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Why successful restaurants do not raise their prices

Market forces of demand and the all-or-nothing demand curve

Abstract

Becker (1991) addresses the problem of persistent queues at popular restaurants. He poses the question why such restaurants do not raise their prices, thus reducing the queues while expanding profits. He presents a solution based on the assumption that demand by a typical visitor to such a restaurant depends positively on the quantities demanded by others which could be so strong that the market demand curve slopes upward. For an equilibrium to emerge, Becker introduces a free lottery. We show that Becker's lottery is based on assumptions which may hold in the case of spontaneously emerging queues, but not in situations like popular restaurants where consumers apply self – rationing. In both cases, however, every individual's demand function, in addition to price, depends on effective demand rather than on aggregate demand. Using the forces underlying aggregated demand, we show that Becker's solution leads to excess supply rather than excess demand. We use the all-or-nothing demand curve and the notion of patient consumer to show that a popular restaurant (and other firms facing persistent queues) sets a price such that equilibrium is achieved while long run demand is upheld.

Keywords: persistent excess demand, bandwagon effect, queue, waiting list, long run demand curve, short run demand curve, Becker, all-or- nothing demand curve, patient consumer

JEL code: R10, D01, D11

I. INTRODUCTION

In a seminal paper, Becker (1991, p.1109) posed the puzzle why popular restaurants with persistent queues do not raise their prices, thus reducing the queues while expanding profits.[1] Becker's paper has influenced a substantial literature in various branches of economics including demand theory (Pesendorfer, 1995; DeGraba, 1995; DeSerpa and Faith, 1996; Katz and Spiegel, 1996; Plott and Smith, 1999 and Metrick and Zeckhauser, 1999), price theory (Karni and Levin, 1994; Rozen and Rosenfield, 1997; Lee and McKenzie, 1998 and Boyer and Moreaux, 1999), information economics (Bikhchandani et al., 1992; Carminal and Vives, 1996; Zhang, 1997; Vettas, 1998; Aoyagi, 1998; Welch, 1999, Hung and Plott, 2001; and Albrecht et al, 2002), the theory of rationing (Denicolo' and Garella, 1999; DeGraba and Mohammed, 1999, Gilbert and Klemperer, 2002), the theory of auction markets (Bulow and Klemperer, 2002), and environmental economics (Silby, 2001). Becker's note has also inspired sociologists and psychologists (see among others Kirman, 1993; Karni and Levin, 1994; Bose, 1996, Winston, 1999, Pastine and Pastine 2002). However, although it is a typical regional phenomenon, to the best of our knowledge, the puzzle has not been dealt with in regional science.[2]

Becker's solution to the puzzle is based on the assumption that the restaurant's popularity creates a positive externality such that the demand curve facing the popular restaurant is upward sloping over part of its domain with a maximal price attained at a level of demand exceeding its seating capacity. See Figure 1, taken from Becker (1991), where DD is the long run (equilibrium) demand curve postulated by Becker. Becker argues that any price increase beyond the maximal price results in a discontinuous drop in quantity and profits. By charging p_{max}, the restaurant has a permanent gap between demand D_g and supply S. In Becker's view, the gap and the resulting queue are necessary in order to sustain demand. Particularly, the price cannot be raised without losing all consumers.

Becker's solution to the puzzle of persistent queues does not hold, because it conflicts with the market forces underlying demand which he ignores. For a correct understanding, we must take into account the relationship that exists between the aggregated demand schedule and the demand schedule of the separate sources of demand, as already pointed out by Pigou (1913, p. 19). To only look at the result of aggregation may lead to wrong conclusions, as observed by Friedman (1976, p. 87). See also Morgenstern (1948, p. 176) who observed: 'The belief that the particular way in which aggregates arise is unimportant underlies much of contemporary economic theory […]. It involves an idea of simplification which falsifies the very inner structure of economic problems and phenomena.' In addition, Becker's definition and description of the problem are incomplete (see sections II and III).

The objectives of this paper are the following. First, we show that Becker's solution leads to excess supply rather than excess demand, as postulated by him (section II). Next, in section III, we redefine the problem and present the all-or-nothing demand curve in combination with the notion of patient consumer as a solution to the puzzle. Note that in spite of the considerable attention that as been paid to Becker's puzzle this simple explanation has not been given as yet.

II. BECKER'S RESTAURANT REVISITED

We adopt Becker's demand framework and assume that all individuals *i* have identical Marshallian demand curves:

$p_i = a – bd_i + cD.$

Where d_i is the quantity bought by the individual consumer and D is aggregated demand. As usual, a and b are positive. If c is positive too, then there is a bandwagon effect; if c is negative, there is a snob effect.

If there are m identical consumers, then $D = md_i$. This gives the following long-run equilibrium market demand curve:

$p_i = a + [c – b/m] D.$

On this demand curve, ceteris paribus, no consumer wants to change his or her plans. If $c-b/m<0$ (interval O-A in Figure 1), the demand curve slopes downwards. A strong bandwagon effect (i.e. $c>0$) (interval A-B in Figure 1), can make c-b/m positive and the equilibrium market demand curve slope upwards. Hence, Becker's market demand curve, DD, is non-monotonic. Note, however, that the short-run individual demand curves, d_i (given the total quantity that is expected to be demanded), and also the sum of them, slope downwards (Leibenstein 1950, pp. 194-195). See Σd_i in Figure 1. The points on the aggregated short-run demand curves are unstable, except for those that coincide with the equilibrium (long-run) market demand curve. That is, sooner or later the consumer discovers that the quantity demanded differs from the quantity he expected. He adjusts his behavior and the points on the long-run market demand curve, DD, emerge (Leibenstein op.cit. pp. 194-195).

Becker assumes that the social effect depends on the total quantity that consumers would like to purchase at the prevailing price, i.e. on aggregated demand, as shown by his demand curve (1):

$$D = \Sigma d_i (p,D) = F (p, D), F_p < 0, F_D > 0 \qquad (1)$$

where $d_i(p,D)$ is the demand of the individual consumer and D is aggregated demand. In other words, Becker assumes that the "line" in front of a popular restaurant is positively valued by consumers. Not in the sense that waiting itself is a “good”, but because the line, including the people who are waiting but will not be seated, is an indicator of the quality (prestige, reputation) of the restaurant.

The assumption that demand depends on aggregated demand necessitates Becker to pose an equilibrium with demand exceeding supply where the money price of the meal is the full cost to the consumer (Becker, 1991, p. 1112). For the equilibrium to emerge, Becker introduces a rationing mechanism, e.g. a pure lottery, that does not impose any costs on anyone. (Since he assumes that the restaurant does not take reservations, waiting and waiting lists cannot serve as instruments of rationing (Barzel, 1974; Lindsay and Feigenbaum, 1984)). That is, Becker assumes that everyone appears at the door of the restaurant where there is a lottery. Only the lucky ones can enter the restaurant, though both those who can enter and those who cannot, are willing and able to pay the price.

Becker's lottery is based on two assumptions: (i) the queues encompass all the consumers who want to visit the restaurant such that it represents total demand, and (ii) all potential customers arrive at the door at exactly the same moment and thus need to be treated equally, i.e. their chances to be admitted are equal. Both assumptions are extreme and at odds with experience. First, queues in front of a popular restaurant are not arbitrary long, but are restricted such that the last ones in line still have a fair chance of being seated. Upon arrival, a consumer will estimate this chance and decide upon lining up or not. No one will be in line, if they know that they will not be seated. Potential visitors will collect information about the restaurant including its seating capacity. Hence, everybody arriving at the restaurant is aware of SS in Figure 1. Secondly, the daily queue is not equal to total demand. In fact, the daily queue is only a portion of total demand which is the sum of daily demand over an unknown spell of time, and thus is unknown. Hence, consumers need another indicator of a restaurant's popularity than total demand. A natural alternative for consumers to evaluate the restaurant's popularity is the persistence of a (limited) daily queue which signals a full house every night. Hence, consumers base their individual demand functions on effective demand as well as on price. Neither does the second assumption hold water, since the customers apply self-rationing on the basis of order of arrival, i.e. their positions in the queue are based on the order of arrival. As in the case of Becker's lottery, the ones who cannot enter do not influence the market anymore. In other words, although the intentions of the unlucky are not satisfied, they are neutralized. As a result, and as far as the market forces of demand go, the intentions of the consumers (and the restaurant) are satisfied at the quantity SS. Put differently, every individual's demand function depends on effective demand rather than on aggregate demand as well as on price.

Note that Becker's implicit assumptions may hold in the case of queues that emerge spontaneously, e.g. when an ice cream vendor suddenly arrives at a crowded beach on a hot day. However, even in that situation there is likely to be some ordering of the queue in that the fastest or strongest will be in the front line. In that situation individual demand is likely to depend on aggregate demand rather than on effective demand. In contrast to the queue in front of a popular restaurant, quantity SS will be unknown.

Becker argues (p.1114) that the high-price equilibrium Dg in Figure 1 is unstable because markets with fads can quickly flip from exhibiting excess demand to exhibiting excess supply. However, is Becker's equilibrium constructed via the lottery a stable equilibrium? To answer this question, we refer to Friedman, who said: "…the underlying forces of demand and supply, not demand and supply themselves have established a price that equates the quantity supplied and the quantity demanded" (1976, p. 17). Applying Friedman's observation and considering the underlying forces of demand and supply, we arrive at the following outcome. When the restaurant supplies SS, buyers will operate on the short-run demand curve that passes through the intersection of the long-run demand curve, DD, and SS. Except for the point on the SS curve, Σd_i^s can never be real; it is in a sense the shadow or virtual demand curve. But it certainly influences the situation, as shown by Friedman (1976, pp. 99-100). Hence, Σd_i^s is the relevant and effective demand curve.

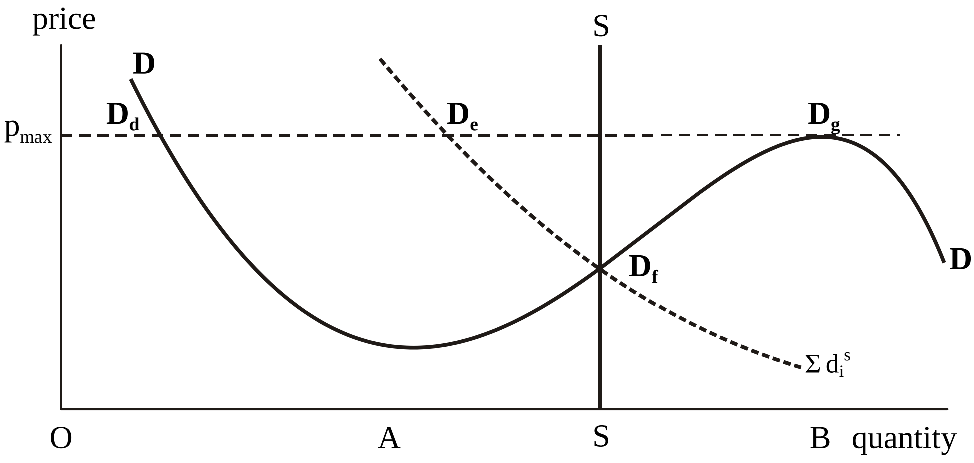

Fig. 1

With Σd_i^s as the relevant demand curve and the price set by the restaurant at p_{max}, the quantity demanded is much smaller than Becker's equilibrium demand curve suggests. Particularly, there is no excess demand of D_g-S but rather excess supply of S-D_e. Hence, there is no pressure on the market to increase prices, but just the opposite! Moreover, Figure 1 shows that D_e is no equilibrium. If the price stays at p_{max},, Σd_i ultimately shifts along the DD curve to D_d, as consumers curtail their demand further.

We can put it differently. For the equilibrium to materialize, Becker assumes that the price is the maximum willingness to pay so that producers cannot increase it. Therefore, the equilibrium needs to be brought about by a change in the quantity demanded. So, in fact, Becker switches from the assumption that people care about how many people would like to consume the good at a price (desired consumption) - regardless of whether or not they are able to – to the assumption of actual consumption.

In sum, Becker introduces the lottery so that the equilibrium materializes. However, the lottery renders his solution untenable. This is because Becker's solution can only be obtained via coordination of the intentions of buyers and sellers such that DD becomes SS, and total quantity demanded decreases via the lottery. Put differently, if the lottery is effective, then SS must be the aggregate quantity demanded that the consumers actually base their demand on. Hence, the actual quantity consumed becomes the quantity demanded in Becker's equilibrium with excess supply rather than excess demand. The upshot is that we need another solution to the puzzle of persistent queues.

Before ending this section, we observe that the market forces of demand, as discussed above, are similar to the better known market forces of supply. Consider a situation where an individual (marginal cost) supply curve shifts (up)downwards because of external (dis)economies. The points on the aggregated individual supply curve are all virtual points, except for the one where the curve intersects the total equilibrium supply curve of the industry: the curve that reflects external (dis)economies affecting marginal cost curves. However, if there is an effective minimum or maximum price, the aggregated individual supply curves have real significance, showing the pressure on the market at non-equilibrium prices (Friedman 1976, pp. 98-102; Dobson, et. al. 1995, p. 165).

III. THE ALL-OR-NOTHING DEMAND CURVE AND THE PATIENT CONSUMER

Since Becker's analysis leads to excess supply rather than excess demand, as claimed, we present in this section we an alternative explanation to the puzzle why popular restaurants do not raise their prices, thus reducing the queues while expanding profits. We first describe the nature of the queues and next explain how they are appreciated by consumers and handled by producers.

First, consider the kind of goods we are dealing with. Dining in a famous restaurant is a once-in-a-life-time experience for the vast majority of the customers. (Admittedly, there are regulars but they usually do not have to wait in line.) Secondly, when dining with your wife you also face an all-or-nothing choice. Either you buy two meals, or none at all. You do not leave your wife behind in the rain or the dark. Thirdly, popular restaurants are not cheap. They usually belong to the most expensive ones in town. Hence, dining at such a restaurant is not possible for the masses: they are exclusive. Even more so, a small, daily clientele is a basic feature of the utility or satisfaction of dining at a famous restaurant. If it is crowded and lively every night, the fancy customers will stay away. When that happens, the restaurant needs to create a new regular clientele which can usually only be charged a lower price. To keep up exclusivity and retain a fancy kind of clientele, the restaurant restricts its seating capacity and fixes prices are at the higher end.[3] Fourthly, a distinction needs to be made between the length of the daily queue and the persistence of the queues over time. As mentioned above, the daily queue is not arbitrary long but restricted by seating capacity and turnover. The persistence over time depends on the clientele that intends to enjoy the once-in-a-lifetime experience. In both cases consumers are patient. In the case of the daily line, they are willing, or can afford, to wait till they are seated. They are basically paying a higher price in the form of waiting time. However, if they are very hungry or in a hurry, they will not line up but look for substitutes. To reduce the risk of not being served, they may choose to arrive early. Also in the case of waiting over a longer time span, they are willing to pay a higher price. There are the daily lining up costs. Moreover, there is the additional cost of trying several times. These costs can be reduced by choosing off days and by early arrival. Finally, there are no close substitutes. Although there may be similar, or even better, restaurants in town, it is its reputation that makes the famous restaurant unique and worthwhile lining up for.

From the above it follows that the popular restaurant is a monopoly with a long- run business schedule in that it wants to optimally exploit its popularity. Hence, it needs to balance its price and clientele such that (i) it has an optimal future market,[4] and (ii) has a full house every night. The mechanism to achieve this objective is the daily queue as a signal of the restaurant's popularity which extends its clientele into the future. The length of the daily queue is approximately its seating capacity times turnover. The way to model the above structure is the all-or-nothing demand curve (Morgenstern 1948, p. 167; Friedman 1976, pp. 15-6). It implies that total demand increases or decreases because of a change in the number of buyers; no intra-marginal goods are sold. To understand the implications of this market structure, we follow (David) Friedman (1986, pp. 76-79) who notes that it is crucial to make a distinction between how much you want to buy at a certain price (as a traditional demand curve shows) and how much you value a certain quantity (as the all-or-nothing curve depicts). If faced with an all-or-nothing choice, the consumer is usually willing to pay more, as indicated by the standard demand curve. Particularly, in the case of an all-or-nothing choice, the consumer is willing to pay p_d', as in Figure 2. If it is either-or, he is willing to sacrifice his whole consumer surplus: triangle A is equal to triangle B. Hence, the all-or-nothing demand curve lies above the normal demand curve.

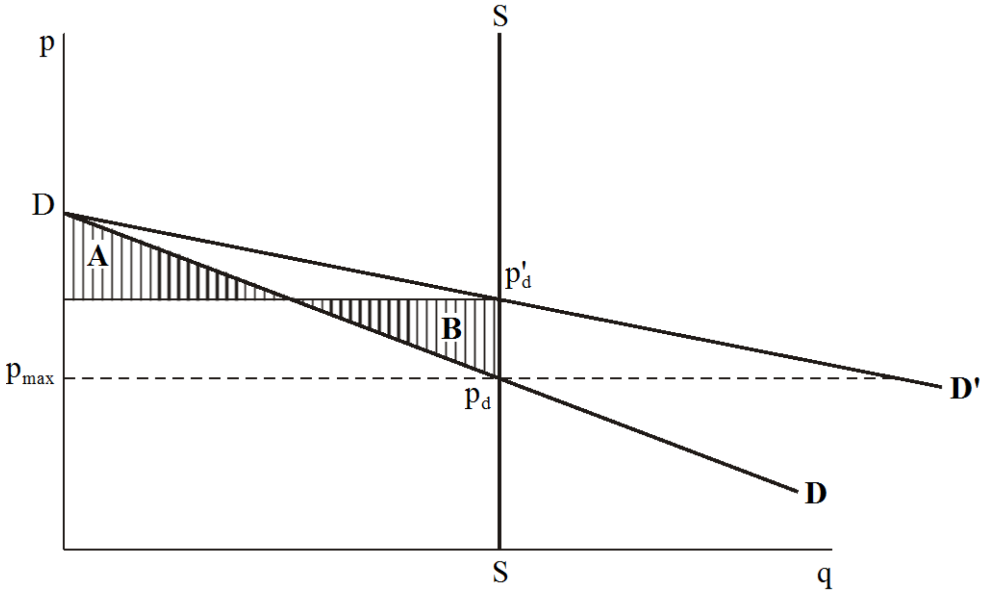

Fig. 2

What does it mean when the normal demand curve (DD), which depicts the situation where goods are bought by many, continuously, and in large amounts, becomes an all-or-nothing curve (DD' in Figure 2)? If the DD' curve applies, the restaurant can fix the price at p_d' in Figure 2. However, the price cannot be raised above p_d'. The reason is that the price hike would put off potential consumers because the goods are rationed by delays. You cannot, as is often implicitly assumed, wait till demand reconstitutes itself at the higher price (Morgenstern 1948, pp. 170-2). Those who have bought the good will not come back, as only one or few goods are bought. So, by raising prices the producer loses contact with his future market. In the case of the normal demand curve, by raising prices the producer loses each buyer gradually: they buy less. In contrast, in the case of the all-or-nothing demand curve, the producer loses the excluded buyer completely. And, because of the bandwagon effect, he loses them in great numbers. This implies that he has to start from scratch to get the lost consumers back which is aggravated by the fact that the good depends on the bandwagon effect. Therefore, the most effective way to signal the quality of the good and keep capacity fully used is to keep the price at P_d'.[5]

Note that the all-or-nothing curve can also be applied to model Becker's daily queue . In that case the price is set at p_{max} such that the demand of the last ones in line exceeds supply. For the same reasons as described above, the price cannot be increased.

IV. CONCLUSIONS

In this paper we have addressed the puzzle of queues at popular restaurants whose popularity creates a positive externality such that the demand curve facing the restaurant is upward sloping over part of its domain. Particularly, we have considered the puzzle posed by Becker why popular restaurants do not raise their prices, thus reducing the queues while expanding profits. Using the same demand functions as Becker, i.e. individual demand, and the sum of the *n* individual demands, as functions of price and total market demand, we have analyzed the stability of the equilibrium that he constructs by way of a lottery. We have pointed out that the introduction of the lottery to generate an equilibrium is based on two assumptions which may apply to spontaneously emerging queues but do not hold in the case of queues in front of popular restaurants. We have shown that in both cases the intentions of the unlucky who cannot enter are not satisfied, though neutralized. It thus follows that every individual's demand function depends on effective demand rather than on aggregate demand as well as on price. In the resulting situation, with consumers operating on the short-run demand curve that passes through the intersection of the long-run demand curve and the infinitely elastic supply curve, there is excess supply rather than excess demand.

As an alternative to Becker's solution [6] we have argued that the consumers face an all-or-nothing demand curve which allows the restaurant to set a price which exhausts the whole consumer surplus of the marginal consumer. In addition, the restaurant is a monopoly that needs to balance its price and clientele such that it has an optimal future market, i.e. that exhaust its clientele optimally.[7] The mechanism to achieve this objective is a sequence of daily queues (i.e. a notional waiting list) which extends the clientele into the future. We have furthermore argued that optimal price is determined by the intersection of the all-or-nothing demand curve and the inelastic supply curve which is higher than the equilibrium price determined by the regular demand curve. To the best of our knowledge, the all-or nothing demand curve has not been applied to explain queues at restaurants.

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Notes

[1] The same issue was addressed before by Basu (1987) regarding exclusive cars, newly released shares of a company or consultation with a famous doctor.

[2] Grillo et al. (2001) discuss a spatial duopoly model in the presence of a consumption externality.

[3] Similarly for luxury cars. The fun of owning a luxury car is that you are one of the happy few in town to have one. If it is bought by the masses, the regulars will stay away.

[4] Note that a popular restaurant often is a fad. To gain popularity it usually starts with a relatively low price which is gradually increased in line with growing popularity. Another strategy to boost sales is offering lower prices on weekdays compared to weekends. In a similar vein, it is not uncommon for a luxury car to be introduced at a launching price which is gradually raised when demand increases. Another common strategy in the car industry is the introduction of a simpler version at substantially lower price, or a more luxurious variant for the same, or a slightly higher, price.

[5] Haddock and McChesney (1994), dealing with a fad, arrive at the same conclusions. When a restaurant becomes the object of a fad, increasing the price would drive away reliable long-term consumers, many of whom might not return after demand returns to normal.

[6] Observe that inter alia Ungern-Sternberg (1991) and Haddock and McChesney (1994) have developed explanations for the reluctance of producers to raise prices amid persistent queues without

Becker's assumption that consumers base their individual demands in part upon the aggregate demand. Basu (1987) on the other hand, like Becker, assumes that an individual's desire for status goods is positively related to the amount of aggregate demand for it. However, he does not apply Becker's lottery to proof equilibrium in the presence of persistent excess demand.

[7] Note the similarity to the optimal exploitation of a non-renewable resource