fragmentation. Let me introduce this idea in the abstract, to start with. Suppose there are two producers, agents 1 and 2, who have a fixed clientele or set of potential buyers. Let these sets be, respectively, S_1 and S_2. This would be rightly described as a case of two monopoly islands if S_1 and S_2 had no overlaps. In reality, S_1 and S_2 may look as in figure 5 which suggests that there are some people (those in the eclipsed region of the two moons) who have access to both sellers 1 and 2 and there are also people who have access to either only 1 or only 2. This was described as a case of <u>fragmented duopoly</u>.

A fragmented duopoly is distinct from a standard duopoly which would require $S_1 = S_2$ or a total eclipse in figure 5. To analyse a fragmented duopoly we can however take cue from the literature on switching costs (e.g. von Weizsacker, 1984; Klemperer, 1987) since a fragmented duopoly may be conceived of as a model of industry with infinite switching costs.

To give the reader an idea of how fragmented duopolies work let me consider a simple model with n consumers. Each of them has an identical inverse demand function:

$$p = p(x) = a - bx$$

That is, if p is the price of the good then each consumer would demand $x = (a-p)/b$ units. These n consumers are partitioned into three sets, consisting of n_1 ,n_2 and n_3 members. Thus

$$n_1 + n_2 + n_3 = n$$

The first n_1 buyers have access only to seller 1, the next n_2 have access only to seller 2 and those in the last n_3 can go to whichever seller offers better terms. This is called the contested segment of a market. The buyers who can buy only from seller i comprise i's captive segment.

Figure 5 somewhere here

Each of the two sellers produce the good at the fixed per-unit cost of c. I shall assume that no price discrimination is possible. The case where sellers can discriminate between the captive and contested buyers is discussed in Basu and Bell (1991, Section 3).

Clearly firm i's profit function is given as follows, where q_i denotes the amount sold by i on the contested segment:

$$\pi_i(q_1, q_2) = \begin{cases} \max_x \left[p\left(\frac{x}{n_i}\right) - c \right] x, & \text{if } q_i = 0 \\ \left[p\frac{(q_1+q_2)}{n_3} - c \right] \left[q_i + \frac{n_i}{n_3}(q_1+q_2) \right], & \text{if } q_i > 0 \end{cases}$$

This is explained as follows. If firm i decides not to sell anything on the contested segment ($q_i = 0$), he simply maximises his monopoly profit on his captive segment by selling x units of good so as to maximise $[p(x/n_i)-c]x$. If $q_i > 0$, the price on the contested segment is $p[(q_1+q_2)/n_3]$. Hence on the captive segment the price is $p[(q_1+q_2)/n_3]$. Thus the number of units demanded from him from his captive segment is $(n_i/n_3)(q_1+q_2)$.

We shall say that (q_1^*, q_2^*) is an <u>equilibrium</u> of the fragmented duopoly only if

$$\pi_1(q_1^*, q_2^*) \geq \pi_1(q_1, q_2^*), \quad \text{for all } q_1$$

and $$\pi_2(q_1^*, q_2^*) \geq \pi_2(q_1^*, q_2), \quad \text{for all } q_2.$$

In other words, (q_1^*, q_2^*) is a Nash equilibrium of the above game.

It is easy to check that there is always a unique Nash equilibrium and this happens where q_1 and q_2 are positive. The reaction functions of the two firms are illustrated in Figure 6. The reaction functions have breaks because if total supply in the contested segment becomes too high resulting in too low a price and profit for a firm, say firm 1, then the firm has the option of withdrawing totally from the contested segment and supplying only to his captive segment and charging monopoly prices. It

follows that at point B in figure 6, firm 1's profit is equal to $\max_x [p(x/n_1) - c]x$.

Given the ubiquitous presence of fragmented markets in developing economies, the above method of analysis can be put to a variety of uses. We may do comparative static analysis for changes in the size of captive and contested segments (Basu and Bell, 1991), analyse the effects of various taxes and subsidies on the final industrial outcome and examine the effects of entry and conditions under which the market gets completely 'balkanized' (Mishra, 1991) or clientelized in the sense of Geertz (1978).

The above model can be moulded to fit many different real-life contexts. If the two agents 1 and 2 are two moneylenders, for example, the village landlord and the merchant, then this could be thought of as a credit-market model. The landlord's urge to expand his captive segment could then provide a new explanation of interlinkage. Hence this model can be used to bolster some of the issues discussed in section 3.

Figure 6 somewhere here

Under another interpretation, agents 1 and 2 can be two spatially separated firms, serving different sets of customers S_1 and S_2, where S_1 and S_2 may have some overlap. Given that products and people are less mobile in under-developed countries, models of this kind acquire special significance in such countries. There have also been times when bureaucrats have carved up the market into territories for different producers.

There is scope for applying switching cost models to all these contexts.

6. Of Bureaucrats and Businessmen

As mentioned in section 1, in many developing economies, such as India, a firm's interaction with the government is the central feature of industrial organization. Hence, the strategic interaction between the owners of private firms and the officials of government ought to be a major concern. The standard literature on industrial organization does not give any primacy to such interaction because this literature emerged primarily from western, industrialized nations, where a boxwallah's major preoccupation is not with the civil servant but with the rival company's boxwallas[4].

Fortunately a small literature including some substantial contributions from India is now beginning to emerge, which models the government-firm interaction. This is important from India's point of view as it is likely to have a significant fall-out for industrial policymaking. While there are many different aspects to the interaction between the private sector and government, I shall comment here on three different ideas.

One way in which the government has intervened in the functioning of industry is through actual participation. Thus, when the government nationalizes some banks it is indulging in participatory regulation. Beginning with the work of Merrill and Schneider (1966), this subject has generated quite a substantial literature (see, e.g. Sertel, 1988; Cremer, Marchand and Thisse, 1989; De Fraja and Delbono, 1989; Fershtman, 1990; Sen, 1993).

I have surveyed this literature in Basu (1993) and shall only briefly recapitulate the central idea behind these models here.

Suppose we have an industry in which firms 1,...,n are privately owned firms and firms n+1,...n+m are state-owned or nationalized. These firms confront the following inverse demand function:

$$p = p(\Sigma x_r) = a - \Sigma x_r,$$

where Σx_r is a summation for r = 1 up to r = n+m.
Let firm i's total cost function be given by

$$c_i = c(x_i),\ c' > o,\ c'' \geq 0$$

where x_i is the amount produced by firm i.

Private firms have the usual profit-maximising objective. Hence, for all i ϵ (1,...n),

$$\pi_i(x) = p(\Sigma x_r)x_i - c(x_i),$$

where $x = (x_1,...x_{n+m})$.

A state-owned firm, let us assume, maximises total welfare, that is, the surplus of total welfare increase of consumers over and above the cost of production.

Hence, for all i ϵ {n+1,....,n+m}

$$\pi_i(x) = \int_{t=0}^{\Sigma x_r} p(t)dt - \sum_{r=1}^{n+m} c(x_r)$$

In this model $x^* = (x^*_1,...,x^*_{n+m})$ is an <u>equilibrium</u> if an

only if it is a Nash equilibrium. That is, if and only if

$$\pi_i(x^*) \geq \pi_i(x^*/x_i), \quad \text{for all } x_i,$$

where x^*/x_i is a vector of outputs formed by replacing the i^{th} element of x^* with x_i.

For the sake of illustration consider the case where each firm has an identical, linear cost function:

$$c_i = mx_i$$

In that case in equilibrium each private sector firm will produce nothing and nationalised firms together will produce the competitive output. This, as shown in Basu (1993), is easy to prove. To get some insight into more interesting cases De Fraja and Delbono (1989) have worked with the case where

$$c_i = kx_i^2/2$$

This allows them to raise interesting questions concerning the welfare effects of nationalization and privatization. They demonstrate, for instance, that in a highly concentrated industry (i.e. n + m small) it is worthwhile to nationalise at least one firm.

In the last few years there has been talk of privatization in India and some divestiture of public sector enterprises has occurred[5]. In Asia one of the largest privatization programmes

has occurred at the door-step of India. I am referring here to Bangladesh's programme of 1982 (see Bhaskar and Khan, 1993, for discussion). As yet most empirical studies of privatization have dealt with large macro and fiscal issues. The above class of theoretical models however now make it possible for us to conduct micro-empirical studies. Observe that in the above model, a fully nationalized industry is simply the special case where n = 0. A fully private industry is one where m = 0. A process of privatization is one where n increases with n+m remaining constant and nationalization is the reverse move. Hence by doing comparative statics exercises we may be able to examine the effect of changing n and m on social welfare. The Indian automobile industry with its mix of private and state-owned firms is particularly amenable to such analysis[6].

This will of course, be just a preliminary exercise since in reality there may be important differences in the internal structures and efficiencies of private and state-owned firms. But this is an area of considerable potential interest to developing, mixed economies, such as India.

Another class of bureaucrat-manager models is one where the bureaucrat does not participate as a producer but as a controlling agent with legislative powers to tax and subsidize (Stern 1987). Some of this is surveyed in Noll (1989) and Braeutigam (1989). Many Indian industries fit this description well. Given that some of these have undergone changes in the regime of government control, they may be suitable for analysing the effects of control. For instance, India's cement industry has been progressively liberalized since 1982 (see Gokarn and

Vaidya, 1993) and is an obvious candidate for comparative statics.

Most standard theoretical models analyse interactions between firms and governments by casting the government in the role of a Stackelberg leader. Thus the bureaucrats are assumed to know the behaviour response of firms to different stimuli and they use this knowledge to set taxes, subsidize and to regulate in other ways in order to maximize welfare, revenue or other objectives. In Anant, Basu and Mukherji(1993), we argue that there may be a case for casting the bureaucrat in a more symmetric strategic position than in the conventional literature. For instance when a government tries to regulate a multinational it is often a one-to-one face off. We tried to model such interactions where the government chooses the tax rate to maximise its revenue collection while the firm chooses price so as to maximize profit. We begin by analysing the Nash equilibrium of the model and then go on to examine the subgame perfect equilibria of a two-period model where the firm can in the first period select its cost function from a feasible set of functions. We show that this model may exhibit 'strategic inefficiency'. That is, it may be in the firm's self-interest to commit itself to a cost function which is everywhere more inefficient than another feasible cost function. Our model, unlike the models of participatory management, can be particularly useful in explaining the internal cost structures and inefficiencies of firms in a milieu where there is a strategic government trying to control and regulate.

The third class of models of interaction between government

and private agents belongs to the domain of corruption control (e.g., Chander and Wilde, 1991; Mookherjee, 1991; Basu, Bhattacharya and Mishra, 1992; and Mishra, 1992). Corruption is typically an activity that emerges - and, indeed, has handsomely emerged - from the interface between government and profit-maximizing agents. The evasion of taxes - personal income, corporate income and excise - has been a common feature of several economies. This has meant that the instruments of control, like taxes, do not work in reality with as much efficacy as textbook models suggested. While this in itself has been noted for long in the literature, it is only recently that the strategic nature of the interaction between the agents of enforcement and citizens or firms has been modelled. As yet, this literature does not bear directly on industrial organization models but it is an important area for future research. The control of industry by government has chinks created by corruption and the understanding of this is essential for the design of mechanisms of control which are effective.

7. Conclusion

The theory of industrial organization has emerged in recent years as one of the strongest branches of economics. The stylized facts on which this theory is founded are those pertaining to industrialized nations. While a lot of this is relevant to developing countries by virtue of what is innately common to all economies, there are special features of a developing economy which may require special kinds of industrial organization analysis. In India the inadequacy of both

theoretical and empirical research on industrial organization has meant that we try to make do with models of industry which fit our institutions rather like ill-fitting readymade clothes.

In recent years some initial steps have been taken in India to do theoretical and empirical work on the microeconomics of industry which is a response to the ground reality. In this paper I have tried to give a glimpse of some of the theoretical research that has taken place and of future possibilities.

Footnotes

1. Somewhat more surprisingly, closing down a firm in India can be as riddled with bureaucracy as opening a firm. Though I do not go into problems of exit here, this is a growing concern among Indian economists (see Goswami Committee Report, 1993).
2. For a survey of the literature on industry and industrial reform spawned by the recent structural adjustment policy in India, see Joseph (1994).
3. A large part of it was also concerned about the size of firms and placed obstructions on the growth in size. This has however now been deleted as per the ordinance of 1992.
4. It is arguable, though, that even in industrialized nations the strategic interactions between managers and bureaucrats are more important in reality than has been in the textbooks of economics.
5. This and delicensing are the two central tenets of the New Industrial Policy of July 24, 1991.
6. The automobile industry is an interesting market in India where government has repeated interacted with big companies in an effort to break up concentration and promote competition (Mani, 1985).

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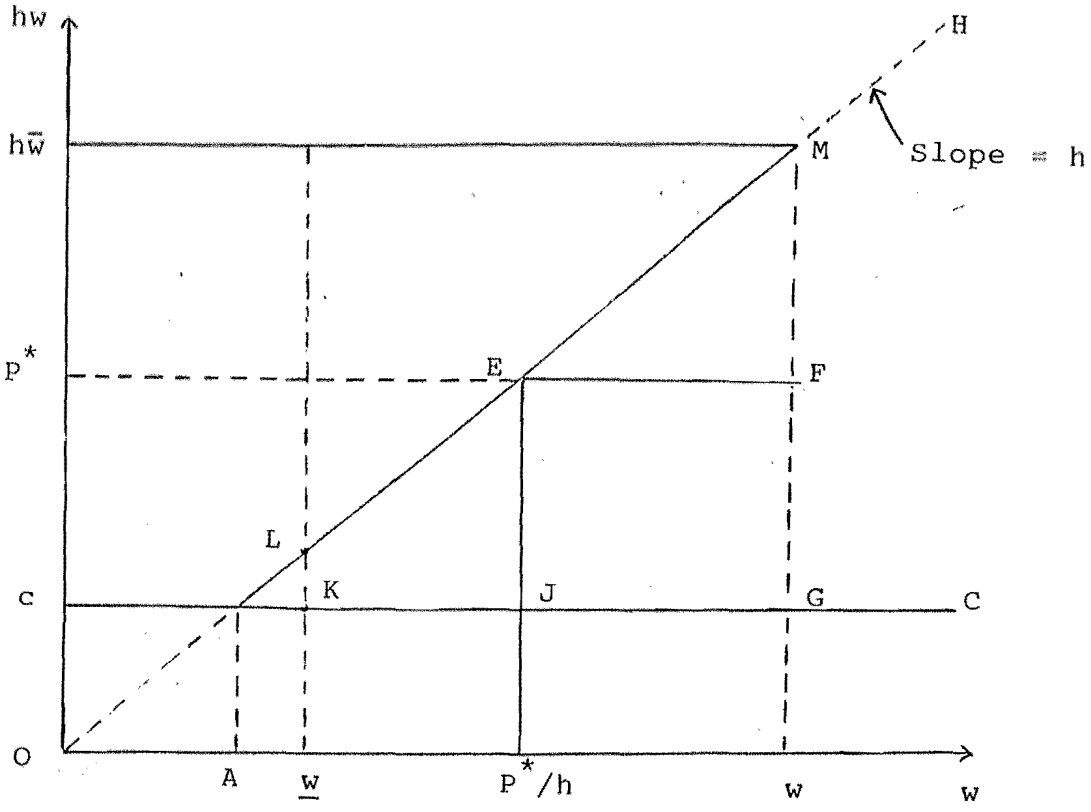


Figure 1

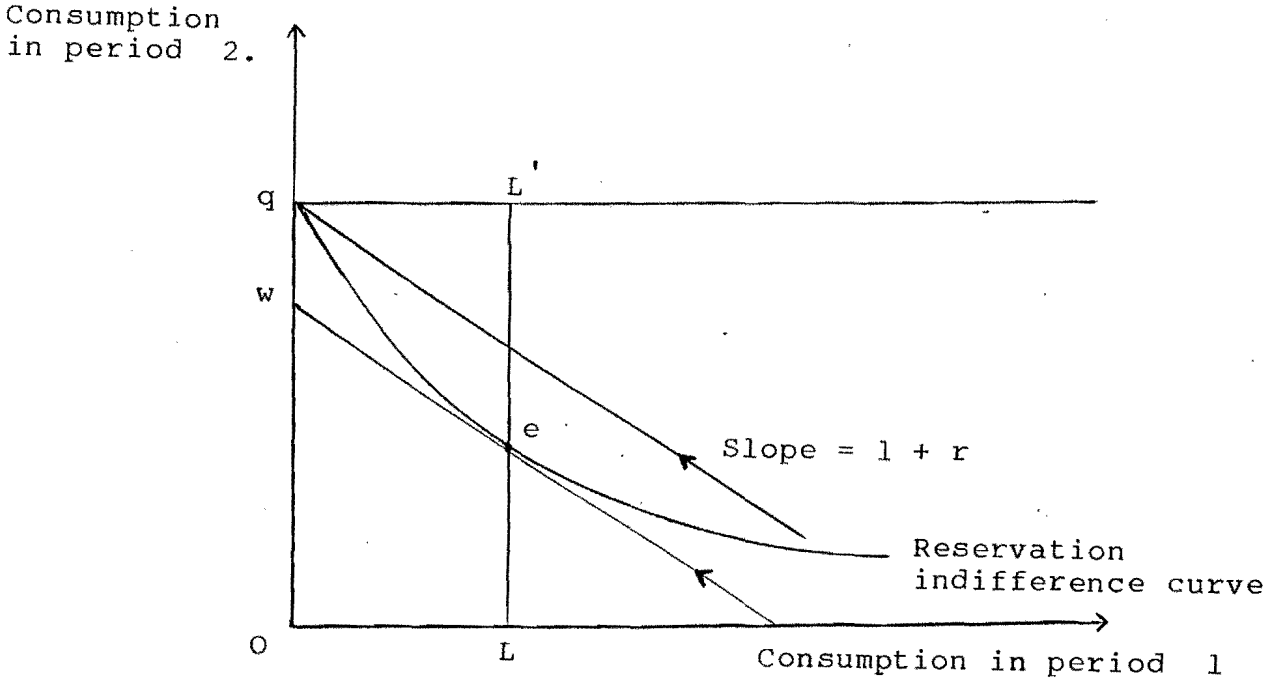


Figure 2

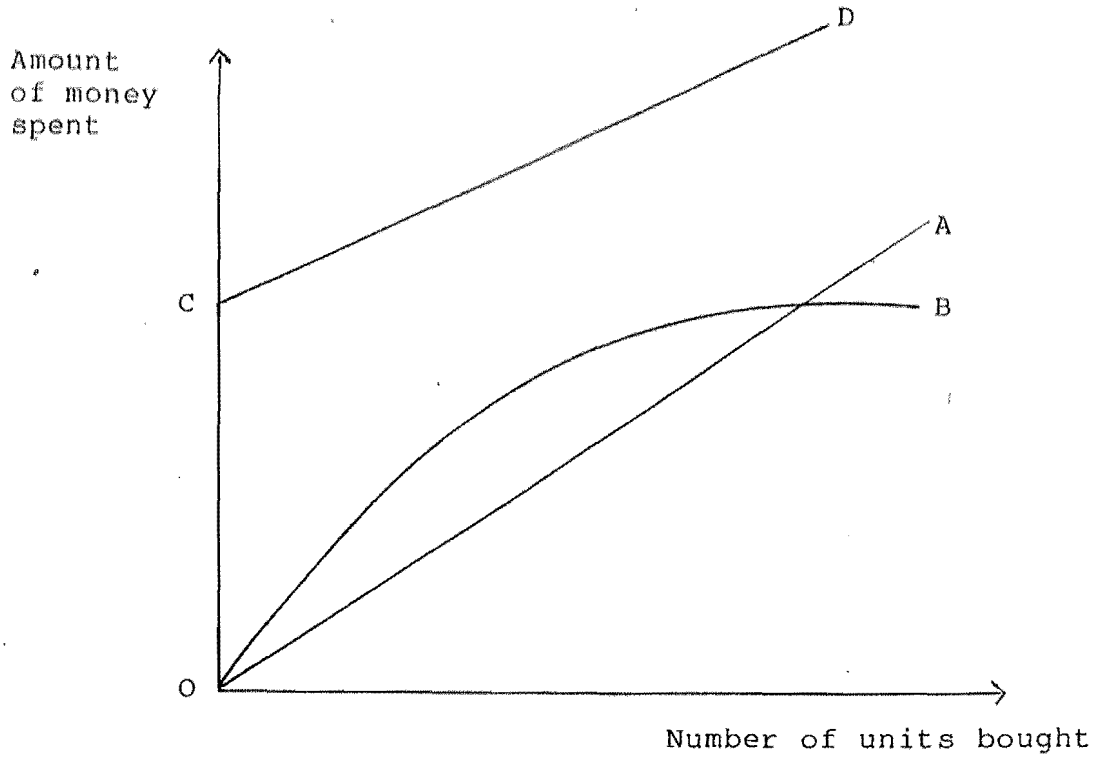
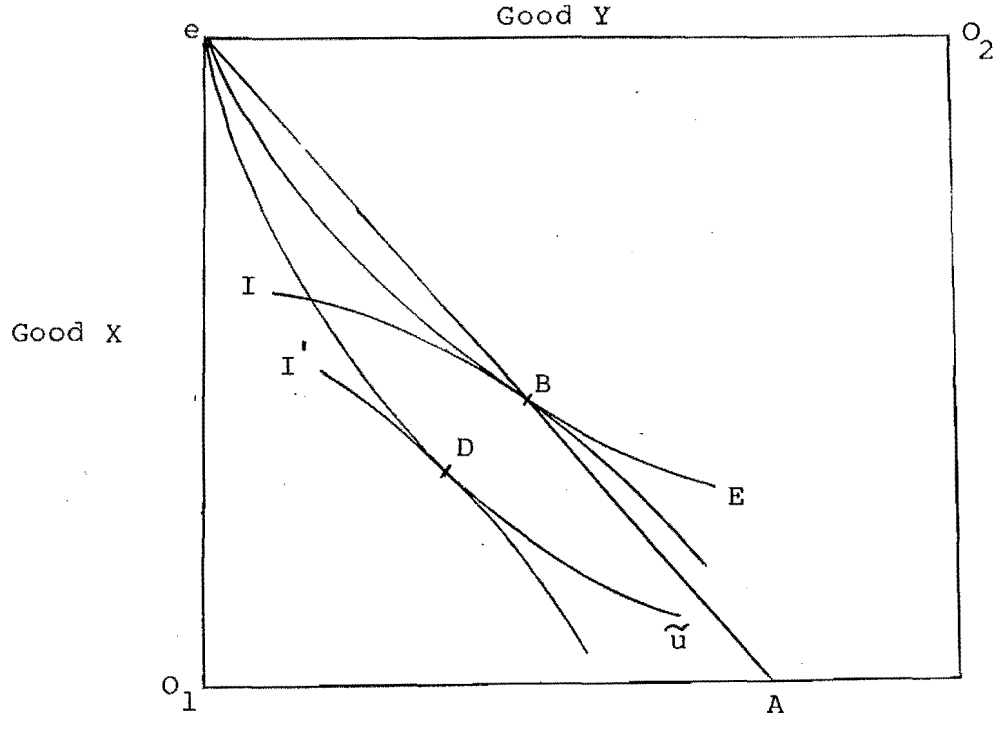


Figure 3



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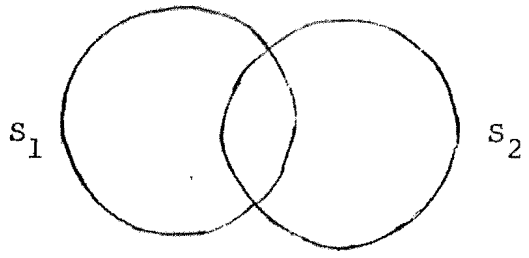

Figure 5

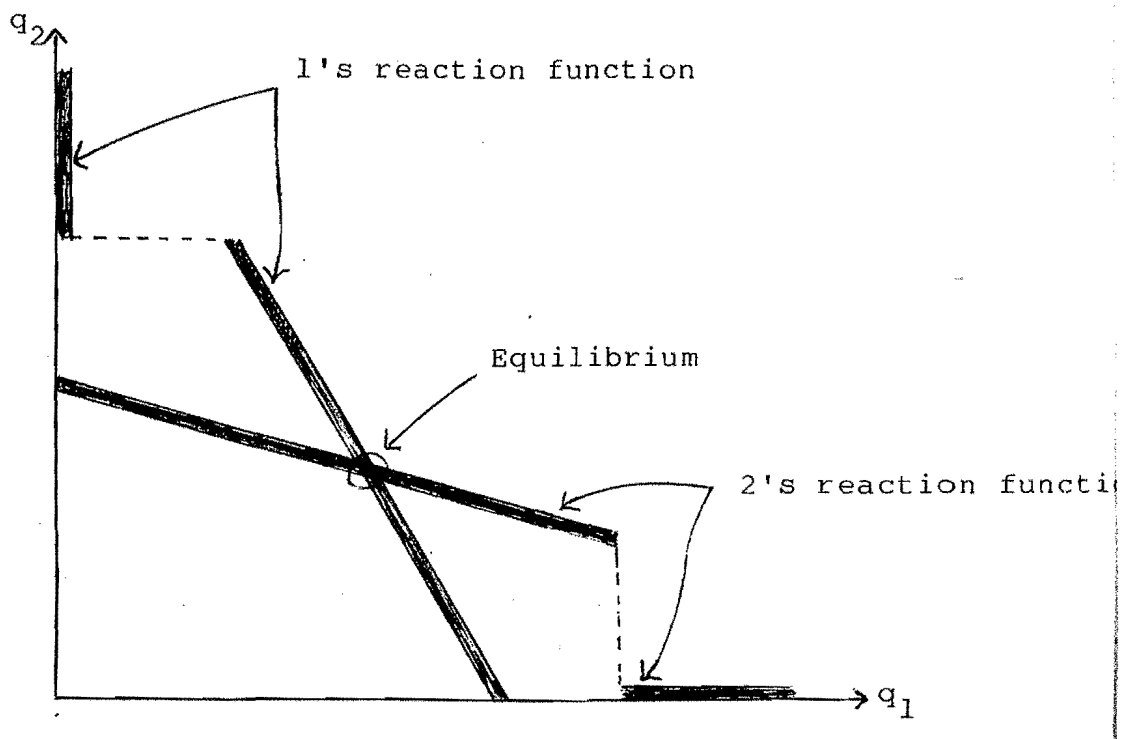

Figure 6

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