

*Review*

# Analysis and Impact of Factors Influencing Supply and Demand of Wine

Dejan Obućinski<sup>1\*</sup>, Nebojša Pušara<sup>1</sup> and Jovana Radulović<sup>1</sup>

<sup>1</sup> Belgrade Business and Arts Academy of Applied Studies, Kraljice Marije 73, 11000 Belgrade, Serbia

\* Correspondence: [dejan.obucinski@bpa.edu.rs](mailto:dejan.obucinski@bpa.edu.rs)

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**Abstract:** The paper presents the state, importance, risks, and other factors regarding wine supply and demand. Vine cultivation and wine production, as part of agricultural production, contribute to a certain extent to the gross domestic product in several ways. There is a noticeable increase in vineyards and private wine production. This paperwork is mostly based on the results of the master's thesis research by the first co-author mentioned, Dejan Obucinski, called "Economics of sustainable wine production and supply in the Republic of Serbia." Presenting the state of wine supply and demand contributes to overcoming risks in the wine business, which will be presented and considered in this paper from the economic level of an organizational perspective, i.e., by using one of the multi-criteria decision-making methods for the structural analysis of a complex system.

**Keywords:** Vine; wine; winery; supply; demand.

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## 1. Introduction

From a historical perspective, the Greeks, Romans, priests, and other nobles of that time found interest in wine production. Nowadays, although the use of beer and other strong alcoholic beverages is strongly promoted, the supply and demand for wine are gaining importance. The age limit of consumers has significantly shifted to a lower level, as has gender dominance. Practically, alcohol consumption has started to prevail among younger people, with an increase in female consumers. The pronounced amount of alcohol consumption is directly related to negative effects on health (depression, diseases of the liver, pancreas, heart, stomach, blood vessels, nervous system, etc.), and indirectly, alcohol consumption is related to road traffic accidents. These facts motivate us to consider a different approach at the cultural level. It is specifically about the social-cultural approach to moderate alcohol consumption, including wine. The reason for this is both the prestige and the price of wine consumption, whether domestic or foreign. However, what puts an exclamation point on these facts is another fact: a certain number of people, i.e., the majority, consume domestic and foreign wine equally. On the other hand, what builds on the culture of wine consumption is the percentage that refers to the "drinking with a meal" moment—one of the most important moments for human health as well as the preservation of the family atmosphere, which presents one of the basic success factors in life. In the real economic environment, the supply and accompanying risks are reflected in the selection of an adequate grape variety due to the existing climatic and other conditions, the cultivation of the land, the protection and maintenance of the vine, and its marketing development and distribution. In the empirical research part of the text, emphasis will be placed on the cost and product risks and overall market conditions. Such an approach implies overcoming traditional attitudes on the one hand while adhering to empirical and generally accepted ones on the other. Besides the theoretical part of the research, the following paper provides a practical approach too.

## 2. Material and methods

The research methodology is based on a list of scientific methods. The research began with the collection and review of the literature. In this way, the predispositions for the analysis and synthesis of data were achieved, which, through further processing, resulted in the information needed to contribute to economic development.

The aforementioned process consists of data collection, generating the factual state of individual items as well as descriptions. The fuzzy DEMATEL (Decision-Making Trial and Evaluation Laboratory) method was used to identify causal and consequential sources of risk. By using fuzzy sets, an unavoidable segment of uncertainty is included in any decision-making criteria, even a multi-criteria one. The reason for this is business uncertainty and limited resources. The result of the process is reflected in the presentation of direct and indirect factors, in this case, risks, which initiate the higher-level achievement of organization and economic effects in the cultivation of vines, production, and wine supply.

## 3. Wine demand and consumption effects

Although the goal of every nation is to decrease its age gap phenomenon, reality says the opposite. Namely, the index of elderly people in the age distribution of a population is increasing from year to year. Based on these facts, there is a need to open up the subject for scientific investigation, particularly in the domain of health contribution, not only to the elderly but also to the entire population. "Considering also the well-documented negative associations between moderate wine consumption and cardiovascular morbidity and mortality in this age group, it seems that there is no medical rationale to advise people over 65 to quit drinking wine moderately, as this habit carries no specific risk and may even be of some benefit for their health" [1]. Of course, an extreme approach to consumption is out of the question because chronic consumption leads to an increased risk of cardiovascular diseases.

"The term French paradox was coined in 1992 to describe the relatively low incidence of cardiovascular disease in the French population, despite a relatively high dietary intake of saturated fats, and potentially attributable to the consumption of red wine" [2]. Knowing that the spectrum of emotions is based on sensory stimulation, the authors of their research, "Emotional response to wine consumption," conducted in Italy, concluded that most Italian terms focused on emotions caused by wine consumption fall into the category of pleasure [3].

Certain key similarities between wine consumption and artistic evaluation are suggested in the study findings about consumers' perception, which include [4]: "the pleasure provided by each; the interrelated role of sensory, emotional and cognitive responses; the focus on evaluative processes, particularly concerning the concentration and training which they require; and the issues of personal taste. It can also perhaps be argued that both wine and art forms prompt a common perception of beauty"

In general, moderate consumption of wine has positive effects on the consumer's health and, most importantly, his mood. This gives another positive psychological effect that is expressed through readiness and easier reciprocity than under today's circumstances.

## 4. Supply and demand factors for wine

The wine trade has experienced radical changes. An increasing role is played by so-called "e-commerce or online wine sales characterized by information and comfort. In this way, suggestions for combinations of food and wine, as well as other recipes, are obtained. Also, it is possible to access the list of interesting things, starting with history, manufacturers, recommendations, etc. Nowadays, discounts, as actions that represent a marketing card, are very significant. On the other hand, there remains the question of the consumer profile classification for red, white, rosé, or sparkling wines. What needs to be emphasized during market research is how potential customers interpret and approach information during each purchase.

Therefore, it is necessary to analyze and define the approach to the production and sale of wine (its characteristics, regional origin, age, and commercial approach) that is consistent with the

demands of consumers, i.e., its characteristics and pedigree, concerning the quality and quantity of wine consumption. The supply of wine can be more efficient if the agricultural holdings join together in cooperatives and thus enter the market. In this way, they would have market power both in sales and distribution, as well as in the procurement of consumables needed for planting, growing vines, and wine production. The demand for wine is practically an incentive and the second main reason for the supply of wine, and it mostly depends on the level of income, the price of wine, as well as cultural, religious, and geographical preferences.

“An acceleration of the wine industry globalization process has occurred in the last decades due to increased competition, the emergence of new producers and exporters, and the existence of new wine-consuming countries” [5]. It is interesting to consider who dominates in wine consumption, male or female because it has been established that there are “significant gender differences are identified; wine buying is often perceived as a predominantly male role although more women buy more wine. Differences in low involvement and novice behaviors are identified” [6]. The production of organic wine is gaining importance around the world. This implies the use of only organic fertilizers and the more widespread use of basic winemaking techniques for natural ripening. After researching twelve small wineries in Serbia, the conclusion is that their success, in addition to product quality, is mostly contributed to their marketing strategy. The conclusion is also that each of the following activities is realized with the aim of market positioning [7]:

- website and online advertising;
- promotions on television, newspapers and magazines, fairs, and stores;
- lectures in educational institutions;
- wine tourism development and others.

## 5. Effects of wine tourism on wine supply and demand

Wine is an agricultural food product created in the process of grape fermentation, which passes through an intermediate phase called vinification. In the aforementioned boiling process, primarily sugar is added, as well as other auxiliary substances that accelerate, enrich, and enhance the process. The entire process, environment, and vine region represent the cornerstone of wine tourism. Wine tourism greatly contributes to the demand and supply of wine. Namely, the critical characteristics of wine tourism from the consumer's perspective, according to [8] complimentary with [9] stating that wine tourists are looking for:

- dining;
- shopping;
- cultural and recreational activities;
- authentic (e. g. reflecting local elements and unique events) products and experiences.

In this way, the circle of wishes, wine users' demands, tourists, as well as the goals of wine producers and other services, is closed.

Actually, in this way, revenue is maximized, customer expectations are exceeded, and service provider-user relationships are made. The need for a greater emphasis on wine tourism destinations, on the protection of rural landscapes, on encouraging authentic and unique forms of development, and on focusing the image projection on those elements of the wine location experience that are crucial for the wine tourists' interests was identified [10]. Also, seven topics were identified, which were emphasized [11]:

1. Wine tourism and its development
2. Wine tourism and regional development.
3. Size of the winery visitation market
4. Winery visitor segments.
5. The behavior of the winery visitors.
6. Nature of the visitor experience.
7. An emerging area of research on the biosecurity risks posed by visitors.

Researching the relationship between wine consumers' preferences for wine from certain countries or regions and their interest in or inclination to travel to certain wine regions, it was found that almost 70% of respondents preferred to drink wines of a certain origin, while planned trips related to wine by respondents fully matched those geographic preferences [12].

## 6. Other wine supply and demand factors

Many factors or risks affect the wine supply and demand. Each of the factors has value in one aspect or another. However, given that demand exists in varying degrees of intensity, the emphasis is placed on the production process in all stages.

Consistently positive results in businesses, such as wine production and trade, are based on technological advances, such as mechanization of pruning, harvesting, and new grape varieties, and necessitate a shared strategic vision, significant support from the infrastructure of research institutions, new tertiary educational institutions, a network of consultants and suppliers, and a tax regime that promotes knowledge, marketing, distribution, and the development of a successful innovation system [13].

The problems of wine tourism marketing at the regional level are classified as [14] following:

- market image and branding;
- regional identity;
- facilities;
- infrastructure;
- wine tourist expenditure;
- market research;
- governmental promotion.

Also, the above-mentioned division of wine marketing problems is criticized for the fact that the economic indicators of wine tourism at the regional level are based on industry estimates and there is no systematic collection of survey data on wine tourism. Based on the fact that one person can pick approximately 500 kg of grapes per day, it is necessary to "find" approximately fifty pickers to pick an area of one hectare at the same time in one day. This type of organization contributes to weaknesses in production and competitive results.

In the wine industry, companies are facing three levels of commercial risk in the market [15]:

1. Cost Risk (CR);
2. Product Risk (PR);
3. Market Risk (MR).

The costs and risks speak for themselves. Specifically, the first level is based on the price ratio of the product price and the cost of sales. The second one refers to the quality and quantity of the product itself, and the third one refers to the rigorous and unpredictable market, which is a synthesis of the two previously mentioned.

In determining the price of the quality, i.e., the variability of the price-quality ratio of the wine, marketing has the greatest influence, which takes time. Wine production also contributes to the development of the catering industry, hence the name "HORECCA," a blend of hotels, restaurants, and cafes. Among other things, it must be taken into account that vineyard pruning residues in wine production can be a significant source of biomass. That final process can be a significant element in closing the circle of the wine production process. A process that is very important for the wine assortment strategy is the pairing of wines with a list of food products as well as other fruits.

The compound of the wine's piquancy and the taste of the supplements give off a specific aroma that creates a special impression. Wine supplements can also be medicinal or herbal, or made from their roots or flowers, such as cinnamon or ginger. Also, an interesting but insufficiently used supplement is honey. The result of the above is reflected in the fact that on the consumer's side, there should be a perception of respect, and on the other, on the producer's side, the maximization of income should be achieved, i.e., profit. If the manufacturer, as a bidder, applies the first principle of the quality management system, even better business results will be achieved. In this way, the



**Table 3.** Linguistic evaluations of respondents expressed by Crisp Number for the variable "SS" criteria (CR, PR, and MR).

SS	CR	PR	MR	SS	CR	PR	MR	SS	CR	PR	MR	SS	CR	PR	MR
CR	0.00	0.15	0.85	CR	0.00	0.45	0.15	CR	0.00	0.45	0.45	CR	0.00	0.45	0.85
PR	0.85	0.00	0.85	PR	0.45	0.00	0.85	PR	0.85	0.00	0.85	PR	0.85	0.00	0.45
MR	0.15	0.15	0.00	MR	0.85	0.15	0.00	MR	0.85	0.45	0.00	MR	0.85	0.45	0.00
SS	CR	PR	MR	SS	CR	PR	MR	SS	CR	PR	MR	SS	CR	PR	MR
CR	0.00	0.45	0.15	CR	0.00	0.15	0.15	CR	0.00	0.15	0.85	CR	0.00	0.15	0.15
PR	0.85	0.00	0.45	PR	0.85	0.00	0.85	PR	0.85	0.00	0.45	PR	0.85	0.00	0.85
MR	0.15	0.45	0.00	MR	0.85	0.45	0.00	MR	0.85	0.15	0.00	MR	0.45	0.15	0.00
SS	CR	PR	MR	SS	CR	PR	MR								
CR	0.00	0.15	0.85	CR	0.00	0.15	0.45								
PR	0.45	0.00	0.45	PR	0.45	0.00	0.45								
MR	0.45	0.15	0.00	MR	0.45	0.45	0.00								

The following steps for implementing the fuzzy DEMATEL method are shown in the tables, beginning with Figure 1.

**Table 4.** Average opinions of 10 respondents for the criteria (CR, PR, and MR) of the variable "SS".

SS	CR	PR	MR	Σ
CR	0.0000	0.2700	0.4900	0.7600
PR	0.7300	0.0000	0.6500	1.3800
MR	0.5900	0.3000	0.0000	0.8900
Σ	1.3200	0.5700	1.1400	3.03

**Table 5.** Normalized initial influence matrix for the criteria (CR, PR, and MR) of the variable "SS".

SS	CR	PR	MR
CR	0.0000	0.2045	0.3712
PR	0.5530	0.0000	0.4924
MR	0.4470	0.2273	0.0000

To obtain the total-relation matrix, the following formula (1) was used:

$$T = N \times (1 - N)^{-1} \tag{1}$$

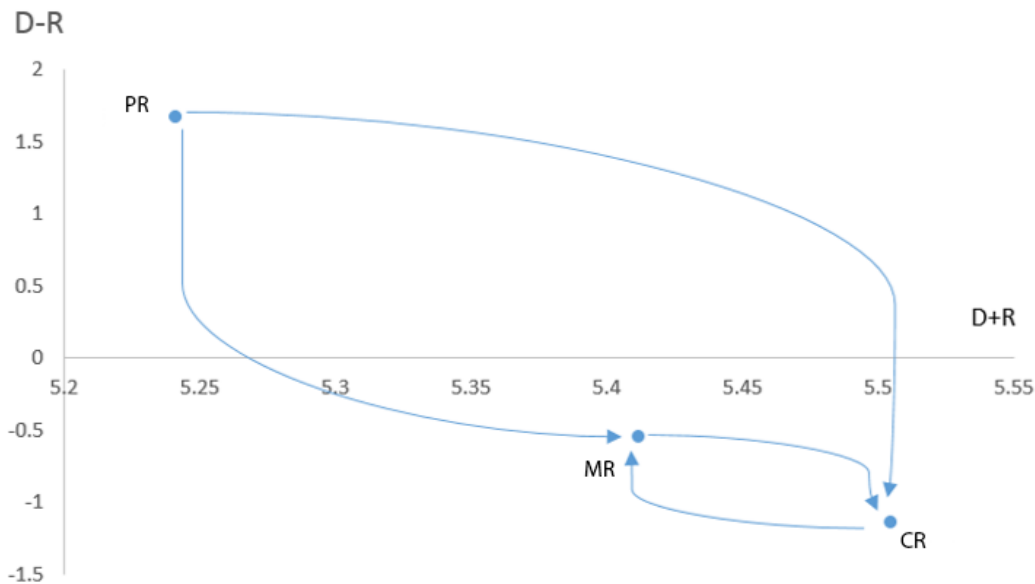
$$\begin{pmatrix} 0.0000 & 0.2045 & 0.3712 \\ 0.5530 & 0.0000 & 0.4924 \\ 0.4470 & 0.2273 & 0.0000 \end{pmatrix} \cdot \left( \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} - \begin{pmatrix} 0.0000 & 0.2045 & 0.3712 \\ 0.5530 & 0.0000 & 0.4924 \\ 0.4470 & 0.2273 & 0.0000 \end{pmatrix} \right)^{-1} = \begin{pmatrix} 0.7164 & 0.5583 & 0.9121 \\ 1.4942 & 0.6121 & 1.3484 \\ 1.1069 & 0.6160 & 0.7142 \end{pmatrix} \tag{2}$$

**Table 6.** Total-relation matrix for the criteria (CR, PR, and MR) of the variable "SS" (first step).

SS	CR	PR	MR	D
CR	0.7164	0.5583	0.9121	2.1868
PR	1.4942	0.6121	1.3484	3.4547
MR	1.1069	0.6160	0.7142	2.4371
R	3.3175	1.7864	2.9747	

**Table 7.** Total-relation matrix for the criteria (CR, PR, and MR) of the variable "SS" (second step).

SS	D+R	(D+R) rank	D-R	(D-R) rank	$\omega_i$	Wi (%)	Wi rank
CR	5.5043	1	-1.1307	3	5.6192	33.94	1
PR	5.2411	3	1.6683	1	5.5002	33.22	2
MR	5.4118	2	-0.5376	2	5.4384	32.84	3
R	5.3857		0.0000		16.5579	100.00	



**Figure 1.** The sustainable success of wine production and supply based on defined risk factors.

The causal diagram is given in the previous figure. The importance of the limiting success factor (SS) is shown on the axis (D+R) in the following order: CR> MR > PR, and on the axis (D-R) is shown the cause for the critical factors' adoption according to the following importance: PR > MR > CR. Factor values that are positive on the D-R axis are the net causal factors, which are the PRs that directly affect the other two. The factor that most influence other factors is PR. Values that are negative on the D-R axis are the net reception or effect factors, namely MR and CR.

### 8. Conclusions

The expansion of wine consumption largely depends on consumer habits. To encourage the expansion of habits, emphasis must be placed on marketing strategies. On the other hand, to encourage and expand consumer habits, it is necessary to define and specify goals, criteria, and principles. Such a move opens up the issue of import tariffs as well as other trade barriers, which is an item for consideration at the state level. One of the wrong steps on the supply side is the planting of foreign vine varieties instead of domestic, autochthonous varieties. In this way, domestic producers met with foreign ones who already had a developed market and higher level production of the same quality wine at lower prices because the market was already established, i.e., saturated. One of the risks associated with costs and products can be recognized from the above.

It should not be overlooked that one of the main risk factors affecting the production and consumption of wine is the market. It can be concluded from this that the decision to consume wine, on the other hand, is influenced by a wider range of factors, among which the social category of the consumer is in the first place. The market as a social, climatic, and geographical determinant is also conditioned by legal regulations and agent mediators. Practically, it is a sociological approach to marketing, which is reflected in the synthesis of quality, quantity, and price. In this way, i.e., by fulfilling the previously mentioned items, the general satisfaction of producers and consumers is reached.

According to the findings of the analysis, the market is a significant limiting factor between costs and product risks. Cost risk represents the greatest strategic importance in achieving the sustainable success of the wine supply. However, it should be emphasized that product risk, in any case, represents a net causal factor that directly and most significantly affects other factors. It can be concluded that cost risk and market risk represent net receipts or effect factors. To reduce the possible crisis in the sector as well as the mismatch between wine supply and demand, the customs policy must be reformed and raised to a higher level. In addition to customs, the state must take into account other trade barriers, i.e., costs such as technical, sanitary, and phytosanitary barriers, as well as transportation and marketing costs. In this way, wine production at the national level will be protected.

Of course, such a step should not be extreme but moderate. Also, the state should use its measures to encourage production even more, emphasize comparative advantages, and contribute to export potential. As a result, it can be concluded that such a state contributes to domestic supply and demand as well as foreign trade exchange, i.e., such a strategy contributes to the process of national economic development. This step is necessary because the market in this domain is extremely global and competitive. In the end, it must be emphasized that in this sector, the authenticity of the wine is the basis of the marketing strategy, the production organization, and the consumer's motive for purchasing and loyalty to the production brand.

It is assumed that this research, based on the literature review, analysis, and processing of the obtained results based on the competent persons' assessment, as well as the setting up of a selected factor system and its systematization, will lead to the conclusion that the aforementioned considerations and the developed wine production system and supply are realistic and dynamic categories that, with the encouragement of the state, can be sustainable. This method reduced the risks associated with a total cost, product, and market range. The result of the above will be a greater supply of wine products, long-term total consumption profitability, and customer loyalty.

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