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Bottle size and scarcity: A case on price of bottles in Champagne

J. François Outreville

Contact: jf.outreville@laposte.net

Abstract

What determines wine prices? The question is obviously not new but the most recent papers dealing with this subject tend to go beyond a simple competitive market where the prices are the result of supply and demand. There is more than the price of wine in a bottle. The decision to market wine in a different bottle size is considered to have more to do with the judgment of taste and the feeling of pleasure than other factors ... bigger is better. Is it true? Does size matter? In this research note, we argue, like Walras, that value is also a function of scarcity.

Keywords: Price-size relation, scarcity, wine

JEL classification: D40, L66

1. Introduction

What's behind the bottle price? Weather, vintage, geographic area, bottling, marketing, recipe are all important factors in the cost of the wine. Wine prices are also determined by their reputation or perceived quality. Many papers look at the determinants of prices by using hedonic price functions to conclude that the market price of wine can be explained by the objective characteristics appearing on the label of the bottle. (For a review of the literature see Lecocq and Visser (2006).

There is more than the price of wine in a bottle. When it comes to calculate a wine's final price, there are certain concrete costs that go into every bottle of wine. Production costs vary enormously based on the type of wine, the size of the winery and its location. There are important economies of scale since new vineyards may have major start-up costs, while a big player sees the cost-per-bottle goes down as production goes up.

Wineries may use many tools to convince consumers that their wines are worth more - fancy bottles, designer labels, sophisticated advertising. Several other factors intervene in the intersection of image and pricing. Scarcity, or the perceived rarity of a wine, can be one, because motivated consumers are willing to pay for the prestige associated with small-production bottling from renowned appellations.

The decision to market wine in a different bottle size is considered to have more to do with the judgment of taste and the feeling of pleasure than other factors. The price of wine increases more than proportionally with the size of the bottle. In this paper we show that the relative scaled price of the marketed bottle may vary from 1.0 for a standard bottle (0.75l) to a factor of 2.1 when the size of the bottle increases whatever the type of wine or region of production.

To our knowledge, no investigation of the possible effects of bottle size on supply or demand of liquid products has ever been made. The only exception we found is an analysis of the effect of the size of bottles of water on the activity of plankton. Fogg and Calvario-Martinez (1989) found that the different sized bottles gave values which did not differ by statistically significant amounts.

We demonstrate in this paper that the value is an increasing function of scarcity and that this hypothesis may be the only one explaining the increasing relationship between the price and the size of a bottle. In the following section we define the notion of scarcity. The next section reviews the types of bottles available in the market. Then we demonstrate that the relative scaled price increases with the size as a function of scarcity. The paper concludes with research proposals.

2. Price or value as a function of scarcity

Walras argued that value is a function of scarcity. It is generally agreed that the value of any product satisfies the following properties (Chen 2005):

(a) The value of two products should be higher than the value of each of them.

(b) If two products are independent, that is, if the two products are not substitutes or partial substitutes of each other, then the total value of the two products should be the sum of two products.

(c) The value of any product is non-negative.

The only mathematical functions that satisfy all of the above properties are of the form

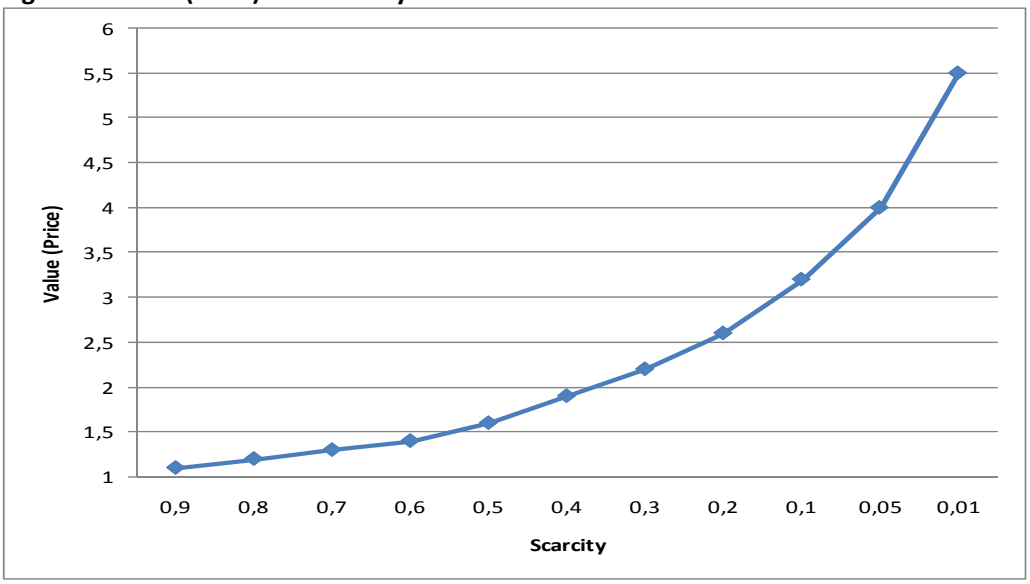
(E1) $V(P) = -\log_b P$ where *b* is a positive constant. The base *b* can be understood as the number of unit produced.
In general, if the scarcity of a service or product, *X*, can be estimated by the probability measure {$p_1, p_2, \ldots p_n$}. The expected value or price of this product is the average of the value of each possibility, that is

$$V(X) = \sum_{i=1}^{n} p_i(-\log_b p_i)$$

Therefore, value, just as information, in its general form can be defined as entropy, a measure of the unavailability. The concept was introduced by Claude E. Shannon (1948). Figure 1 is a graph of (E1), which shows that value (price) is an increasing function of scarcity measured by the decreasing probability of availability.

If we apply this concept to our case study, it will mean that the price of a bottle will increase with the perceived scarcity of this bottle. The hypothesis to be tested is that scarcity increase with the size of a bottle.

Figure 1: Value (Price) and scarcity



3. Does the bottle matter?

Whereas it isn't really necessary to have any knowledge of wine bottles in order to appreciate wine, the bottles are vitally important. A glass bottle, sealed with a cork or other device, is preferable for the storage and transport of wine. The size and the color of the bottle may also have important implications. Shape of bottles also evolved according to traditions and customs of the people which made them and has proved to be a reliable container, including other essential environmental factors, ideal for the keeping and the aging of wine.

As well as the traditional (in many cases, legally required) 750ml bottle (the standard size), and the useful half-bottle (containing 375ml of wine), there are a number of legally permitted 'large format' bottles.

Magnums, the next size up from the standard bottle, are probably the most popular choice. Wine bottles, however, come in many different sizes, and all of them serve a purpose (the list of all formats used this paper is available from the author).

- Single serve bottles (187.5) or Piccolo in Italian, are great for picnics.
- Half bottles (375ml) are often reserved for restaurants and desert wines.
- The everyday bottle is the 750ml.
- Moving next is the Magnum (1.5 L bottle). The size is great for serving wine by the glass in family reunions. Champagne is also commonly packaged in Magnums.
- Marie-Jeanne (two bottles) and double magnums for Bordeaux wines are less popular.
- Next are the big bottles. Many of these are biblical names (Jeroboam, Rehoboam, Methusalem, Salmanazar, Balthazar, Nebuchodonosor and Melchior to name the most famous).

There are a few other bottle sizes permitted in some regions, like the Clavelin (62ml) in Jura or in some countries, like the commonly encountered size of 500ml bottle, used for some Ports designed for drinking young, and Tokay, the famous sweet wine of Hungary.

The price of an empty bottle (including or not the label and cork) should be almost identical among providers in a same region or even in different regions whatever the quality of the wine in the bottle. It is usually estimated that the price is less than 10% of the final price of a standard bottle and may significantly decrease when the number of bottles produced increases.

More expensive wines tend to have more expensive packaging. A flat-bottom, generic Burgundy-style bottle (at 50 cents per) may do just fine for a less expensive wine. But if a producer wants to target a different market with higher-priced wines, he or she may select a more expensive bottle style.

Wineries produce very few large format bottles because they require manual processing. Once they choose to release a bottling that is larger than a magnum, it no longer fits on a standard bottling line. Each step means higher labor costs and higher risk of poor closure. Nevertheless, large format bottles are popular with collectors and scarcity puts a premium on large formats.

4. A measure of scarcity

The value of the wine is hypothesized to be the same whatever the quantity sold. The basis for the observed price of wine is the standard bottle (750ml). Everything else being equal, the price of a larger bottle of wine should be a simple multiplier of the quantity of wine in the bottle. A measure of scarcity is the ratio of the observed price of the bottle to the normalized price relative to the price of the standard bottle for the same wine.

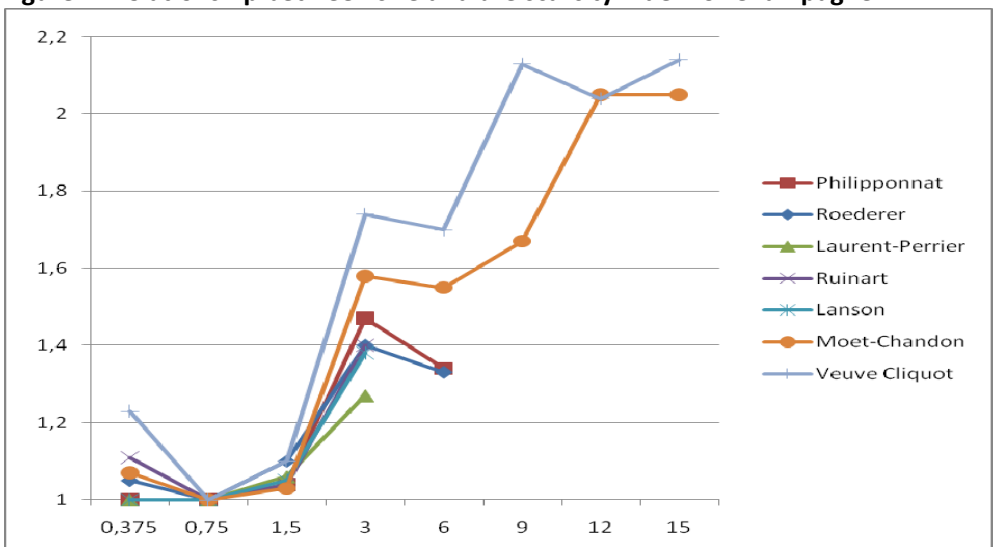
For example, if the price of a standard bottle is $15 then the normalized price of a magnum should be $30 (15x2) or the price of a Methusalem $120 (15x8). We assume there are no economies of scale.[1] The ratio of the real price of the Methusalem bottle ($216) to the normalized price ($120), gives an index of scarcity equal to 1.8. The index of scarcity is equal to 1.0 for the standard bottle.

Data for Champagne have been found on company's websites. Figure 2 presents the relationship between the sizes of the bottle measured as the number of standard bottles and the scarcity index. The

[1] This hypothesis is not true for water (validation is available from the author).

relationship is calculated for seven different producers. The scarcity curve is similar whatever the perceived quality of the producer. The index also increases for smaller bottles (375ml) to a value of 1.2 and the larger the size of the bottle is, the higher is the scarcity index, up to a value of 2.1.

Figure 2: Relationship between size and the scarcity index for Champagne

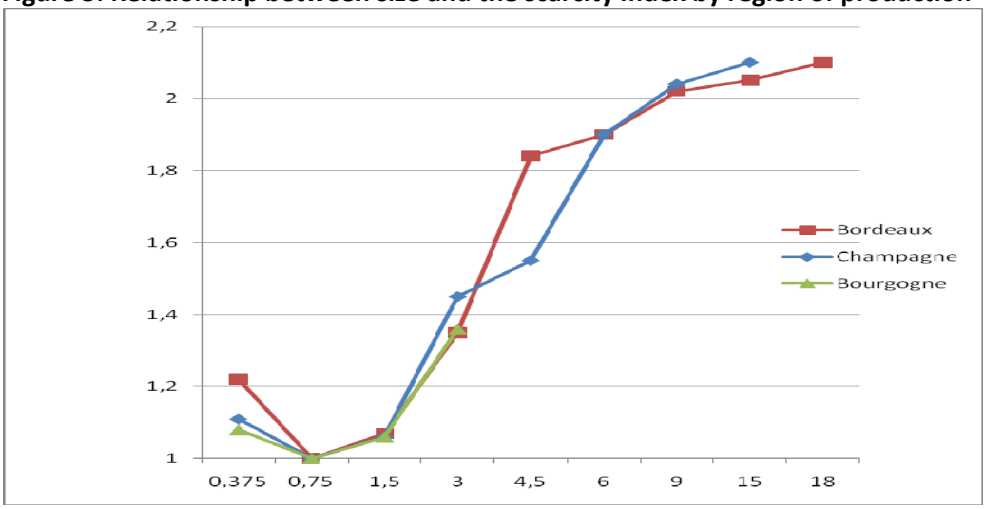


It is also interesting to note that the patterns of the curves do not seem to be related to the producer. But is it related only to this region of production, i.e., Champagne.

5. Is this relationship related to other factors?

The quality or perceived reputation of the wine do not seem to have any impact on the index values (or curve) as shown for average values in the three regions (Figure 3).

Figure 3: Relationship between size and the scarcity index by region of production



Bigger bottles are also supposed to be the ideal medium for ageing wine. The larger the bottle the less air space per milliliter of wine, resulting in better storage conditions. Collectors attracted by the rarity of such bottles are also attracted by the fact that wine ages much more slowly and gracefully in larger bottles.

Unfortunately this hypothesis does not hold for large format bottles if, as it is sometimes the case, they are filled using wine poured from single 750ml bottles prior to sale. Another example against this hypothesis is given by the relationship between the scarcity index and the size of bottles of whisky which is not supposed to age better in bigger bottles (Figure in Appendix).

It could be also argued that in the case of whisky, the higher index may only reflect the higher cost of producing bigger bottles. When comparing the index for Whisky and wine, it is clear that the much higher value of the index for wines cannot be only explained by the higher cost of production.

6. Conclusion and suggestions for further research

According to Walras, value is an increasing function of scarcity. We demonstrate in this paper that this hypothesis of scarcity explains the increasing relationship between the price and the size of a bottle independently of the perceived quality of the wine or the region of production.

Further investigation of the possible effects of bottle size on supply or demand of wine products would need access to larger databases on this subject. It would also be important to verify if this scarcity hypothesis is only valid for wine or alcohols or if it could be extended to other products like perfumes or olive oil for example.

7. References

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Appendix:

Figure in Appendix: Relationship between size and the scarcity index for whisky