

Vienna 2019 Abstract Submission

Title

Is beer cheaper by the keg?
Package size effects in U.S. retail prices

I want to submit an abstract for:

Conference Presentation

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Keywords

beer, retail prices, quantity, volume discounts, consumer behavior, branding, marketing

Research Question

Is beer cheaper by the keg?

Methods

Between-means comparisons of conditional means; univariate regressions of keg-bottle and keg-can differences on package size; multivariate regressions of log price on hedonic attributes.

Results

For large U.S. brands and cases of 24, 30, and 36 units, beer is cheaper (per 12oz serving) by the bottle or can than by the keg.

Abstract

Consumers can typically expect to save money on liquid goods if they buy a larger quantity of the contents (the liquid) at once. In a data set of 305 California and Nevada retail prices for various quantity packs of individually packaged bottles or cans of beer, for instance, the price per 12-ounce serving is inversely proportional to the number of units in a package. Beers sold by the individual bottle or can (a "single") have an average conditional mean price of \$2.89 per serving, whereas beers sold in 4-packs cost \$2.29; 6-packs, \$1.67; 12-packs, \$1.19; 15- to 18-packs, \$1.01; 24-packs, \$0.96; and 30-to-36-packs, \$0.61.

This apparent inverse proportionality between total volume purchased and price per unit volume may be driven partly by the producer's diminishing marginal packaging costs: for instance, the packaging for a case of 36 beers does not cost 50% more than the packaging for a case of 24 beers, because there are some fixed costs per case (e.g. box assembly). Volume discounts on liquids are sometimes offered even when there are no packaging advantages of scale, as in the example of a 10% discount on 12 or more bottles of wine purchased at a supermarket. Some of the quantity-discounting phenomenon may therefore be attributed to the classical willingness of sellers to accept lower prices for larger quantities of goods.

The largest package of beer commonly available on the U.S. retail market is the half-barrel keg. Its interior volume is 50 liters = 13.2 gallons = 1690 ounces for European brands, and 15.5 gal = 1984 oz for non-European brands.

The central purpose of this paper is to compare the retail price per serving of beer by the keg with the price of beer by the bottle and can in various quantity packages. Given that the half-barrel keg has about four times the quantity of beer as the largest-volume case of cans or bottles on the U.S. retail market (a 36-pack, with 432 oz of beer), and comes in a single package that must be returned to the seller, one might naturally expect the keg to be cheaper per ounce at retail than any quantity of beer in individual bottles or cans. Does this intuition hold?

To answer this question, I assemble a data set of 610 beer prices from Total Wine, a national retail chain. I collect the full set of retail prices for half-barrel kegs in four cities in California (Sacramento, San Jose, Fresno, and Pasadena) and one city in Nevada (Reno). I match each keg price with a price observation of the same brand in its cheapest available form by the bottle or can. Thus half of the observations in the full data set ($n=305$) are of keg prices, and the other half are of bottle prices ($n=212$) or can prices ($n=93$).

First I observe some conditional means. Next I construct the variables “Bottle Premium” and “Can Premium” to represent the difference, for a given brand, between the natural log of the lowest bottle or can price, respectively, per 12oz of beer and the half-barrel keg price per 12oz of beer. In a series of univariate regressions of bottle and can premium on package sizes (with separate regressions for bottle and can groups), I find that for case sizes up to 12 units, and for craft and imported beers, beer is cheaper, on average, by the keg than it is by the bottle or can. This is in keeping with the usual price-volume relationship for liquid goods. Surprisingly, however, for case sizes of 24 (288 oz total), 30 (360 oz), and 36 units (432 oz), and for large U.S. brands (top 25 by volume), beer is more expensive by the keg (1690-1984 oz), i.e. the Bottle and Can Premiums are negative, in violation of the usual inverse price-volume relationship for packaged liquid goods.

To test the robustness of this apparent price-quantity inversion effect, I construct a hedonic model with log price per 12-ounce serving of beer as the dependent variable.

Based on the hypothesis that consumers are willing to pay proportionally more for more of some types of information, I add a variable “Chars” to represent the number of characters (including letters, numbers, and spaces) in each beer’s brand name. I also collect four external “social information” variables from Beer Advocate, a popular beer ratings and information portal: the average rating of the beer (out of 5 points), the average percent deviation of the rating, the number of written reviews of the beer, and the number of “gots” (users who have tried the beer). To the regression model I also include store location fixed effects (via a dummy variable for each of the five locations).

Results from the multivariate regressions of log price on hedonic attributes support the finding from the univariate regressions that beer by the keg is cheaper per serving than beer by the 12-pack, 6-pack, 4-pack, or 1-pack, but more expensive per serving than beer by the 24-pack, 30-pack, and 36-pack.

I suggest that this apparent inversion of the usual price-volume relationship effect in 24-packs and above, which I verify to be statistically significant, may be related to the absence of packaging attributes (e.g. logo, design, and label information) on kegs. Half-barrel kegs of different brands of beer look alike. They are squat silver cylinders that display few of the information attributes (words, numbers, and symbols) that bottles or cans do. Therefore, when sold in the keg format, different brands are not substantially differentiated by their packaging attributes, other than perhaps a small sticker or logo on the top of the barrel, covering a small fraction of its surface, that indicates the beer’s brand name.

Consumers may be willing to pay extra for bottles or cans whose packaging contains the brand name, logo, design, and label information when the brand attributes are desirable (e.g. the packaging of an artisanal Belgian ale). For desirable brands, consumers may get less value from a keg, which is missing the recognizable brand attributes. On the other hand, when the brand attributes are undesirable (e.g. a cheap U.S. mass-market lager), consumers may attach a negative value to their display and thus be willing to pay extra for a form of packaging that conceals the brand attributes. I support this possible explanation of the keg price-quantity inversion effect with some evidence from the hedonic coefficients generated by the regressions, and I discuss some implications and avenues for future research.

Privacy

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