

## The Price and Output of Beer Revisited

### I. Introduction

In an earlier article (Lynk 1984) I discussed several hypotheses about the interpretation of rising industry concentration and concluded essentially that the phenomenon, standing alone, was consistent with both the ordinary competitive process and with various (successful) anticompetitive practices. I focused on the brewing industry for an empirical investigation of this phenomenon because it has had an unusually high rate of increase in concentration and has attracted a correspondingly high level of antitrust and merger scrutiny. Noting a number of basic ambiguities with the use of average prices (competing brands may sell at different prices, as may competing package types), I shifted the test of the competitive consequences of rising concentration from price effects to output effects (see Posner 1981). I found that as concentration grew through the continued expansion of the larger U.S. brewers (over time and in different parts of the country), output expanded rather than contracted. This finding, I concluded, was consistent with growing concentration as an effect of the competitive process and inconsistent with the contraction of output we associate with increasing market power.

Victor Tremblay's (in this issue) paper considers

Rising concentration may often result from an efficient reorganization of an industry's assets, but it may also create market power. I found earlier that the efficiency effects dominate in the brewing industry. In related research, Tremblay discusses some policy implications of my finding, noting that greater concentration may result in more advertising rather than lower prices. I argue here that a higher level of competitive advertising does not have the adverse welfare implications that Tremblay suggests and that, in any case, Tremblay's tests are biased against finding an inverse relationship between retail prices and either advertising or concentration. I note also that, despite these biases, Tremblay's findings confirm and extend my earlier results: higher concentration has led to lower prices as well as higher output.

a number of extensions of my analysis, criticizes certain elements of that analysis, and questions its implications. Tremblay's chief extension is an attempt to consider the effect of advertising volume on product price, an element of competitive behavior that I noted but did not disentangle from other means of competition. And his principal criticism appears to be that my analysis sums all brands of beer in measuring output, but because some brands are advertised more than others they should count for more in any such aggregation.<sup>1</sup>

I examine these issues below and show why Tremblay's "extension" (advertising) is flawed in its interpretation and why his complaint (aggregation of nonidentical brands) is better directed to his own methodological error in interpreting product price. But I note at the outset that Tremblay's paper in fact confirms the principal finding that I reported earlier: as industry concentration rises, the output supplied rises (Lynk 1984) while the price charged falls (Tremblay in this issue). Tremblay places greater weight on the lack of statistical significance of his estimate ( $t = -1.52$ ) than on its sign. But, as I show below, his method of estimate could hardly be better designed to obscure the price-concentration relationship in this application, so even a relatively low level of statistical significance is properly considered a strong confirmation.

## II. Output and Advertising

Tremblay adopts no single theory of advertising, but instead offers a menu of possibilities. Perhaps advertising informs consumers of real product differences; it might increase firm-specific demand and thus permit the realization of scale economies; maybe it independently creates a superior "image" for the advertised brand; or possibly, because advertising is costly, it creates market power through the erection of entry barriers. Declaring that "real differences are minimal among light pilsner beers marketed by the U.S. brewers in this sample," he concludes by elimination that advertising "is predominantly used by beer producers to create perceived product images *and* increase market power" (emphasis added).

In his empirical model, brand-specific demand rises with the brand's own, and falls with its rivals', advertising volume. From the positive estimated coefficient of advertising volume on price, Tremblay suggests that advertising may have had a negative impact on consumer welfare and that, if higher concentration has caused greater advertis-

1. Another complaint is that my analysis "assumes" an equivalence between an expansion in the supply of industry output and a reduction in product price. Alternatively it assumes that if sellers charge a lower price, *ceteris paribus*, the quantity demanded rises.

ing, higher concentration may also have had a negative effect on welfare.

The first problem with this is that Tremblay has completely forgotten the retail component of the industry. If he has found anything here, it is that the brewer receives a higher price per barrel the more the brewer advertises. This says nothing about the price that the consumer pays to the retailer to purchase the product; the retail price may be higher, lower, or unchanged, and it is retail price that determines (in part) final consumer demand. It is a well-documented finding that increased advertising effort by manufacturers tends to result in lower retail margins (see, e.g., Schmalensee 1972; Aaker and Myers 1975; Porter 1976; Bresnahan 1984). The usual interpretation of this finding is that it represents a shift of the task of promotion from the retailer to the manufacturer, a task for which the retailer was previously compensated through higher competitive margins. All Tremblay may have found is evidence of exactly this transfer of functions, accompanied by lower retail margins and (perhaps) lower retail prices.

But it is also worth noting that an applied welfare judgment about these advertising effects does not hinge crucially on the direction of the retail price change. Standing alone, a positive effect of product advertising volume on product price cannot distinguish between the hypotheses of market power creation (Greer 1971) or perfect competition in a heterogeneous market (Telser 1964; Rosen 1974; Lynk 1981). If the flow of advertising messages raises the value consumers place on the product, and if that increment is greater than an (assumed) increase in retail prices, then the marginal value of the product has risen (and so will output). Therefore, Tremblay not only has found no evidence of advertising effects on the prices to consumers, but his related suggestion of advertising's "harm to consumer welfare" would be unwarranted even if he had found what he claims.

### III. Price and Quality

As I noted, and as Tremblay acknowledged, beer is a heterogeneous product, encompassing both various "grades" of the product (e.g., "popular," the higher-priced "premium," and others) and also various packaging options (e.g., cans, bottles, and kegs). In studying trends in "the" price level of beer it is as appropriate to track these characteristics as it is to note size category and horsepower in studying auto prices, or octane category and lead content in studying gasoline prices.

But having noted the problem, Tremblay proceeds to ignore it in his empirical work. He tries to explain the level of  $P_{it}$ , where  $P_{it}$  is the price of firm  $i$ 's "representative brand [and presumably package]" in year  $t$ , and is calculated by dividing the firm's total revenue by its total barrels of beer produced. His sample covers 22 firms and spans 28 years

(1950–77).<sup>2</sup> The problem is that the product mix shifted from the cheaper “popular” to the higher-priced “premium” category as industry sales became more concentrated in the large “national producers,” because the latter category was a greater percentage of the output of large firms than of the smaller firms.<sup>3</sup> For this reason Tremblay has confounded a shift in the prices of all grades of beer with a shift in the mix of beer toward the higher range of the falling price distribution.<sup>4</sup> Define  $P_1$  and  $P_0$  as the price of premium and popular beer, respectively, and  $\pi$  as the premium proportion of all beer sales. The average price of beer,  $P$ , will be

$$P = \pi P_1 + (1 - \pi)P_0. \quad (1)$$

If the effect of rising concentration ( $C$ ) is to reduce both  $P_1$  and  $P_0$  but to increase  $\pi$ , we have

$$\frac{\partial P}{\partial C} = \pi \frac{\partial P_1}{\partial C} + (1 - \pi) \frac{\partial P_0}{\partial C} + (P_1 - P_0) \frac{\partial \pi}{\partial C}. \quad (2)$$

The first two terms are negative but the third is positive.

The coefficients of Tremblay's concentration variables,  $HI$  and  $CR5$ , are his empirical equivalent of equation (2). He finds that they are negative. Since these coefficients have embedded within them the positive price effect of the shift in product mix, we can conclude that the “pure price effects,”  $\partial P_1/\partial C$  and  $\partial P_0/\partial C$ , are more strongly negative than his interpretation would suggest.<sup>5</sup>

#### IV. Conclusion

Tremblay's extension of my previous work to encompass advertising effects, although an interesting objective, founders on a confusion of

2. There are some gaps; out of 616 maximum possible observations (22 firms  $\times$  28 years), nearly half, or 300, are missing because of the progressive exit of smaller firms over the period. Therefore the sample composition shifts over time: it has many small firms in the early (low-concentration) years that drop out by the later (high-concentration) years.

3. For example, the “popular-price” proportion of all beer was more than halved over the last 10 years, falling from 44.36% in 1974 to 21.86% in 1983 (*Advertising Age* [March 4, 1985], p. 18).

4. Tremblay's appeal to the composite commodity theorem (Green 1976, pp. 111–12, 150–51) is misplaced. If greater efficiency is the explanation for the expansion of the large national brewers, we expect (and observe; see, e.g., Scherer [1979, pp. 197–98]; Elzinga [1982, p. 234]; and Lynk [1984, pp. 52–53]) that the price of premium-grade beer falls relative to popular-grade beer. Thus the assumption underlying the theorem is false, and the theorem is inapplicable.

5. To illustrate, suppose that in response to a rise in the Herfindahl index of .047 (see Lynk 1984, table 3), the prices per barrel of premium and popular beer fell by \$1.00 and \$.50, respectively, and that the mix shifted from 56% premium to 78% premium (see n. 3 above). Assuming sample means of  $\pi = .67$  and  $P_1 - P_0 = \$2.00$ , the pure price effects would be  $\partial P_1/\partial C = -21.3$  and  $\partial P_0/\partial C = -10.6$ ; but an estimate like Tremblay's would yield  $\partial P/\partial C = -8.4$ , understating by over 50% the weighted average of the two price effects.

manufacturers' prices and prices at retail. Most consumer products are sold with a significant amount of promotion, and all that Tremblay finds is that manufacturers' prices are higher the more they take on the promotional burden. Whether in this instance we see also the plausible by-product of lower retail margins and, further, lower retail prices is simply not addressed. And Tremblay's finding that higher concentration leads to lower manufacturer prices in fact confirms indirectly my earlier findings on increased output. The confirmation is particularly striking because Tremblay's methods do not disentangle the concentration-induced shift toward premium-grade beer, an effect that offsets—but apparently not entirely—the tendency for rising concentration to bring with it a lower price for a given grade of the product.

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