A Note on Restaurant Pricing under the Social Influences

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People frequently face rather strange situation in their economic activity: many successful restaurants, plays, sporting events, and other activities do not raise prices even with persistent excess demand. A popular restaurant in many cities does not take reservations, and every day it has long queues for tables during prime hours. Almost directly across the street is another same type of restaurant with comparable food, slightly higher or even lower prices, and similar service and other amenities. However, we can find that many empty seats are available most of time in this restaurant.

Why doesn’t the popular restaurant increase prices? This would reduce the waiting line for seats but expand profits?. The puzzle is easily shown in a usual supply-demand diagram, in which S in figure 1 is the number of restaurant tables and \( d_t \) is the negative sloped demand curve. At a price of \( p_o \) the S units sold must be rationed, with \( D_o = S \) being the excess demand at that price. Clearly, profits increase if price is raised to \( p_c \) since S units are still sold, but at a higher price. The profit maximizing price is even higher if \( d_t \) is inelastic at \( p_o \).

As well known, many explanation have been suggested for apparently non maximizing prices such as \( p_o \) . One of them is “under the
table", that is, managers may try to provide scarce tables to customers willing to pay under the table. The other is for the tax evasion. However, it is unclear why such tax evasion or principle-agent conflicts should be more common with successful restaurants and plays than with the sale of other goods.

Prices increases will be discouraged if consumers believe that they are unfair (see Kahneman, Knetsch, and Thaler 1986). This may sometimes help explain why prices do not rise to take advantage of temporary shortfalls in supply, but it is not plausible since rationing is more permanent. A strategy of gradual price increases could get rid of the gap in figure 1 without causing serious complaints about unfair pricing.

Professor Becker suggests a different explanation, which assumes that consumers's demand for some goods depends on the demand by other consumer. The motivation for his approach is the recognition that restaurant eating, watching a game or play, or talking about books are all social activities in which people consume a product or service together and partly in public.

According to his assertion, pleasure from a good is greater when many people want to consume it, 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. Based on his argument, he formally propose a new type of demand function as follows.

The demand for a good by a person depends positively on the aggregate quantity demanded of the good:

\[ D = \sum d_i'(p, D) = F(p, D), \quad F_p < 0, \quad F_d > 0, \quad (1) \]

where \( d_i'(p, D) \) is the demand of the \( i \)th 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 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), we get

\[
dp/dD = G_d = (1-F_d)/F_p .
\]  

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 \( D^* \) which brings about the \( \cap \) shape demand curve (see \( d_0 \) in fig. 1); that is, while \( F_d > 1, F_{dd} < 0 \) should be satisfied for the \( \cap \) shape demand curve, which implies that \( F_{dd} < 0 \) is a necessary condition for the analysis.

![Figure 1](image-url)
Since \( d_0 \) is rising at the market clearing price \( p_0 \), it obviously pays to raise price above \( p_0 \); no less is sold and each unit fetches more. Indeed, profits are maximized when the price equals \( p_{\text{max}} \), 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 \( p_{\text{max}} \) since \( D^* \) exceeds \( S \). To simplify the discussion, it assumes that the method used to ration demand is costless, such as pure lottery system, so that the money is the full cost to consumers.

Since a firm that charges \( p_{\text{max}} \) 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 profit? The answer from figure 1 is clear: demand is discontinuous at \( p_{\text{max}} \) for price increases and falls to zero even for trivial increases. The reason for the discontinuity is clear. If demands fell only a little (say to \( D_1 \)) at \( p = p_{\text{max}} + \epsilon \), there would be multiple demand prices at \( D_1 \): \( p_1 \) and \( p_{\text{max}} + \epsilon \). 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.

Obviously producers prefer the excess demand equilibrium with high price, but how can they help bring that about? Since each consumer demand more when others do, producers can try to coordinate consumers to induce them to raise their demand 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 also indirectly 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 it suggests that goods with bandwagon properties tend to be heavily advertised.

Of course Becker, without specifying advertising as a variable, assumes implicitly that the effect of advertising decreases as the quantity of demand increase, which brings about the downward slope of demand curve; that is, \( F_d \) becomes less than 1 as \( D \) is beyond \( D^* \), which implies
that \( F_{dd} < 0 \) due to advertisement. Note that \( F_{dd} < 0 \) is necessary condition for the \( \cap \) shape demand curve. However, there is no reason that the advertisement effect greatly exist at initial stage only and decreases over time for the \( \cap \) shape demand curve.\(^1\)

In fact, to explain why supply does not grow in spite of excess demand, Becker suggest to extend demand function such that \( D = \sum d^i(p, D, D/S) = F(p, D, D/S) \), \( \partial F/\partial (D/S) > 0 \). That is, aggregate demand depends not only on price and aggregate demand but also positively on the gap between demand and supply. This is plausible assumption as long as 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 queue itself derives utility. Actually his explanation about fixed supply in spite of excess demand is valid only when his new demand curve \( F(p, D, D/S) \) has an \( \cap \) shape demand curve, which implies that \( F_{DD} = (\partial/\partial D)(F_D + F_{DS}) \) should be negative. In terms of Becker's concept, this is possible only when not only the value of \( F_D \) is very large at initial stage through advertisement but also \( F_{DD} < 0 \) since \( \partial/\partial D(F_{DS}) \) is positive (note that \( F_{DS} \) is positive by assumption and \( D/S \) increases as \( D \) goes up). In sum, the results of Becker's model is valid only when there exist a great demand promotion through advertisement at an initial stage and also \( F_{DD} \) is negative. Again note that \( F_{DD} < 0 \) is a necessary condition for the Becker's model However, it seems to be implausible in practical sense. There is no reason that \( F_{DD} \) should be restrictive to be negative as long as we emphasize the impact of social influence on consumer demand. Rather, the assumption that \( F_{DD} > 0 \) is more plausible in the context of social influence.

Hence, to obtain the same result as Becker without the implausible assumption that \( F_{DD} < 0 \) (in other words, to obtain \( \cap \) shape demand

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1) Furthermore, if the multiplier effect through advertising becomes weak as \( D \) increases, we have to decide optimal amount of advertising. This implies that advertising should be included into demand function as an endogenous variable. Then it is impossible to decide optimal amount of advertising since only two equations (demand curve, and supply curve (fixed)) exist for the solution of three variables, that is, price, quantity, and the amount of advertising.
curve with $F_{DD} > 0$), I propose that the demand for a good by a person depends on not only the aggregate quantity demanded of the good but also the waiting time for a good to be served, that is,

$$D = \sum d'(p, D, W(D)) = F(p, D, W(D)), \quad F_p < 0, \quad F_D > 0, \quad F_w < 0, \quad W_D > 0,$$

where $W(D)$ is the waiting time which is decided by the amount of demand. Note that the disutility by waiting time is fully covered by consumers and is reflected into demand curve.\(^2\) Actually, $W(D)$ corresponds to the variable($=D/S$) suggested by Becker. But its effect on demand function is opposite.\(^3\) Then, by differentiating equation (2), we get

$$\frac{dp}{dD} = F_d = \frac{(1-F_D-F_wW_D)}{F_p}$$

This result shows that the sign of $dp/dD$ depends on the relative size of $F_D$ and $F_w$. That is, if $F_D+F_wW_D > 1$, $dp/dD > 0$ and if $F_D+F_wW_D < 1$, $dp/dD < 0$. Note that if $(\partial / \partial D)(F_D+F_wW_D) < 0$, the value of $F_D+F_wW_D$ decreases as $D$ increases. Hence, if $F_D+F_wW_D > 1$ and $(\partial / \partial D)(F_D+F_wW_D) < 0$, the demand curve becomes $\cap$ shaped type. Since we can assume that $F_D+F_wW_D > 1$ at initial stage as long as $F_D$ is great, all we have to do is to investigate under what conditions $(\partial / \partial D)(F_D+F_wW_D) < 0$. Note that

$$(\partial / \partial D)(F_D+F_wW_D) = F_{DD} + F_{WD}W_D + F_wW_{DD}.$$  

Since $F_{DD}$ and $W_D$ are positive and $F_w$ is negative by assumption, the sign of $(\partial / \partial D)(F_D+F_wW_D) = F_{DD} + F_{WD}W_D + F_wW_{DD}$ depends on $F_{WD}$ and $W_{DD}$. First, $F_{WD}$ seems be positive as long as social influence is emphasized; the utility loss due to waiting may be compensated by the fact itself that a lot of people are served at a restaurant. In other words, the value of utility loss caused by waiting is smaller under the mild crowd than under the heavy crowd. Hence, the value of $F_w$ goes up as $D$ increases. Second, the sign of $W_{DD}$

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2) Here we assume a full price which is price($-price$) plus waiting time. Hence variable $W(D)$ comes from budget constraint, which will appear in indirect utility function.

3) While variable D/S increases demand as D increases, variable W(D) decreases demand as D increases. However, as it will be shown later, we also consider the Becker's assertion indirectly by assuming that the value of $F_w$ decreases as D increases; in other words, the demand decrease caused by waiting become smaller as the value of D becomes larger.
is positive if the supplier can not reduce the rate of increase of waiting
time caused by demand increase, that is, if the supplier gets more trouble
in handling customers as its number increases. Hence, if \( W_D \) becomes
large at later stage due to demand increase, the demand curve can be \( \cap \)
shaped type even though \( F_{DD} \) is positive(note Becker assume that \( F_{DD} \) is
very large at intial stage only and decreases as \( D \) increases, that is, \( F_{DD} \) is
negative).

To derive \( \cap \) shape demand curve, professor Becker assume that social
influence is very large at intial stage only and decreases as \( D \) increases.
However, his assumption seems to be implausible since there is no reason
that the effect of social influence become weaker as demand increases
(Actually Becker simply mention that advertisement would make a role
while he does not specify advertisement for the demand function).

In this note, to emphasize and generalize social influence effect, we do
not restrict the value of to be negative \( F_{DD} \). However, it has been shown
that \( \cap \) shape demand curve can be obtained by introducing waiting time.
We show that the puzzle for the restaurant price can be solve in more
complete form by considering not only social influence but also the
consumer's utility loss caused by waiting time.

References

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4) Actually, social influence are incorporate into economic models to explain residential
segregation and neighborhood "tipping," custom, and other behaviour(for example, see
Becker(1974), Akerlof(1980), and Bond and Coulson(1989)). However, social influence is in
more general way.