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# A NOTE ON RESTAURANT PRICING AND OTHER EXAMPLES OF SOCIAL INFLUENCES ON PRICE

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I am indebted for helpful comments to Ted Bergstrom, Bruno Frey, David Friedman, Milton Harris, Eugene Kandel, Edward Lazear, Kevin M. Murphy, Sherwin Rosen, and George Stigler, and to the participants in a Seminar on Rational Choice in the Social Sciences at the University of Chicago, and to the Lynde and Harry Bradley Foundation and the Hoover Institution for support.

A popular seafood restaurant in Palo Alto does not take reservations, and every day it has long queues for tables during prime hours. Almost directly across the street is another seafood restaurant with comparable food, slightly higher prices, and similar service and other amenities. Yet this restaurant has many empty seats most of the time.

Why doesn't the popular restaurant raise prices, which reduces the queue for seats but expands profits? Several decades ago I asked my class at Columbia to write a report on why successful Broadway plays do not raise prices much; instead they ration scarce seats, especially through delays in seeing a play. I did not get any satisfactory answers, and along with many others, I have continued to be puzzled by such pricing behavior. The same phenomenon is found in the pricing of successful sporting events, like the World Series and Superbowls, and in a related way in the pricing of best-selling books. This Note suggests a possible solution to the puzzle based on social interactions.

The puzzle is easily shown in a supply-demand diagram, where S in Figure 1 is the number of restaurant tables, theatre seats, etc., and $d_1$ is the usual negatively inclined demand curve. At a price of $p_0$, the S units sold must be rationed, with $D_0$ - S being the excess demand at that price. Clearly, profits increase if price were raised to $p_e$ since S units are still sold, but at a higher price. The profit-maximizing price is even higher if d is inelastic at $p_e$.

Many explanations have been suggested for apparently non-maximizing prices like $p_0$. It could be a tax dodge if speculators who sell tickets at a higher price than $p_0$ share profits with owners or employees that are not reported as taxable income. A similar story goes with the maitre de who provides scarce tables to customers willing to pay "under the

table." However, it is unclear why such tax evasion or principle-agent conflicts should be more common with successful plays and restaurants than with the sale of steel or oranges. Moreover, nonprice rationing apparently existed on Broadway long before tax considerations were important.

If consumers consider as unfair price increases that close a current demand-supply gap, this may lower demand in the future, which would discourage current increases in price (see Kahneman, Knetsch and Thaler [1986]). This may sometimes be the correct explanation for why prices do not rise to take advantage of temporary shortfalls in supply, but it is not plausible when rationing is more permanent. A series of gradual price increases could eliminate the gap in Figure 1 without causing serious complaints about unfair pricing.

In this Note I provide a different explanation that assumes a consumer's demand for some goods depends on the demands by other consumers. The motivation for this approach is the recognition that restaurant eating, watching a game or play, attending a concert, or talking about books are all social activities where people consume a product or service together and partly in public.

Suppose that the pleasure from consuming a good is greater when many people want to -- perhaps because a person does not wish to be out of step with what is popular, or because confidence in the quality of the food, writing, or performance is greater when a restaurant, book, or theater is more popular. This attitude is consistent with Groucho Marx's principle that he wouldn't join any club that would accept him.

Formally, I propose that the demand for a good by a person depends positively on the aggregate quantity demanded of the good:

$$\sum d^i(p,D) = F(p,D), \qquad \text{with } F_p < 0,\ F_d > 0\ , \tag{1}$$

where $d^i(p,D)$ is the demand of the ith consumer, and D is the market demand. For each value of D, the equilibrium price solves $D = F(p,D)$. Since $F_p < 0$, there is a unique price for each feasible level of demand, given by the inverse demand function, $p = G(D)$. There are formal similarities between the effects of social interactions and the gains from standardization (see, e.g., Farrell and Saloner [1988]).

Social interactions imply that $\partial G/\partial D$ may not be negative. As is well known, $F_d > 0$ can lead to a positive relation between price and aggregate demand. By differentiating equation (1),

$$\frac{dp}{dD} = G_d = \frac{1-F_d}{F_p}\ . \tag{2}$$

If the social interaction is strong enough -- if $F_d > 1$ -- an increase in aggregate demand would increase the demand price. If $F_d > 1$ for all $D < D^*$, $F_d = 1$ for $D = D^*$, and $F_d < 1$ for $D > D$, the demand price rises as D increases for $D < D^*$, it hits a peak when $D = D^*$, and then it falls as D increases beyond $D^*$ (see $d^0$ in Figure 1).

Since $d^0$ is rising at the market clearing price $p_e$, it obviously pays to raise price above $p_e$ -- no less is sold and each unit fetches more. Indeed, profits are maximized when the price equals $p^{max}$, the peak demand price. The positively inclined demand curve in the vicinity of S explains why popular restaurants remain popular despite "high" prices. Obviously, demand must be rationed at $p^{max}$ since $D^*$ exceeds S. To simplify the

discussion, I assume that the method used to ration demand is costless, such as a pure lottery system, so that the money price is the full cost to consumers.

Since a firm that charges $p^{max}$ has a permanent gap measured by the difference between $D^*$ and S, shouldn't it raise price still further, cut the gap, and make even more profits? The answer from Figure 1 is clear: demand is discontinuous at $p^{max}$ for price increases, and falls to zero even for trivial increases. The reason for the discontinuity is clear. If demand only fell a little (say to $D_1$) at $p = p^{max} + \epsilon$, there would be multiple demand prices at $D_1$: $p_1$ and $p^{max} + \epsilon$. We know that demand price is unique at $D_1$ and at all other values of D. Hence demand must fall to zero when $\epsilon > 0$, no matter how small $\epsilon$ is.

Of course, demand curves like $d^0$ that first rise and then fall are not the only possible outcome of the positive effect of market demand on the quantities demanded by each consumer. The net effect could be a demand curve that is negatively inclined (when $F_d$ always $< 1$, as $d_1$ in Figure 1), or it could be the demand d in Figure 2 that is first negatively sloped, becomes positively sloped for some D, and then becomes negatively sloped again. The firm would like to charge p* in Figure 2 and sell all S units, with demand at $D_g^*$ and the gap being sizable. This equilibrium is similar to the equilibrium at $p^{max}$ in Figure 1.

However, if the firm simply chooses the price p*, demand may be at $D_b^*$ rather than at $D_g^*$ since demand has two values at p*. Moreover, $D_b^*$ is not an attractive equilibrium since the excess capacity ($S-D^*_b$) is substantial. If the firm must have an inferior equilibrium, it prefers $p_e$ to p* since marginal revenue is zero when $p = p_e < p^*$ and $D = D_e < S$.

Consequently, there are two competing locally profit-maximizing equilibria: one has excess capacity and a low price ($S-D_e$, $p_e$), and the other has excess demand and a high price ($D^*_g-S$, $p^*$). The difference between these equilibria corresponds to the difference between a struggling restaurant or play with excess tables or seats, and a highly successful one that is "in" and turns away would-be customers.

Obviously, producers prefer the excess demand equilibrium, but how can they help bring that about? Since each consumer demands more when others do, producers can try to coordinate consumers to induce them to raise their demands together.

Advertising and publicity may help, for these have a multiplier effect when consumers influence each other. Advertising that raises the demands of some consumers indirectly also raises the demands of other consumers since higher consumption by those vulnerable to publicity campaigns stimulates the demands of others. This explains the promotion of new books, and suggests that goods with bandwagon properties tend to be heavily advertised.

The distinctive equilibria at $D = D_e$ and $D = D^*_g$ is a formal recognition of the well-known fact mentioned at the beginning that one restaurant may do much better than another one, even though they have very similar food and amenities. The success and failure of new books is an equally good example. Stephen Hawking's A Brief History of Time was on the New York Times' best seller list for over one hundred weeks and sold more than 1.1 million hardcover copies. Yet I doubt if 1 percent of those who bought the book could understand it. The book's main value to purchasers has been as a display on coffee tables and as a source of pride in conversations at parties.

The inequality in book sales is large: the coefficients of variation in total sales to August 1989 of books issued in 1987-88 by one publisher exceeded 129 percent and 177 percent for hardcover fiction and nonfiction books, respectively (the data were supplied to me by Eugene Kandel). The success and failure of trade books -- like that of restaurants, plays, and other events -- often depends on fortuitous factors that help sales snowball when they catch on and sink when they flop.

Figure 2 can explain an important characteristic of book pricing: the price of the hardcover edition almost never increases when a book turns out to succeed, nor until remaindering does it fall so much if it flops (see the analysis and evidence in Kandel [1990]). The reason is that $p^*$ is more or less the optimal price whether it flops or not -- assuming demand is quite inelastic for $p < p^*$ (so that $p_e$ is close to $p^*$). Publishers set a price of $p^*$ and hope for success, but they recognize that they may end up with many unsold copies ($S-D_b^*$) that are mainly useful in the remainder market and for the paper content.

The "fickleness" of consumers evident in the shift of restaurants between "in" and "out" categories is also captured by this analysis. Although the equilibrium at $(p_e,D_e)$ is locally stable, the one at $(p^*,D_g^*)$ is not stable for shocks that reduce demand, and neither equilibrium is stable for large changes. If consumers at $(p^*,D_g^*)$ lose confidence that other consumers want the good, demand will drop all the way to $D_b^*$.

This analysis explains too another commonly-noted phenomenon: it is much easier to go from being "in" to being "out" than from being "out" to being "in." Since the equilibrium at $(p_e,D_e)$ is locally stable in <u>both</u> directions, only a large upward shock to demand could shift that "out" equilibrium to the more profitable one at $(p^*,D_g^*)$.

The partial instability of the profitable equilibrium at $(p^*, D_g^*)$ may also explain a puzzle about supply. If price is not raised when demand exceeds supply, why doesn't output expand to close the gap? That does happen for best sellers, where unexpected heavy demand is usually met by additional printings. Sometimes, too, restaurants faced with excess demand expand seating capacity, but often they do not. One explanation for why they do not expand is that restaurants know customers are fickle and a booming business is very fragile. They might be reluctant to expand capacity if demand at $p^*$ could suddenly fall from $D_g^*$ to $D_b^*$. The cost of an expansion in capacity from say S to $S^1$ could then drive a restaurant into bankruptcy.

Another possible explanation of why supply does not grow is that aggregate demand depends not only on price and aggregate demand, but also positively on the gap between demand and supply:

$$\sum d^i(p,D,\frac{D}{S}) = F(P,D,\frac{D}{S}),\ \frac{\partial F}{\partial d/s} > 0\ . \qquad (3)$$

Greater supply might not pay because that lowers the gap, and hence the optimal price available to a producer.

This may explain why customers who have trouble getting into the popular Palo Alto restaurant mentioned at the beginning of this Note do not switch to the nearby unpopular one. When I suggest doing this to my wife, she usually answers that she prefers the amenities at the popular restaurant. But the main difference in "amenities" is that one restaurant is crowded and has queues, while the other one is partly empty and provides immediate seating!

The gap between what is demanded and what is supplied affects demand when consumers get utility from competing for goods that are not available to everyone who wants them -- such as an exclusive club -- or when the camaraderie on a queue itself delivers utility. Of course, entering the gap into the demand function to explain why supply does not increase appears to be an ad hoc invention of a "good" to solve a puzzle. Therefore, I do not want to overemphasize the importance of the gap between demand and supply, although I do believe it is sometimes relevant.

In an insightful comment, Ted Bergstrom was disturbed by the leftward instability of the equilibrium at $(p^*, D_g^*)$, and proposed a somewhat different approach. In his model, typical consumers prefer a larger aggregate demand only up to some fraction of capacity -- beyond that they find a restaurant, theatre, etc. "too crowded." He shows that this can lead to a locally <u>stable</u> high price profit-maximizing equilibrium where demand equals capacity. Bergstrom's suggestion is valuable for some problems, but the model in this Note seems better suited to the best-seller phenomenon, persistent excess demand, and the much greater fragililty of being an "in" activity than an "out" activity.

A restaurant could increase the leftward stability of a high price equilibrium by lowering price in figure 2 below $p^*$, say to $\bar{p} < p^*$, which has a demand at $\bar{D}_g > D_g^*$. The seller might be willing to trade off a lower price than $p^*$ for a more stable equilibrium: the point $(\bar{p}, \bar{D}_g)$ is stable not only for increases in demand, but also for some shocks that lower demand. However, $\bar{p}$ does not avoid but magnifies the multiple equilibrium problem since there is the leftward unstable equilibrium at $\bar{D}_f$, as well as the excess capacity locally stable equilibrium at $\bar{D}_b$.

It may strike some readers as ad hoc to make a person's demand depend on the demands of others in order to explain why restaurants, theaters, publishers, and others do not raise price when demand exceeds supply. But economists have paid insufficient attention to direct social influences on behavior. Fortunately, social interactions finally are being incorporated into economic models to explain residential segregation and neighborhood "tipping," custom, pay structure, gambling, and other behavior (for some examples, see Akerlof [1980], Becker [1974], Bond and Coulson [1988], Brenner [1983], Frank [1985], Granovetter [1978], Jones [1984],and Schelling [1978]). Therefore, the analysis in this Note fits well into a growing economic literature that recognizes the influence on consumers and workers of the social world they live in.

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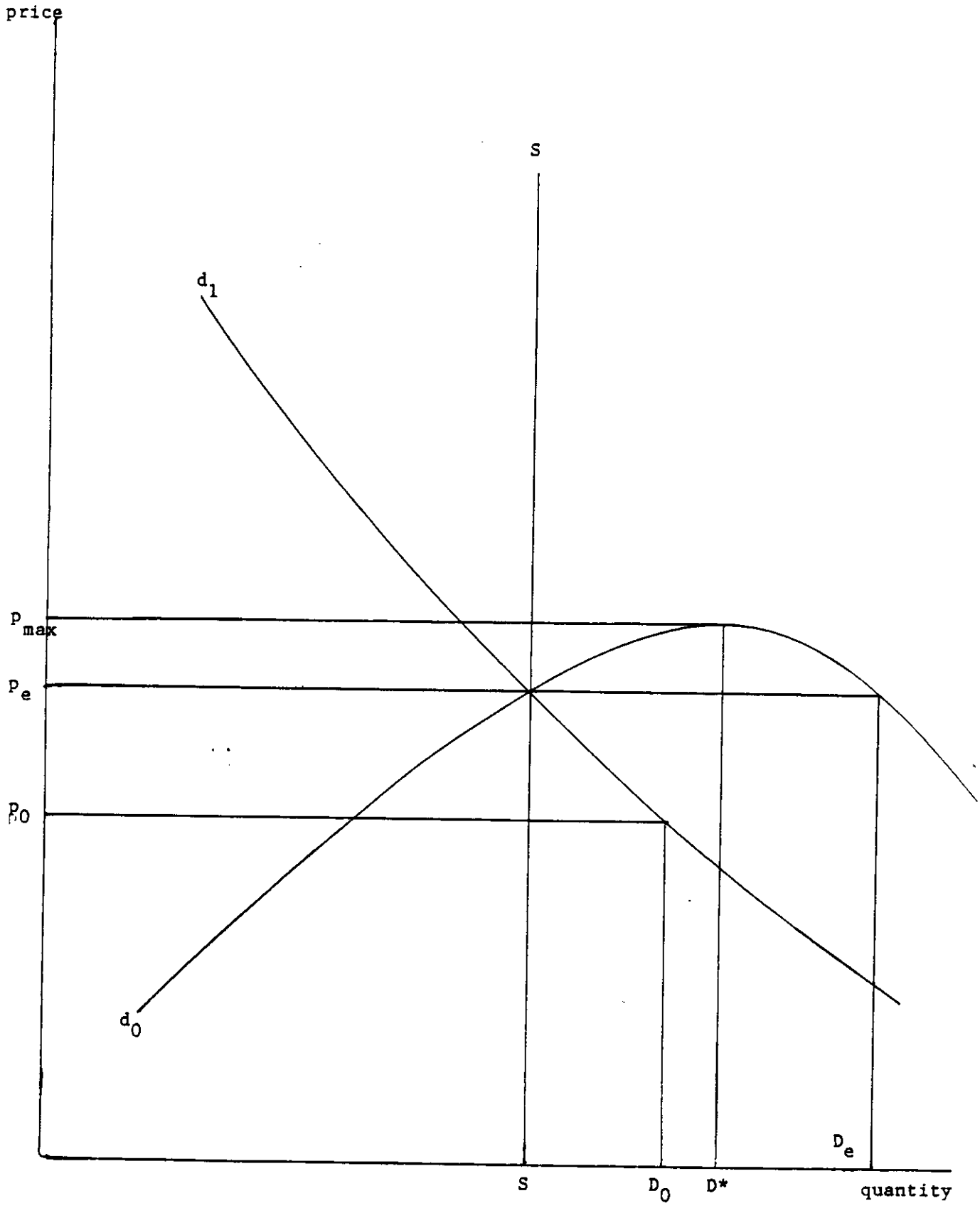


Figure 1

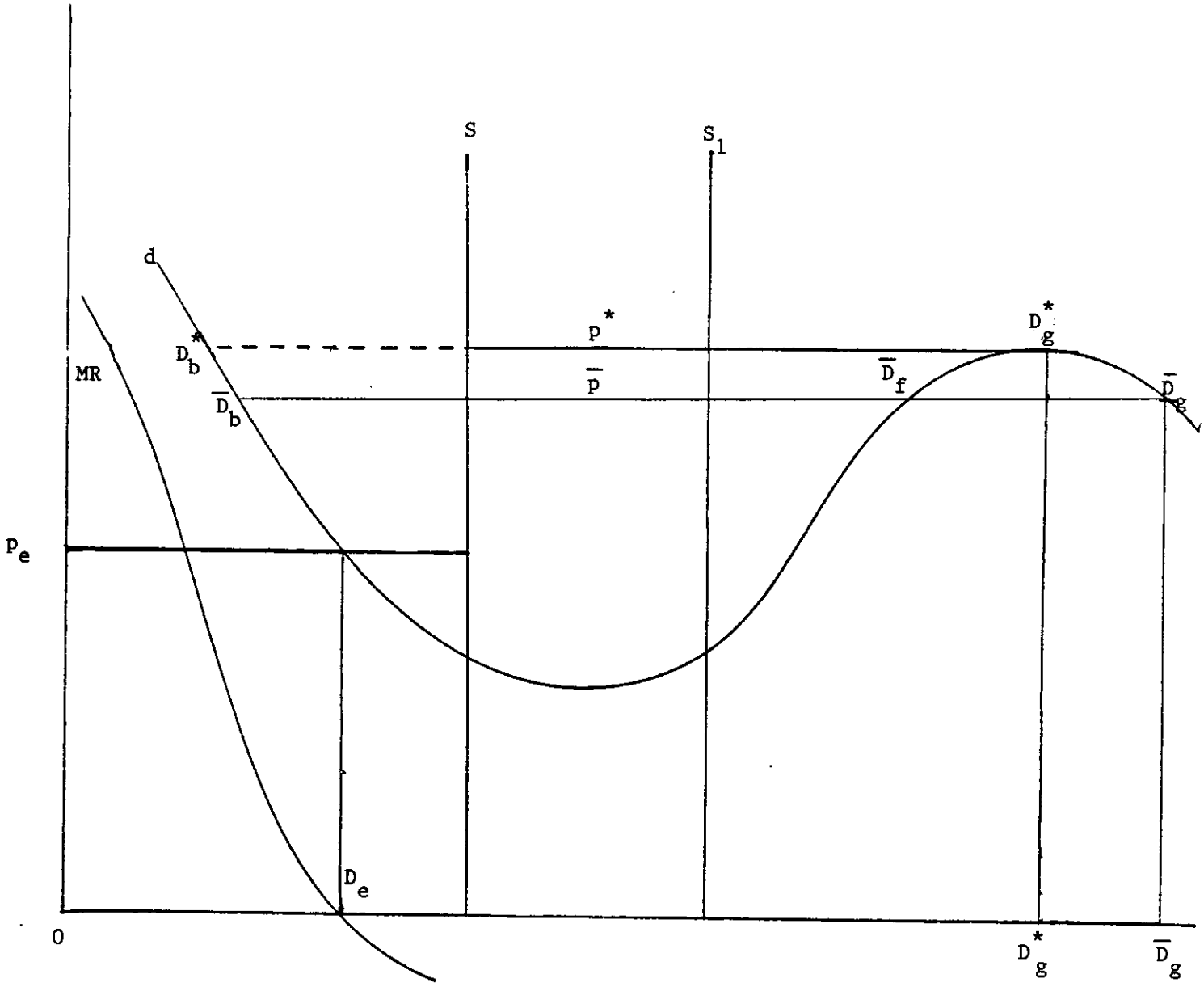


Figure 2