HAPPY-HOUR ECONOMICS

MARK FISHER

Abstract. Seasonal increases in demand may cause price to fall in markets with travel or search cost. These costs limit the effective substitutability among products and brands. When individual demand increases, the benefits from additional travel or search increase. Increased willingness to travel or search can translate into more elastic demand curves facing monopolistic competitors, in which case—as long as marginal cost does not increase too quickly—price falls.

1. Introduction and Summary

The expected benefit from search, as Stigler (1961) pointed out, is positively related to the amount one plans to spend. It makes sense to search more for a new car than for a new pencil. The relationship between expenditure and search holds for any particular good as well. It makes sense to search more for a case of whiskey than for a single pint.

This note shows that the increase in search that comes from higher demand may lead to lower price. Monopolistic competitors who owe their monopoly power to the cost of travel or search will find their power eroded: Consumers nearby will be more willing to go elsewhere, and consumers who would have settled for a given combination of price and style will be more willing to look for a better deal. This willingness to go farther or continue searching translates into more elastic demand curves facing firms. And when demand is more elastic, marginal revenue is higher, which—if it exceeds marginal cost at the higher output—gives firms the incentive to cut price.

The phenomenon of high demand and low price will be most evident in markets where demand fluctuates seasonally. In such markets, the cost of entry may be high enough to keep the number of firms from changing with the seasons, so that fluctuations in price will reflect only fluctuations in demand. Two simple models of such markets are investigated in what follows, a travel-cost model and a search-cost model.

Consider the "happy hour" phenomenon: Bars near work are often crowded during a period known as happy hour when prices of alcoholic beverages are reduced. Low prices and crowded bars make standard economic sense if we think bar owners reduce prices to lure customers into otherwise empty bars. However, the travel-cost

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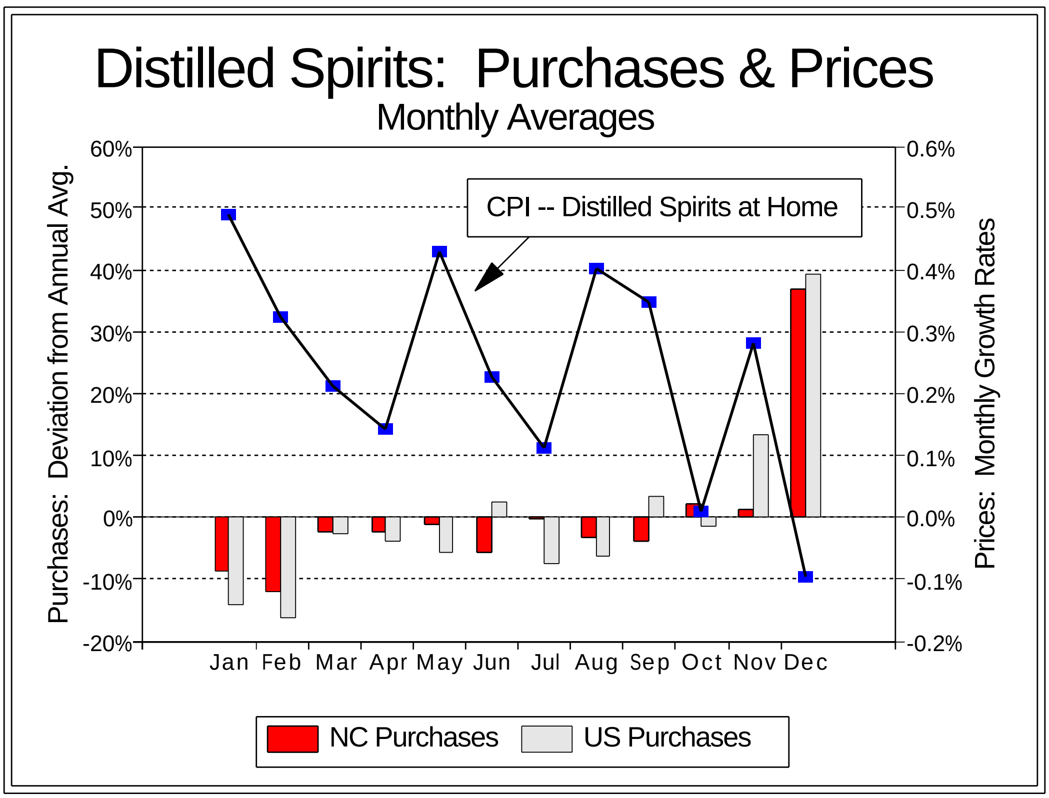
model provides an explanation for the lower prices if, instead, we think bar owners reduce prices in response to higher but more elastic demand.

The search-cost model provides an explanation for another alcohol-related phenomenon: The quantity of off-sale liquor sold in the U.S. is substantially higher in December than in other months, yet December is the only month that shows a decline in the Distilled-Spirits-at-Home component of the Consumer Price Index. See Figure 1.[1] It is unlikely that the increase in quantity is driven by the decrease in price, since the quantity sold in North Carolina—where seasonal price reductions are illegal—follows the same seasonal pattern.



In his critique of monopolistic competition, Stigler (1949) wrote "the specific contribution of the theory of monopolistic competition [is] the analysis of the many-firm industry producing a single (technological) product under uniformity and symmetry conditions, but with a falling demand curve for each firm." He suggested the theory would not be a useful addition to an economist's toolbox unless it provided

[1]Data sources: The monthly average price growth rates are calculated from a component of the Consumer Price Index entitled "Other Alcoholic Beverages, including Whiskey, at Home," January 1978 through December 1986. The nine percent increase for October 1985 (due to the increase in the excise tax that took effect that month) has been omitted from the average. The data on purchases are taken from the Distilled Spirits Industry Statistical Report, January 1982 through December 1985. Purchase data for October 1983 are missing.

"different or more accurate predictions (as tested by observation) than the theory of competition." This note shows that monopolistic competition, under Stigler's conditions, predicts something different—seasonal increases in demand lead to decreases in price.

2. Market Equilibrium

There are L consumers, n technologically identical firms, and two seasons—a low-demand season and a high-demand season. Each consumer demands θ units, an amount that depends only on the season,[2] but neither L nor n changes from season to season. The quantity a firm can sell, $Q(\theta, p, p^*)$, is a function of individual demand, θ, the price the firm charges, p, and the price competing firms charge, p^*. The specific form of $Q(\theta, p, p^*)$ depends on the cost of travel or search (two examples of which are given in the next section).

Assume there is a symmetric equilibrium where each firm takes the other firms' prices as given.[3] Profits are $\pi(\theta, p, p^*) = p\, Q(\theta, p, p^*) - C(Q(\theta, p, p^*))$ where $C(\,\cdot\,)$ is production cost, a function of quantity produced, and the first-order profit maximization condition for a firm is $\pi_p(\theta, p, p^*) = 0$. In equilibrium, each firm charges $\widetilde{p}$ and sells $Q(\theta, \widetilde{p}, \widetilde{p}) = \theta\, L/n$. Equilibrium price is found by solving $\pi_p(\theta, \widetilde{p}, \widetilde{p}) = 0$ for $\widetilde{p}$:

$$\widetilde{p} = \widetilde{C}_Q - \widetilde{Q}/\widetilde{Q}_p, \tag{1}$$

where $\widetilde{C}_Q := C_Q(Q(\theta, \widetilde{p}, \widetilde{p}))$, $\widetilde{Q} := Q(\theta, \widetilde{p}, \widetilde{p})$, and $\widetilde{Q}_p := Q_p(\theta, \widetilde{p}, \widetilde{p})$. The change in equilibrium price from an increase in demand, then, is given by differentiating (1) with respect to θ:[4]

$$\frac{d\widetilde{p}}{d\theta} = \frac{d\widetilde{C}_Q}{d\theta} - \frac{d(\widetilde{Q}/\widetilde{Q}_p)}{d\theta}.$$

Thus price will fall when demand increases as long as

$$\frac{d(\widetilde{Q}/\widetilde{Q}_p)}{d\theta} > \frac{d\widetilde{C}_Q}{d\theta}. \tag{2}$$

Equation (2) shows that if marginal cost rises steeply, price will not fall when demand increases. But there are two reasons why marginal cost might be fairly flat. First, storage may attenuate increases in marginal cost. Firms may be able to produce at a nearly constant rate across the seasons, building up and running down inventories. Second, as Stigler (1939) discusses, there is "the possibility of building flexibility of operation into the plant, so that it will be passably efficient over the range of probable outputs." In other words, owners may choose an average cost curve that has a higher minimum if it is flatter. Of course, flatter average cost curves make for flatter marginal cost curves.

[2] If individual demand were not perfectly inelastic, the elasticity of demand would increase with the budget share. As long as the budget share did not shrink in the high-demand season, price would still fall. In the examples below, expenditure—and hence the budget share—does not shrink in the high-demand season.

[3] See Novshek (1980) on the existence of Nash equilibria in differentiated product models.

[4] Note that $d\widetilde{C}_Q/d\theta = (L/n)\,\widetilde{C}_{QQ}$.

If, however, storage and flexibility are expensive, marginal cost can rise enough during the high-demand season to offset increases in the elasticity of demand. Beer, for example, is bulky and spoils without refrigeration, and the price of beer is at its highest during the summer months, the high-demand season. This pattern of price and quantity is unlike the pattern for distilled spirits (discussed above) and may be attributable to the cost of storing beer.

Because demand is inelastic at the industry level, schemes that raise every firm's price would raise profits. For example, if all firms could agree to maintain off-season prices during the high-demand season, profits would be higher (if entry were restricted). But collusive agreements are difficult to enforce. Would a law that required firms to charge the same price in both periods—an anti-happy-hour law—increase profits? The answer is no: As long as consumers' willingness to substitute depends on the price differential alone and not on the level of prices, the equilibrium elasticity facing the firms will be independent of equilibrium price; hence deviations from the two-price solution reduce profits.

3. Two Models of Consumer Cost

Travel Cost. A graphical exposition of the model in this example can be found in the chapter on monopolistic competition in McCloskey (1985).

Along Hotelling Road, identical firms are discretely located, n per mile. Consumers are continuously distributed, L per mile, and can travel to firms at a cost of c per mile. For a consumer located m miles from a firm charging price p, the full cost of θ units is $\theta\, p + m\, c$. A consumer will patronize the firm where the full cost is lowest and will travel to a more distant firm if the saving on price, $\theta \times \Delta p$, compensates for the extra travel cost, $\Delta m \times c$. Hence, if θ increases, the consumer will be willing to travel farther.

A firm charging p whose competitors on either side charge p^* gets the patronage of all consumers up to $\widehat{m}$ miles away, where $\widehat{m}$ solves

$$\theta\, p + \widehat{m}\, c = \theta\, p^* + \left(\frac{1}{n} - \widehat{m}\right) c. \tag{3}$$

The firm sells $Q = 2\, c\, L\, \widehat{m}$ units. To find the demand curve, use (3) to eliminate $\widehat{m}$ from the previous expression:

$$Q = \frac{\theta\, L}{n} + \frac{\theta^2\, L}{c}\,(p^* - p).$$

The slope of the demand curve with respect to price is $Q_p = -\theta^2\, L/c$. Since $\widetilde{Q} = \theta\, L/n$, $\widetilde{Q}/\widetilde{Q}_p = -c/\theta n$, and $d(\widetilde{Q}/\widetilde{Q}_p)/d\theta = c/(\theta^2\, n)$. By equation (2), if

$$\frac{c}{\theta^2\, n} > \frac{d\widetilde{C}_Q}{d\theta},$$

then price falls when demand increases.

Search Cost. The model in this example is from Wolinsky (1986).

The are L consumers who differ in the valuations v_i they put on n different brands.[5] Consumers' willingness to compare substitutes is limited by the cost of search—it costs c to sample a brand and learn its value and price. The valuations are realizations of independent and identically distributed random variables with a distribution function $G(v)$ that has finite support $[\underline{v}, \bar{v}]$ and a density function $G'(v)$.

A consumer who expects all firms to charge price p^* sets a reservation value, w^*, and (assuming $w^* > p^*$) buys the first brand for which $v > w^*$. The reservation value is the solution to

$$c = \theta \int_{w^*}^{\bar{v}} (v - w^*)\, dG(v), \tag{4}$$

where θ measures individual demand as before. The expression on the right-side of (4) is the expected gain from an additional search once the consumer has sampled a brand valued at w^*. The search rule is standard: Stop searching when the expected gain is less than the cost. Notice that $dw^*/d\theta > 0$.

A firm can improve the chances that a consumer buys its brand by lowering its price, p. When $v_i - p \geq w^* - p^*$, a consumer who expects all other firms to continue to charge p^* will stop searching because the net gain for this brand, $v_i - p$, meets or exceeds the minimum acceptable net gain, $w^* - p^*$. Since the stop-searching condition can be written $v \geq w^* - p^* + p$, the probability that a consumer buys a particular brand is $1 - G(w^* - p^* + p)$, a decreasing function of p.

The expected demand curve facing the representative brand is

$$Q = \theta \Big(1 - G(w^* - p^* + p)\Big)\left(\frac{L/n}{1 - G(w^*)}\right). \tag{5}$$

The third factor on the right-hand side of (5) is the expected number of searches per firm, the product of the average number of consumers per firm and the expected number of searches per consumer. Taking the partial derivative of (5) with respect to p yields

$$Q_p = -\theta\, G'(w^* - p^* + p)\left(\frac{L/n}{1 - G(w^*)}\right).$$

Thus $\widetilde{Q}/\widetilde{Q}_p = -\big(1 - G(w^*)\big)/g(w^*)$, and

$$\frac{d(\widetilde{Q}/\widetilde{Q}_p)}{d\theta} = \frac{dw^*}{d\theta}\left(1 + \frac{G''(w^*)\,(1 - G(w^*))}{G'(w^*)^2}\right).$$

Since $dw^*/d\theta > 0$, $d(\widetilde{Q}/\widetilde{Q}_p)/d\theta > 0$ only if

$$G''(w^*)\big(1 - G(w^*)\big) + G'(w^*)^2 > 0. \tag{6}$$

[5]The demand curve in this model, equation (5), holds only in the limit as L and n go to infinity with L/n fixed.

Although (6) does not hold in general, it is satisfied for a wide variety of distributions.[6]

Condition (6) does hold for the uniform distribution for which $G(v) = (v - \underline{v})/(\bar{v} - \underline{v})$, $G'(v) = 1/(\bar{v} - \underline{v})$, and $G''(v) = 0$. Moreover, equation (4) can be solved for w^* when G is the uniform distribution:

$$w^* = \bar{v} - \sqrt{\frac{2\,c\,(\bar{v} - \underline{v})}{\theta}}.$$

In this case $\widetilde{Q}/\widetilde{Q}_p = -\sqrt{2\,c\,(\bar{v} - \underline{v})/\theta}$, and $d(\widetilde{Q}/\widetilde{Q}_p)/d\theta = \sqrt{c\,(\bar{v} - \underline{v})/(2\,\theta^3)}$. From equation (2), if

$$\sqrt{\frac{c\,(\bar{v} - \underline{v})}{2\,\theta^3}} > \frac{d\widetilde{C}_Q}{d\theta},$$

then price falls when demand increases.

References

[1] Distilled Spirits Council of the United States (DISCUS). *Distilled Spirits Industry Statistical Report.* G–82–1 through G–85–12. (January 1982–December 1985).

[2] McCloskey, Donald N. *The Applied Theory of Price*, 2nd ed. Macmillan: New York, 1985.

[3] Novshek, William. "Equilibrium in Simple Spatial (or Differentiated Product) Models." *Journal of Economic Theory* 22 (1980): 313–326.

[4] Stigler, George J. "Production and Distribution in the Short Run." *Journal of Political Economy.* 47 (June 1939) 305–327.

[5] Stigler, George J. "Monopolistic Competition in Retrospect" in *Five Lectures on Economic Problems.* London School of Economics, 1949. Reprinted in George J. Stigler. *The Organization of Industry.* Irwin: Homewood, 1968.

[6] Stigler, George J. "The Economics of Information." *Journal of Political Economy.* v. 69, no. 3 (June 1961). Reprinted in George J. Stigler. *The Organization of Industry.* Irwin: Homewood, 1968.

[7] Wolinsky, Asher. "True Monopolistic Competition as a Result of Imperfect Information." *Quarterly Journal of Economics* (August 1986): 493–511.

Research Department, Federal Reserve Bank of Atlanta, 104 Marietta St., Atlanta, GA 30303

E-mail address: mark.fisher@atl.frb.org

[6] The differential equation $G''(x)\big(1 - G(x)\big) + G'(x)^2 = 0$ has the solution $1 - e^{-c_1\,(c_2 + x)}$, where c_1 and c_2 depend on the initial conditions. Thus the exponential distribution lies on the boundary of condition (6).