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Misery loves company: social influence and the supply/pricing decision of a popular restaurant

J. Atsu Amegashie
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Mailing Address:
8888 University Drive, Burnaby, B.C., V5A 1S6, Canada
http://www.sfu.ca/economics
Misery loves company: social influence and the supply/pricing decision of a popular restaurant*

J. Atsu Amegashie

Department of Economics
Simon Fraser University
Burnaby, British Columbia
Canada V5A 1S6

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E-mail: jamegash@sfu.ca

Abstract

In a model with social influence, Becker (1991) offers an explanation for why popular restaurants with excess demand do not raise their prices. He also offers an explanation for why such restaurants do not increase supply but admits his explanation may be weak. Becker does not provide a formal analysis of why supply is not increased. In this paper, I present a formal analysis of Becker’s argument based on a different kind of social influence. I also offer an alternative explanation of why some restaurants are popular and others are not. Finally, while Becker (1991) includes market demand and the gap between market demand and supply as separate arguments in the customers’ demand function to explain why supply and price are not increased, I only include the gap between demand and supply in the customers’ utility function to explain both puzzles.

Key words: cost of failure, excess demand, social influence.

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1. Introduction

Becker (1991) observes that “[a] popular seafood restaurant in Palo Alto, California … has long queues … during prime hours. Almost directly across the street is another seafood restaurant with comparable food, slightly higher prices, and similar food and other amenities. Yet this restaurant has many empty seats most of the time…”

However, the popular restaurant does not raise prices, although it has excess demand.

Becker offers an explanation for this puzzling phenomenon. He argues that this is due to the fact that a consumer’s demand for some goods depends on the demands by other consumers. Becker (1991, p. 1110) writes “[s]uppose that the 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…” He shows that with this consumption externality, the demand curve for the popular restaurant may have an inverted-U shape. If the maximum price attained is at a demand level exceeding the restaurant’s capacity, then it is not optimal to increase price although there is excess demand. In a model with two restaurants, Karni and Levin (1994) examine Becker’s model. In particular, they provide micro foundations for the demand function used by Becker (1991) and also examine if his model could be the equilibrium outcome of two restaurants engaged in a Bertrand game.

Becker (1991, p. 1114) also poses the question “[i]f price is not raised when demand exceeds supply, why doesn’t output expand to close the gap?” He continues “[o]ne explanation why they do not expand is that restaurants know customers are fickle and a booming business is fragile. They might be reluctant to expand capacity if demand … could suddenly fall…” He continues “[a]nother explanation… is that aggregate demand depends not only on price and aggregate demand but also positively on the gap
between demand and supply… [g]reater supply might not pay because that lowers the gap and, hence, the optimal price available to a producer.” Becker (1991, p. 1115) then notes that “… 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 that it is sometimes relevant.”

Becker does not present a formal analysis of why supply is not increased. In this paper, I present a formal analysis based on a different kind of social influence. I also offer an alternative explanation of why some restaurants are popular and others are not. Finally, while Becker (1991) includes market demand and the gap between market demand and supply as separate arguments in the customer’s demand function to explain why supply and price are not increased, I only include the gap between demand and supply in the utility function to explain both puzzles.

The paper is organized as follows: the next section presents the model based on the simple idea that a customer who is unable to eat at the popular restaurant incurs a cost of failure which is decreasing in the number of other customers who were unable to eat at the restaurant. Section 3 concludes the paper.

2. The model
Suppose that there are two restaurants. By assumption, one restaurant is popular and the other is not. I shall return to this assumption.

Suppose that \( \overline{B} \) is the benefit to a customer when he eats at the popular restaurant and \( \overline{b} \) is his benefit when he eats at the unpopular restaurant, where \( \overline{B} \geq \overline{b} \). This,
among others, includes the material benefit of eating at a restaurant (for example, to satisfy one’s hunger) and the benefit from the quality of service. Let the price at the popular restaurant be \( p \) and the cost of serving a customer be \( c \). Let the corresponding price and cost at the unpopular restaurant be \( \bar{p} \) and \( \bar{c} \), where \( c < \bar{c} \). A potential customer who is refused entry into the popular restaurant incurs a cost of \( D = \theta + g(N^f) \) where \( N^f \) is the number of customers refused entry into the popular restaurant and \( g(N^f) < 0 \) for any \( N^f > 0 \) (i.e., excess demand). I interpret \( \theta \geq 0 \) as an exogenous psychic cost of failing to eat at the popular restaurant; this may be due, among others, to feelings of disappointment. I assume that \( \theta \) is commonly known to be distributed on \([\underline{\theta}, \overline{\theta}]\) with cumulative distribution function \( F(\theta) \) and associated density \( f(\theta) > 0 \) for all \( \theta \in [\underline{\theta}, \overline{\theta}] \); \( \theta \) is a customer’s type. My key assumption is that \( D \) (the cost of failure) to a customer is decreasing in the measure of customers refused entry (i.e., \( \partial D/\partial N^f = \partial g/\partial N^f < 0 \)). This reflects the idea that it is easier to deal with failure the more the number of people who have also failed. For example, the emotional cost of failing an exam is smaller if a person is one of twenty students who failed than if he is one of two students who failed. As Hoyle et. al (1999, p. 106) write “[b]y concluding that plenty of other people are just like them, people who believe they possess negative attributes can feel better about themselves.”\(^1\) Indeed, the saying that “misery loves company” captures this behavior.

The negative relationship between the cost of failure and the number of (other) agents who have also failed is somewhat similar to the negative relationship between the

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\(^1\) Indeed, since failure tends to have an adverse effect on one’s self-esteem, using the failures of others to counteract this adverse effect is one of the many self-enhancement mechanisms discussed in Hoyle et. al (1999, chapter 6).
cost of deviating from a social norm and the number of (other) agents who have also deviated from the norm in Akerlof (1980). Also Lindbeck, Nyberg, and Weibull (1999) assume that an agent’s disutility of not working (due to “welfare stigma”) is decreasing with the number of (other) unemployed agents in the economy [see also Besley and Coate (1992)].

Note that a disappointed customer does not have to personally know or socially interact with other disappointed customers for this social effect to work. This social effect could work by only knowing the “number” (not necessarily the identity) of other disappointed customers. This is similar to Becker (1991), for in his model it is an individual’s knowledge of other consumers’ demand which affects his demand; he does not have to know these other customers. A similar interpretation is implicit in Besley and Coate (1992) and Lindbeck, Nyberg, and Weibull (1999).

Let $0 < \pi < 1$ be the probability of getting entry into the popular restaurant and $N$ be the measure of customers who want to enter the restaurant. $N$ is the demand for the popular restaurant and $N^f = (1- \pi)N$. If $E > 0$ is the capacity of the popular restaurant, then $0 < \pi = E / N < 1$ and $N^f = N - E > 0$.

I assume that the customers and restaurateurs are both risk neutral. I also assume that a customer who is refused entry into the popular restaurant can always eat at the unpopular restaurant. Since demand exceeds supply, there has to be some rationing. As in Becker (1991, p. 1112), I assume that “… the method used to ration demand is costless, such as a pure lottery system…”

Let a customer’s utility function be given by $U = B - p - D$, where $B$ is the benefit from eating at a particular restaurant, $p$ is the price, and $D$ is the cost of failure
A customer will participate in the lottery\(^2\) for entry into the popular restaurant if

\[
\pi(B - p) + (1 - \pi)(B - \bar{p} - D) \geq (B - \bar{p})
\]

(1)

The right-hand side of (1) is the payoff to a customer who does not participate in the lottery for entry to the popular restaurant and the left-hand side is the expected payoff of a customer who participates in the lottery. The marginal customer (who participates in the lottery) satisfies (1) with equality. His exogenous cost of failure is

\[
\hat{\theta} = \frac{\pi[(B - p) - (B - \bar{p})] - (1 - \pi)g(N^i)}{(1 - \pi)}
\]

(2)

Equation (2) implies that all customers with \(\theta\) such that \(\theta \leq \hat{\theta}\) will try to enter the popular restaurant and those with \(\theta > \hat{\theta}\) will just go to the unpopular restaurant.

For now, I treat the price of the unpopular restaurant as exogenous. Consider the pricing decision of the popular restaurant. As in Becker (1991) and Karni and Levin (1994), I assume that the restaurant is restricted to charging a single price. I also assume that customers pay to eat in a restaurant after (not before) they gain entry into the restaurant; for example, after they get a table. This is consistent with the following sequence of actions: in stage 1, given the prices set by the popular restaurant (and unpopular restaurant), there is a lottery to determine entry into the popular restaurant. In stage 2, after the outcome of the lottery is known, the successful customers decide whether or not to eat at the popular restaurant. Consider then the customer of type \(\theta = \theta\),

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\(^2\) Note that I use the word “lottery” for the sake of exposition. What matters is that the method of rationing demand is costless. Indeed, the analysis still goes through if there is an exogenous fixed cost associated with the method of rationing demand.
who will, for sure, enter the lottery for entry into the popular restaurant. Suppose that the cost of failure as a result of gaining entry but not eating at the popular restaurant is the \textit{same} as the cost of failure as a result of participating in the lottery but not gaining entry.\footnote{This means that the cost of failure, \( D \), is actually the cost of failing to eat at the restaurant, given that an effort was made to do so. How one failed to eat at the restaurant does not affect this cost.}

\textit{Ex post}, when this customer gains entry into the popular restaurant, he will pay to eat there if \((B - p) \geq (B - \bar{p} - D)\). Hence the maximum \textit{time-consistent} (or sub-game perfect) price the restaurant can charge this customer is

\[ p(N) = B - B + \bar{p} + \theta + g(N^f) \quad (3) \]

If this restaurant sets this price, then any other customer, who gains entry, will also want to pay this price.

Putting (3) into (2), noting that \( N^f = N - E \) and \( \pi = E/N \), equation (2) can be rewritten as

\[ \hat{\theta}(N) = \frac{-E\theta - Ng(N - E)}{(N - E)} \quad (2a) \]

Note that \( \hat{\theta}(N) \) is independent of \( \bar{p} \).

Normalizing the total measure of potential customers to 1, the measure of customers who want to go to the popular restaurant is

\[ N = \int_{\theta}^{\hat{\theta}(N)} \hat{f}(\theta)d\theta = F[\hat{\theta}(N)] \quad (4) \]

Since \( F[\hat{\theta}(N)] \) is continuous function of \( N \) mapping the unit interval \([0, 1]\) into itself, it follows that there exists at least one solution \( N^* \) (i.e., a fixed point) satisfying
equation (4). This may be written as

$$N^* = N^*(E, \theta)$$ \hspace{1cm} (5)

The equilibrium measure $N^*$ may not be stable and it may not be unique. For the sake of exposition, I assume, unless otherwise indicated, that the equilibrium is stable and unique. This equilibrium could be reached through the following process. Suppose all potential customers when deciding whether or not to participate in the lottery, predict that $N^e$ customers will participate in the lottery, then from (4), the “actual” demand is $N = F[\hat{\theta}(N^e)]$. If $N = N^e$, then the customers have made a correct or self-fulfilling prediction. However, suppose $N < N^e$, so that fewer individuals than predicted chose to participate in the lottery. It is then plausible that some individuals who chose to participate in the lottery will now opt out since the cost of failure will be greater than expected; in other words, the inequality in (1) is reversed for these individuals. Similarly, if $N > N^e$, some individuals who opted out of the lottery will now join. Under this adaptation process, $N^e$ will increase (decrease) if $F[\hat{\theta}(N^e)]$ is greater than (smaller than) $N^e$ and will neither decrease nor increase when $N^*$ is reached. Geometrically, $N^e$ will increase (decrease) when $F[\hat{\theta}(N)]$ (in figure 1) lies above (below) the 45-degree line. It follows that fixed points where $F[\hat{\theta}(N)]$ intersects the 45-degree line from above (below) are stable (unstable) under such dynamics.\(^4\) That is, for stability we require $\frac{\partial F[\hat{\theta}(N)]}{\partial N} < 1$ (i.e., at a stable equilibrium, $F[\hat{\theta}(N)]$ is flatter than the 45-degree line).

From equation (3), the equilibrium price is

$$p(N^*) = \bar{B} - B + \bar{p} + \theta + g(N^*(E, \theta) - E)$$ \hspace{1cm} (3a)

\(^4\) While this is a fairly standard argument, I have shamelessly borrowed from the presentation of this argument in Lindbeck, Nyberg, and Weibull (1999).
I assume that \( p(N^*) > c > 0 \).

Now \( \partial N^*/\partial E \) may have an ambiguous sign. In particular it may be positive. That is, an increase in supply leads to an increase in demand. Then
\[
\partial p(N^*)/\partial E = (\partial g/\partial N_f)(\partial N^*/\partial E - 1) < 0, \text{ if } \partial N^*/\partial E > 1.
\]

Hence an increase in supply could reduce the price that the popular restaurant can charge. The intuition behind this result is as follows: the higher is the cost of failure, the higher the price that a customer is willing to pay at the popular restaurant. An increase in supply may increase demand. If the increase in demand outweighs the increase in supply, then the measure, \( N^* - E \), of disappointed customers increases [i.e., \( \partial (N^* - E)/\partial E = \partial N^*/\partial E - 1 > 0 \)]. This reduces the cost of failure and hence reduces the maximum price that the popular restaurant can charge. Therefore the maximum price that the popular restaurant can charge may fall if it increases supply. This may reduce its profit which explains why it may not increase supply. I shall present an example of this result shortly. Note that the demand for the unpopular restaurant is \( (1 - E) \). If its capacity is \( E \), then it must be the case that \( (1 - E) < E \).

From equation (3a), one may be inclined to think that the popular restaurant could set a price higher than \( p(N^*) \) to exclude customers with \( \theta \in [\theta, \tilde{\theta}) \), where \( \tilde{\theta} > \theta \). That is, the lowest \( \theta \) among the group which participates in the lottery is \( \tilde{\theta} \). However, it may not be possible to set a higher price. The proof is by contradiction. Let \( \tilde{N} \) be the demand for the restaurant when the price is increased. Given this higher price, it is possible for demand to increase (i.e., \( \tilde{N} > N^* \)). That is, there is the possibility of an upward-sloping demand curve over some price range as is the case in Becker (1991). An intuitive
explanation for why demand may increase with a price increase is as follows: if a price increase excludes some customers with \( \theta \in [\theta, \tilde{\theta}] \), then \( N \) would fall if the marginal customer in the lottery stage was still of type \( \theta = \hat{\theta}(N^*) \). But a lower \( N \) implies that while the cost of failure has gone up, the probability of success has also gone up. If the increase in the probability of success is sufficiently high, then some customers with \( \theta > \hat{\theta}(N^*) \) will now participate in the lottery which might result in an increase in demand.

But then in the post-lottery stage, the price the restaurant can charge may be lower since the cost of failure for the marginal customer may now be lower; this means that it is possible to get \( D(\tilde{N}, \tilde{\theta}) = \tilde{\theta} + g(\tilde{N}(E, \tilde{\theta}) - E) \leq D(N^*, \theta) = \theta + g(N^*(E, \theta) - E) \) since \( g(N^*(E, \theta) - E) > g(\tilde{N}(E, \tilde{\theta}) - E) \). Hence the model implies that the restaurant may not increase its price above \( p(N^*) \), although it faces excess demand. This explanation is consistent with that in Becker (1991), since it also hinges on the existence of an upward-sloping demand curve over some price range. To formalize this argument, note that if a higher price excludes customers of type \( \theta \in [\theta, \tilde{\theta}] \), then the only way for demand to increase is for \( \hat{\theta}(N) \) in equation (2a) to increase. We can write the equations for \( \hat{\theta}(N) \) in the original and new equilibrium as

\[
\hat{\theta}(N^*) = \frac{-E\theta - N^*g(N^* - E)}{(N^* - E)} \quad (2b)
\]

and

\[
\hat{\theta}(\tilde{N}) = \frac{-E\tilde{\theta} - \tilde{N}g(\tilde{N} - E)}{\tilde{N} - E} \quad (2c)
\]

Noting that \( g(N^* - E) > g(\tilde{N} - E) \), it is easy to see that \( \hat{\theta}(\tilde{N}) > \hat{\theta}(N^*) \) is
not inconsistent with \( \tilde{\theta} > \theta \) and \( \tilde{N} > N^* \). If \( \tilde{N} > N^* \), then it is possible to get

\[
p(N^*) = B - B + \tilde{p} + \theta + g(N^*(E, \tilde{\theta}) - E) \geq p(\tilde{N}) = B - B + \tilde{p} + \tilde{\theta} + g(\tilde{N}(E, \tilde{\theta}) - E)
\]

or

\[
D(\tilde{N}, \tilde{\theta}) = \tilde{\theta} + g(\tilde{N}(E, \tilde{\theta}) - E) \leq D(N^*, \theta) = \theta + g(N^*(E, \theta) - E). \]

This contradicts the initial hypothesis that \( p(\tilde{N}) > p(N^*) \). What this result means is that while the higher price is “optimal” in the lottery stage, it is time-inconsistent (or it is not a sub-game perfect price) in the post-lottery stage and hence must be reduced. It follows that it may not be possible to increase the price, if a Becker-type upward-sloping demand curve exists over some price range.

It is possible that \( \partial N^*/\partial E < 0 \). That is, if the popular restaurant were to increase its capacity this may result in a fall in demand. The reason for this counter-intuitive result is as follows: the higher probability of entry to the popular restaurant (as result of the increase in supply) increases the expected net benefit, \( \pi(B - p) \), of eating at this restaurant, holding \( N^* \) constant. However, should a customer fail to gain entry into the popular restaurant, he will belong to a smaller group of disappointed customers, \( N^* - E \), which means that the cost of failure will increase. If this latter effect is sufficiently strong, then \( \hat{\theta} \) falls and thus \( N^* \) falls. This result is counter-intuitive because it suggests that increasing the probability of success in an activity may paradoxically reduce participation in that activity if a social effect, of the kind in this paper, is sufficiently strong. This result may potentially have interesting social applications, although I think it is the exception rather than the rule.

Note that in equilibrium \( D \) may be negative for some disappointed customers who participated in the lottery. That is, these customers get a net benefit (not cost) when they
fail to eat at the restaurant. I interpret this as disappointed customers with sufficiently low \( \theta \) such that the failure of others makes them feel very good about themselves.\(^5\)

An obvious limitation of my analysis is the treatment of the unpopular restaurant’s price as exogenous. Note, however, that \( \hat{\theta}(N) \) and \( N^* \) are independent of \( \bar{p} \). Indeed, for any given \( \bar{p} \), the sign of \( \frac{\partial \underline{p}(N^*)}{\partial E} \) is independent of \( \bar{p} \). Since my conclusion hinges on the sign (and magnitude) of \( \frac{\partial \overline{p}(N^*)}{\partial E} \), the fact that it is independent of \( \bar{p} \) suggests that my assumption that \( \bar{p} \) is exogenous may not be crucial to the analysis. Indeed, this assumption is even more applicable if one considers popular sporting events or best-selling books. As Karni and Levin (1994) note such goods are usually produced by monopolies; in such cases \( \bar{p} \) is meaningless and could be set to zero. However, one could endogenize \( \bar{p} \) as follows: since \( D(N^*, \theta) = \theta + g(N^* - E) \) is a sunk cost for any customer of type \( \theta \) who fails to eat at the popular restaurant, the unpopular restaurant can charge all disappointed customers a maximum price of \( \overline{p} = B \), which gives \( \underline{p}(N^*) = B + \theta + g(N^* (E, \theta) - E) > 0 \). Since \( g(N^* (E, \theta) - E) < 0 \), it is possible to have \( \underline{p}(N^*) \leq \bar{p} = B \), even if \( B > B \). I assume that \( \bar{p} = B > \bar{c} \).\(^6\)

\[^5\] Note, however, that this does not mean that such customers go out of their way to fail. A customer who participates in the lottery would rather succeed than fail since the payoff from success, \( B - \underline{p} \), is never less than the payoff from failure, \( (B - \bar{p} - D) \). That is, \( B - \underline{p} \geq (B - \bar{p} - D) \). Indeed, this condition holds with strict inequality for all customers who participate in the lottery, except the customer with \( \theta = \theta \). An individual may use the failures of others to (ex post) rationalize his own failures. The net effect of such rationalization may differ for different people depending on their type (i.e., \( \theta \)). Thus \( D \) may be positive for some people but negative for others.

\[^6\] I also assume that \( \underline{p}(N^*) \leq \bar{c} > \bar{c} \) which implies that it is impossible for the unpopular restaurant to undercut the popular restaurant.
2.2 Explaining popularity

I have assumed that one restaurant is popular and the other is not. Let me briefly explain how this may arise. Call the restaurants K and J. Think of K as the popular restaurant and J as the unpopular restaurant. Suppose that restaurant J is a Stackelberg leader, so it sets its price before restaurant K does. Then restaurant K observes $\bar{p}$. Suppose restaurant K sets its price according to equation (3a) such that $p = p(N^*)$. Now, for the customer with $\theta = \theta^*$, $(\bar{B} - p(N^*)) = (\bar{B} - \bar{p} - D(N^*, \theta))$. If $D(N^*, \theta) \leq 0$, then $(\bar{B} - p(N^*)) \geq (\bar{B} - \bar{p})$. This means that if the probability of entry to restaurant K were 1, then given the prices set by the restaurants, a customer would rather eat at restaurant K than at J since his payoff is higher. But since everyone prefers to eat at restaurant K, this leads to an excess demand for restaurant K resulting in its popularity and hence the equilibrium in this paper.\(^7\)

As Becker (1991) assumes, one could specify the benefit of eating at the popular restaurant as an increasing function of the gap between demand and supply, $N - \underline{E}$. This can easily be incorporated in the model. Suppose there is no cost of failing to eat at the popular restaurant but instead $D' = \nu (N - \underline{E}) > 0$ is the social benefit of eating at the popular restaurant and $\partial D'/\partial(N - \underline{E}) = \nu > 0$. Suppose that $\nu$ is distributed on $[\nu, \overline{\nu}]$ with positive density. Then, in the post-lottery stage, the marginal customer (i.e., the customer of type $\nu$) at the popular restaurant must satisfy $(\bar{B} - p + D') = (\bar{B} - \bar{p})$. Since $D'$ is

\(^7\) Note that this equilibrium is consistent with Karni and Levin (1994), since they find that a Stackelberg equilibrium may exist in a similar restaurant pricing game. They show that there is no equilibrium in a simultaneous-move game. Of course, like Karni and Levin (1994), I do not have a justification for why the unpopular restaurant should be a Stackelberg leader.
positive, it follows that $(\bar{B} - p) < (B - \bar{p})$. If this is the case, then it is difficult to explain how the “popular” restaurant became popular since it offers a smaller net surplus. However, $(\bar{B} - p + D') > (B - \bar{p})$ for all customers of type $v > v$. Hence if a customer believes that other customers will patronize the “popular” restaurant, then he will also patronize this restaurant. Other than argue that the “popular” restaurant was just lucky (i.e., chance), it would be difficult to justify why any customer will have this belief or expectation, given that $(\bar{B} - p) < (B - \bar{p})$ for every customer. In this case, popularity (or the lack thereof) has to be explained as the result of a self-fulfilling expectation. Indeed, Becker (1991, p. 1114) writes “[I]f consumers… lose confidence that other consumers want the good, demand will drop…” Karni and Levin (1994) reach a similar conclusion. They include the demand – not the gap between demand and supply – in the consumers’ utility function. They assume that the quality of the food, the service, the cuisine and the cost of serving a customer are identical in both restaurants. As they note in the abstract of their paper “[t]he essential aspect of this analysis is the presence of a consumption externality that makes popularity itself a factor in the determination of the relative attractiveness of the restaurants.” In my model, the popularity of a restaurant is not what determines its relative attractiveness; a restaurant is popular because it offers a bigger surplus [i.e., $(\bar{B} - p) > (B - \bar{p})$]. Indeed, in Karni and Levin (1994), a Stackelberg equilibrium where the popular restaurant charges a higher price and hence offers a lower surplus is possible. As they note on page 832 “… the equilibrium of the von Stackelberg game … does not restrict the relative prices in the two restaurants…” In my model, the unpopular restaurant will offer a bigger surplus if $D(N^*, \theta) > 0$. I ignore this case.
because I cannot justify, in my model, why a restaurant offering a smaller surplus will be popular. Indeed, in section 2.1 where I present a specific example, \( D(N^*, \theta) < 0 \) given that \( \theta = 0 \) and \( g(N^* - \bar{E}) < 0 \). Note that \( \bar{B} = B \) and \( \underline{p}(N^*) < \bar{p} \) is consistent with the equilibrium in my model. This is also consistent with Becker’s (1991) observation quoted at the beginning of this paper: both restaurants may have comparable food and similar amenities (i.e., \( \bar{B} \approx B \)) but the popular restaurant may have slightly lower prices (i.e., \( \underline{p}(N^*) < \bar{p} \)).

One may argue that \( \nu \) need not be positive for all customers. In particular, we could assume that the marginal customer in the post-lottery stage is of type \( \nu < 0 \), which then gives \( (\bar{B} - \underline{p}) > (B - \bar{p}) \). This means that the marginal customer is “saddened” by the failure of others to eat at the popular restaurant (given that he ate at the restaurant). This argument makes sense. However, it does not change the basic point that there are two different explanations for the relative popularity of a restaurant; one explanation uses the popularity of the restaurant as a determinant of its popularity and the other uses the relative magnitude of the surplus offered by a restaurant.

It is important to note that, as in Becker (1991) and Karni and Levin (1994), the equilibrium in my model is also based on the expectations of customers about the demand for the popular restaurant (or unpopular restaurant). However, I am inclined to argue that my model offers a justification for why these customers will expect a restaurant to be popular in the first place (i.e., why such customers will have such expectations). In spite of this, I am sympathetic to the explanation in Becker (1991)\(^8\) and Karni and Levin.

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\(^8\) Note, however, that Becker (1991) considers a monopoly restaurant. So it may well be that he does not necessarily subscribe to the view that a restaurant which offers a smaller surplus would be popular.
(1994) since chance or luck does play a role in the real world. Indeed, it is possible that the popular restaurant offers a smaller surplus currently, but it is still popular because it used to offer a bigger surplus (in the past). People then expect this restaurant to be popular today because it was popular in the past. Hence history (i.e., past glory) might influence today’s expectations about a restaurant’s popularity.\(^9\)

2.2 An example

In this section, I use a specific example to show that \(\frac{\partial N^\ast}{\partial E} > 1\).

Let \(D = \theta - \gamma(N - E)^\alpha\), where \(\gamma > 0\) and \(0 < \alpha < 1\). Then

\[
\hat{\theta}(N) = -\frac{E\theta + \gamma N(N - E)^\alpha}{(N - E)}
\]  

(6)

Assume that \(\theta\) is distributed with density \(f(\theta) = (0.5 + \theta)\) on \([0,1]\).\(^{10}\) Then

\[
\hat{\theta}(N) = \frac{\gamma N}{(N - E)^{1-\alpha}}
\]  

(7)

and \(N = \int_{0}^{\hat{\theta}(N)} (0.5 + \theta)\,d\theta = 0.5[\hat{\theta}(N) + (\hat{\theta}(N))^2]\). Hence we want the solution to

\[
N = 0.5[\hat{\theta}(N) + (\hat{\theta}(N))^2] = F(\hat{\theta}(N))
\]  

(8)

I could not obtain an analytical result for \(N\) using the math software, Maple V Release 5. Hence I solve it numerically by setting \(\gamma = 1\) and \(\alpha = 0.8\). For \(E = 0.1\), I find that there are two real and positive roots of \(N\).\(^{11}\) That is, \(N_1^\ast = 0.2464\) and \(N_2^\ast = 0.8105\). The smaller

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\(^9\) For related but different discussion of history and expectations, see Krugman (1991).

\(^{10}\) I initially tried a uniform distribution but that gave \(\frac{\partial N^\ast}{\partial E} = 1\).

\(^{11}\) For \(0 < E \leq 0.15\), there are actually three roots of \(N\): \(N^\ast = 0\) and two real and positive roots. Outside this range, my simulations suggest that \(N^\ast = 0\) is the only solution in the unit interval \([0,1]\).
root is a stable equilibrium but the larger root is not. For $E = 0.11$, I obtain $N^*_1 = 0.2743$ and $N^*_2 = 0.7836$. Clearly, at the equilibrium with the smaller demand, $\Delta N^*_1/\Delta E = (0.2743 - 0.2464)/(0.11 - 0.1) = 2.79 > 1$, which is the result required. This result holds for $0 < E \leq 0.15$ (see footnote 11). Note that $\Delta N^*_2/\Delta E < 0$ at the (unstable) equilibrium which has a higher demand.

3. Conclusion

I have shown that when a popular restaurant increases supply, this may reduce the price that it can charge. This was Becker’s (1991) conjecture for why supply is not increased. But as noted above, he admits that the basis for this conjecture is weak. This paper confirms Becker’s (1991) conjecture by providing an explicit micro analysis of the behavior of the customers and the restaurant. The paper clearly shows how increasing supply could reduce the restaurant’s optimal price. I also provide an alternative justification for why a customer might care about the gap between demand and supply; the gap may affect the cost of failing to eat at the popular restaurant. This gap need not be an ad hoc invention of a good to solve a puzzle because a person’s cost of failure is indeed affected by the number of people who have also failed.

The paper also explains how one restaurant becomes popular and the other unpopular; the popular restaurant offers a higher net surplus than the unpopular

\[12 \partial F[\hat{\theta}(N)]/\partial N \text{ evaluated at } N^*_1 = 0.2464 \text{ is } 0.8397. \text{ At } N^*_2 = 0.8105, \text{ it is equal to } 1.1304 \text{. See figure 1 for a graph of the equilibrium.} \]
restaurant. This is an alternative to the explanation of Becker (1991) and Karni and Levin (1994) which is based on the idea that a restaurant is popular because people expect it to be popular.

Finally, a contribution of this paper is that while Becker (1991) includes market demand and the gap between market demand and supply as separate arguments in the customer’s demand function to explain why supply and price are not increased, I only include the gap between demand and supply in the utility function to explain both puzzles. Note that Karni and Levin (1994) do not consider why supply is not increased.

One might argue that $\theta$ is analytically equivalent to an exogenous time cost of queuing. This is not correct. For time cost to lead to the same results in this paper, it must matter both in the queuing stage and in the post-queuing stage. However, in the post-queuing stage any time cost of queuing must be sunk and hence should not matter. If it matters, then the only way I can rationalize this is that the customers care about sunk costs. But then I would have to appeal to some "psychological" behavior regarding sunk costs which will not be different from interpreting $\theta$ as some exogenous cost of failure.

By identifying a different type of social influence, my model and Becker’s (1991) suggest that social influence can explain why popular restaurants, successful Broadway theaters, successful sporting events and other similar activities do not increase price and/or increase supply in the face of persistent excess demand. Indeed, Akerlof (1980) used some kind of social influence to explain why wages may not fall in the face of excess supply in labor markets (i.e., involuntary unemployment).13,14 Of course, one can

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13 Of course, there are other explanations such as the behavior of unions and efficiency wages for the existence of non-market clearing wages in labor markets.
14 Social influence has also been used, among others, by Bernheim (1994) and Lazear and Kandel (1992) to examine issues like conformity and incentives in partnerships.
think of other relevant social influences in my model. However, these social influences will not change the basic results of this paper; they will just be variations on a theme.
References


Figure 1
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