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How will mandatory nutrition and ingredient labelling affect the wine industry? A quantitative study of producers' perspectives

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Abstract

Purpose: The purpose of this study is to examine producers' perspectives on the mandatory labelling of nutrition and ingredient information for wine, as suggested by the European Commission. Producers' expectations about consumer reactions to new label information, the consequences of mandatory labelling on production processes and relative competitive advantages for different producer sizes are assessed.

Methodology: Data for this survey was collected from producers using the quantitative research method of an online survey. In total, 483 German wine producers, covering a substantial share of the country's wine acreage, took part in the survey, comprising 434 estate wineries, 29 co-operatives and 20 large bottling wineries.

Findings: The study concludes that mandatory nutrition labelling will have several effects on the wine industry. Producers' expectations of consumer reactions largely agree with the findings of recent qualitative studies focusing on wine consumers. While nutritional information is unlikely to have an effect on consumer demand, the listing of ingredients is likely to create consumer confusion and uncertainty, weakening wine's image as a natural product. This creates the opportunity for some wineries to focus on clean labelling strategies by completely avoiding additives that require labelling. From a production point of view, mandatory nutrition labelling is likely to increase costs due to changes in oenological practices, the increased need for laboratory analyses and more challenging labelling processes. Large wineries are better informed, and likely to be better equipped, to react to labelling changes.

Practical implications: The degree to which negative effects will be realised will not only depend on legal decisions about the classification of additives versus processing aids, but also on producers' willingness and ability to adapt to the changes mandatory nutrition labelling will impose on the industry. Producers should react proactively and anticipate consumers' requests for fair and transparent ingredient labelling.

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Keywords: Nutrition labelling; Ingredient lists; Production costs; Competitive advantage; Wine industry structure; Expected consumer reaction

1. Introduction

In March 2017, the European Commission (EC) released a statement that suggested abolishing article 16 of the European Union's Food Information to Consumers (FIC) regulation

1169/2011, which exempts alcoholic beverages above 1.2% alcohol by volume from mandatory nutrition and ingredient labelling. The alcoholic beverage industry was not prepared for this even though a revision of this regulation was already called by [subsection 4](#) of the article in order to ensure coherence with other relevant policies of the EU, originally to be due in December 2014. The statement explained that a further exemption could not be justified based on the need for consumer protection measures ([European Commission, 2017](#)). This decision was based on the belief that consumers require access to complete information about the products they

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consume in order to be able to act according to their interests (Cowburn and Stockley, 2005). Providing this complete information to consumers requires labelling products with both the nutritional values (energy, fats, saturated fatty acids, carbohydrates, sugar, protein, salt) and a list of ingredients. Instead of proposing a regulation, the EC demanded that all European producers of alcoholic beverages come up with a self-regulation proposal within one year, by March 2018 (European Commission, 2017).

The “joint” self-regulatory proposal submitted on the final day of the one-year allotted period outlines general principles of the labelling scheme on which the different alcoholic sectors could agree. These include nutritional labelling and the provision of ingredients off- and/or on-label. In addition, each sector developed its own implementation plans. For wine, this suggests the labelling of calorific content only, and providing ingredient information off-label online (USDA Foreign Agricultural Service, 2018). The EC have yet to react, but regardless of the outcome, experts expect that mandatory nutrition and ingredient labelling for wine will eventually follow the current regulations on food labelling.

The European alcoholic beverage industry lacks experience with mandatory nutrition and ingredient labelling, except for ingredients that may have an allergenic effect (e.g. sulphites). In considering demand, many studies have investigated consumers’ relationship with nutrition and ingredient labelling for food in general, but few have focused on alcoholic beverages and wine specifically. Therefore, the consequences for producers of introducing mandatory labelling remain unknown. Those consequences would not be limited to European wine producers, but instead would affect all global wine producers exporting to the European Union.

There is currently a lack of empirical research on producers’ attitudes to mandatory nutrition and ingredient labelling, producers’ expectations about its effect on consumer demand and the consequences that mandatory nutrition and ingredient labelling will have on oenological practices, competitive advantages and the wine labelling process. Therefore, this study analyses the effects mandatory nutrition and ingredient labelling are likely to have on the demand and supply side of the wine industry from the producers’ point of view.

2. Literature review and problem studied

Legal changes in wine labelling will affect the demand for wine due to consumer reactions. The supply side will be influenced directly by changes in costs and production processes, and indirectly by producers’ reaction to changes in consumer demand.

Producers’ expectations about consumer reactions

Market research into the effect of a new, previously non-existent, labelling system is undermined by hypothetical research bias (Jacoby et al., 1977; Pabst et al., 2019;

Wąsowicz-Kiryło and Styśko-Kunkowska, 2011). Direct research methods that ask consumers about their potential reactions to new labels are prone to overestimate their effect greatly because they create artificial consumer attention and interest (Jacoby et al., 1977; Koenigstorfer et al., 2014; Wąsowicz-Kiryło and Styśko-Kunkowska, 2011). All existing studies examining consumer reaction to nutrition and ingredient labelling for wine used direct research methods (Annunziata et al., 2016b; Grunert et al., 2018; Himmelsbach et al., 2014; Mueller et al., 2010), which means the validity of their results showing high levels of stated consumer interest and concern can be questioned. Indirect and implicit measures of consumer reactions in their natural environment during real shopping or consumption occasions are likely to produce more valid estimates. Such experiments in natural settings are rare because of the extremely high costs involved.

It is therefore a viable approach to ask producers who are in day-to-day contact with consumers about their experience and expectations of potential changes in consumer behaviour when a new labelling system is introduced. However, this subjective producer assessment also involves an unconscious influence and desirability bias. In the particular case of wine, producers observed and could learn from consumer reactions after the introduction of sulphite labelling in 2005. While consumers were initially irritated by this new label information, and required clarification and education, the labelling of sulphites ultimately did not have an effect on wine demand (Costanigro et al., 2014).

It is of particular interest if various producer types differ in their assessment of potential consumer reaction to wine labelling. Wine estates usually sell to highly involved and knowledgeable wine consumers, either directly through their cellar door or through specialty wine retail (Loose and Pabst, 2018). Contrary to this, large bottlers mainly service food retail and discount stores where less-involved consumers source the majority of their wine (Szolnoki and Hoffmann, 2014). Cooperatives share characteristics of both; they sell almost half of their production to food retail, but also sell directly to consumers and to specialty wine retail (Loose and Pabst, 2018).

Producer awareness and attitudes to labelling

The EC demanded that the European alcoholic beverage industry provide its suggested self-regulation within the one-year deadline. The aim and details of this suggestion had to be communicated top-down to all industry members, but because of its highly fragmented agricultural structure (Loose and Pabst, 2018), it is unclear how many wine producers were aware of the labelling discussion six months ahead of the required submission. We can expect large producers, such as bottlers and cooperatives, with efficient sector organisation and dedicated management personnel, to have a higher degree of awareness compared to small-scale family-business wine estates.

Expected effect of labelling on production processes and competitive advantage

In considering the supply side, three broad categories of the effects of labelling changes on wine production can be expected (Battaglene, 2014), including two direct effects. First, there are effects on oenological practices caused by producers avoiding ingredients they would have to indicate on labels. Second, labelling processes during the bottling of wine are likely to change. Third, and as an indirect effect, competitive advantages within the wine industry are likely to shift when various producer types are affected differently by supply and demand effects (Porter, 1985).

If certain substances have to be declared in the ingredient list, wine producers could try to avoid using them in future and change their oenological practices accordingly (Battaglene, 2014). Oenological practices today focus on improving the wine quality while also prolonging the shelf life of the product with minimum costs (Urso et al., 2018). It is highly likely that some producers will focus on “clean labelling”, where they actively avoid using any declarable substances (Asioli et al., 2017). The abolishment of certain oenological practices could lead to a deterioration in wine quality and market supply (Battaglene, 2014). Furthermore, if producers decide to change the substances used or substitute them by physical treatments, meaning they do not have to be declared on the label, a rise in production costs is likely (Battaglene, 2014). What would have to be labelled as an ingredient is currently unclear because the categorisation of substances into processing aids (no longer present in the end product, thus not to be declared) and ingredients/additives that remain in the finished product (declaration obligatory) has not been agreed between the Organisation of Vine and Wine (OIV) and the Codex Alimentarius Commission (CAC). This categorisation will have to be the subject of the first legal action, and is likely to be a huge influence on the consequences mandatory nutrition labelling will have on the industry.

Processes involved in labelling wine will be affected in several ways. First, the additional information required will further increase the battle for space (Mueller et al., 2010) on the back label caused by the different requirements and interests of consumers, legislators and producers (Battaglene, 2014). Space limitations intensify if a product is to be offered in various markets that need the information in different languages. Currently, very few producers offer nutrition information on their wines on a voluntary basis. To do this, they often use off-label systems, where information about the wine is digitally available and accessible through a web link or QR code. While many consumers claim to have an interest in this information, few use the existing offerings (Grunert et al., 2018). Second, labelling costs could increase due to three reasons. First, producers that until now have only used front labels will have to introduce back labels to display nutrition and ingredient information. Second, back labels have to be ordered in smaller quantities in order to ensure the correct nutrition and ingredient information is displayed for each batch, thus decreasing current economies-of-scale effects

(Battaglene, 2014). Third, some substances are only added directly before bottling. Therefore, the labels would often have to be reprinted or retrofitted with nutritional values or ingredients using special techniques, again resulting in higher production costs (Battaglene, 2014).

Competitive advantages or disadvantages can arise from smaller and larger producers being affected differently (Porter, 1985; Sellers and Alampi-Sottini, 2016; Urso et al., 2018). A rise in production costs will face producers who buy wine in bulk in order to produce their own blends. To ensure the accurate declaration of ingredients, the substances used during the prior production steps have to be known for each of these base wines, which will likely result in high laboratory analysis costs (Battaglene, 2014). Large production facilities could benefit from a higher capacity utilisation and quicker amortisation (Sellers and Alampi-Sottini, 2016; Urso et al., 2018) of expensive processing equipment used to avoid additives (e.g. dialysis to avoid tartar crystals). Smaller producers could gain an advantage because a greater share of consumers buy directly from the winery (Loose and Pabst, 2018), allowing them the opportunity to explain the reasoning behind using certain additives. Smaller producers could potentially benefit from working with smaller batches that might require fewer declarable additives.

Regardless of the outcome of the current EC hearing, a long-term extension of the exemption of mandatory nutritional labelling for wine is unlikely. Despite this, few studies have discussed the consequences mandatory nutrition labelling will have for producers. While Battaglene (2014) considered potential consequences for the industry in theory, no empirical research has been conducted yet. Therefore, this paper aims to fill this gap by analysing the effects mandatory nutrition and ingredient labelling will have on the demand and supply of wine from a producer's point of view.

The following main questions will be addressed:

- 1) How do producers perceive consumer interest in and knowledge of nutrition and ingredient information? How do producers expect consumers to react to new labelling information, and how will the demand for wine change from a producer point of view?
- 2) What effect will nutrition and ingredient labelling have on production processes, and will some producers gain a competitive advantage over others?
- 3) To what degree are producers knowledgeable about the legal labelling process, and what are their attitudes regarding it? Do they support the idea of labelling nutrition and ingredient information?

3. Research methodology

3.1. Pre-study qualitative interviews with experts

To analyse producers' perceptions of mandatory nutrition and ingredient labelling on wine, we used a two-step research design consisting of qualitative interviews with experts and a quantitative online survey. In the qualitative phase, six

producers representing wine estates, cooperatives and bottling wineries of different sizes and from different regions were interviewed. All interviews were conducted by phone and followed a semi-structured interview guide covering producers' perceptions on mandatory nutrition and ingredient labelling, and its effect on the demand for and supply of wine. All interviews were recorded and transcribed literally. Transcripts were analysed using a summarising content analysis with an inductive creation of categories (Mayring, 2015). The base material was reduced to its substantial content, followed by paraphrasing and generalising the content based on a defined selection criterion and level of abstraction. The key messages resulting from the analysis of the expert interviews were then used to enrich the literature review and to build the questionnaire for the subsequent quantitative survey.

3.2. Quantitative online survey of producers

The online survey covered five main topics: 1) the interviewees' previous knowledge and experience of wine labelling in terms of nutritional and calorific values as well as ingredient lists; 2) their attitude to labelling nutritional and calorific values and their expected effects on demand; 3) their attitude to labelling ingredient lists and their expected effects on demand; 4) the expected effects of mandatory labelling on production costs, production processes and competitive advantages; and 5) their support for mandatory nutrition and ingredient information on wine.

Example labels with nutritional and ingredient details (see Fig. 1) were shown to respondents to ensure that producers based their survey responses on the same information and to reduce response variance for producers who had not heard about the legal labelling discussion before.

Producer attitudes were elicited using a three-point Likert scale to reduce response time and respondent fatigue for participating producers, who did not receive any incentive for giving their response. Although three-point Likert scales are not very common in recent market research, the number of categories of Likert scales does not have a significant effect on test-retest reliability and the validity of the scales, and two or three-point Likert scales perform equally well (Jacoby and Matell, 1971; Wakita et al., 2012). Three-point-scale answers were then recoded into -1 for "disagree", 0 for "neither agree nor disagree" and $+1$ for "agree". This resulted in an easy-to-interpret average value within the potential range of $+1$ (all producers agree) to -1 (all producers disagree). Middle values around 0 indicated either the neutrality of producers or the cancelling out of heterogeneous views. To increase readability, standard deviation is not shown here, but strongly heterogeneous perspectives will be indicated verbally.

Chi-square and analysis of variance (ANOVA) tests were run to test for the significance of differences between the three producer types. The survey also included a specific space for producers to leave free comments on questions to provide a deeper understanding of their motives and expected reactions. The respondents provided 221 free comments.

3.3. Quantitative survey participants

The quantitative phase was conducted in October 2017. About 4,000 German wine producers were invited by email to participate in an online survey; 483 took part, representing all three major wine producer types found in the German wine industry (see Table 1).

Estate wineries grow grapes and self-market wine, mainly directly through cellar door or specialty wine retail.

Example label for nutritional values

Rheingau • 2016 Riesling	
Average nutritional values	per 100 ml
Caloric value (kJ/kcal)	317/ 76
Ethyl alcohol	10.0 g
Fat	< 0.1 g
hereof saturated fatty acids	0.0 g
Carbohydrates	1.0 g
hereof sugar	1.0 g
Protein	< 0.1 g
Salt	< 0.1 g
German quality wine Estate bottled A.P.Nr. 5512 22 14 Contains sulphites	
Winery of Geisenheim University GER – 65366 Geisenheim	
0.75 l	12.5 % vol

Example label for ingredient listings

Rheingau • 2016 Riesling	
Ingredients: White wine 99%, saccharose, concentrated grape must, carbon dioxide, ammonium sulphate, yeast mannoproteins, arabic gum, citric acid, l-tartaric acid, ascorbic acid, silver chloride, sulphur dioxide, metatartaric acid.	
German quality wine Estate bottled A.P.Nr. 5512 22 14 Contains sulphites	
Winery of Geisenheim University GER – 65366 Geisenheim	
0.75 l	12.5 % vol

Fig. 1. Example labels.

Table 1
Overview of survey participants.

Company type	Definition	Participants	Wine acreage represented	Coverage of total population
Estate wineries	Grow grapes and self-market wine	434	5,352 ha	18%
Cooperatives	Members grow grapes; wine is jointly produced in large facilities. Wine is marketed to a mix of sales channels, with some sold to bottling wineries	29	6,959 ha	25%
Bottling wineries	Buy grapes or bulk wine from wine growers (spot-market or long-term contract); bottle and market wine to food retailers	20	–	25% ^a
Total		483		

^a Based on expert estimation.

Cooperatives have members who grow grapes, while the cooperative then produces and markets the wine. Bottling wineries mainly buy grapes or bulk wine from wine growers on a spot-market or long-term contract basis, and then bottle and market the wine to food retailers.

The participants comprised 434 estate wineries, 29 cooperatives and 20 bottling wineries. The participating estate wineries covered 5,352 ha and represented 18% of the total vineyard area of estate wineries of about 30,000 ha. By size, the share of participating estate wineries closely reflected their market importance by volume. By number, small estate wineries below 5 ha in size, which have limited relevance for the wine market volume (Loose and Pabst, 2018), were underrepresented in the survey. Compared to the number in operation, estate wineries above 10 ha were overrepresented, but well represented when compared to their market relevance in terms of wine volume produced. Wine growing regions were represented according to their population share; only the Mosel, with its many very small producers, was underrepresented. The participating cooperatives represented 6,959 ha, 25% of the total of 28,205 ha cultivated by cooperative members in Germany. The participating bottling wineries had a total turnover of 357 million euros per year and represented about a quarter of German wine bottlers.

4. Results and discussion

4.1. Producer awareness of the legal discussion and prior experience from export markets

Producer awareness of the legal labelling discussion was high, with 73% of all producers having already heard about the deliberation regarding mandatory nutrition labelling for wine

(see Table 2). Bottlers and cooperatives as larger producers with dedicated management staff were significantly more aware than small-scale and fragmented estate wineries. While all cooperatives had heard of the legal discussion, only seven out of ten estate wineries had.

Only 10% of all surveyed wine producers had experience with the declaration of caloric values or other nutritional values from export markets. With a share of 24%, experience with the declaration of ingredient information from export markets was higher. However, the assumption is that this does not relate to the labelling of ingredients to consumers, but instead to conforming to legal requirements in export customs documents. Wine bottlers had more experience of the effect of nutritional and ingredient labelling from export markets, but this difference was only marginally significant.

4.2. Producers' perceptions about consumer interest in nutritional labelling

Producers generally assess consumers as having little interest in wine nutritional labelling. There is strong agreement between producers that a nutritional table would NOT be an important source of information for consumers (see Table 3). Several open comments emphasised that “*wine is not a normal food but [a] luxury food, where nutritional values are irrelevant for consumers*”. This agrees with findings from focus groups with above-average involved wine consumers (Pabst et al., 2019).

Producers disagree on whether caloric information will aid consumers in maintaining a healthy lifestyle. Cooperatives and estate wineries strongly disagree, whereas this disagreement is significantly less strong for bottling wineries, where half of participants hold a neutral or positive opinion regarding

Table 2
Producers' prior knowledge about the labelling discussion and prior experience (values in %).

	Bottling wineries	Cooperatives	Estate wineries	Total	Chi-square, p-value (df = 2)
Have already heard about the discussion of mandatory nutritional labelling for wine.	86	100	71	73	0.00
Experience with the disclosure of caloric values (kJ/kcal) or other nutritional values from exporting.	29	20	8	10	0.09
Experience with the disclosure of ingredient lists from exporting.	57	20	22	24	0.10

Table 3
Producers' perceptions of consumer interest and the effect of nutrition information on demand.

	Bottling wineries	Cooperatives	Estate wineries	F-statistic	p-value
Perceived consumer interest in calorific and nutritional values					
The calorific value (kcal) information on the wine label is an important decision aid for consumers in maintaining a healthy lifestyle.	−0.4 ^a	−0.8 ^b	−0.7 ^b	3.1	0.05
The nutritional table on the wine label would be an important source of information for consumers.	−0.7	−0.9	−0.8	1.3	0.28
Consumers have difficulties interpreting nutritional values on food and only get confused.	0.6	0.6	0.5	0.3	0.71
Consumers are already used to the nutrition table from other foods, and can therefore handle this information for wine.	−0.3	−0.5	−0.4	1.1	0.35
Expected effects on wine demand					
The declaration of calorific and nutritional values will have no effect on wine demand.	0.3	0.1	0.1	0.3	0.71

Note: Values are averages from the three-point Likert scale (agree, neither agree nor disagree, disagree). The average can take the maximum value of 1.0 (agreement of all respondents) and minimum of −1.0 (disagreement of all respondents).

Different superscripts indicate significantly different groups for Post-hoc Tukey-b test at $p < 0.05$.

whether it will help consumers. This difference could partially be rooted in the fact that different consumer segments are serviced by different producers. In consumer studies, for higher-involved wine consumers targeted by estates wineries and to some extent by cooperatives, caloric information was not found to be an important decision cue (Annunziata et al., 2016a; Grunert et al., 2018), and wine was clearly seen as a treat, vice or luxury item (Pabst et al., 2019). Bottling wineries largely service food retail, where caloric information might be somewhat more important to shoppers considering their daily diet. In open comments, several producers emphasised consumer interest in calories and sugar content, but strongly questioned the usefulness of stating fat, protein and salt values: “All values <0.1g in the example label are unnecessary. One can discuss stating sugar and calories.” Respondents were also able to differentiate between producer and consumer interests: “As a vintner I reject it, but as a consumer those values are absolutely useful and interesting – particularly sugar values.”

Producers agree to an extent that consumers have difficulties in interpreting nutritional values, similar to results from consumer studies (Annunziata et al., 2016a; Grunert et al.,

2018; Pabst et al., 2019), and to some extent do not believe that consumers are used to nutritional information from other food. There are differing views regarding whether the declaration of caloric and nutritional values will have an effect on wine demand. More believe that it will not have an effect (42%) than those who believe it will (29%). In focus groups, it was observed that consumers strongly overestimate the calories in a glass of wine, and that the nutritional labelling of calories will be unlikely to reduce, or could even increase, wine consumption (Annunziata et al., 2016a; Pabst et al., 2019). Overall, producers' views somewhat agree with findings for higher-involved wine consumers.

4.3. Ingredient labelling

Producers share a strong belief that consumers do not need an ingredient list for wine (Table 4). There is less agreement on whether consumers have the right to know about the ingredients in wine. Half of bottlers believe consumers have the right to know about ingredients, the majority of cooperatives do not while wine estates are largely neutral. Again, those differences might be caused by bottlers' close relationship

Table 4
Producers' perceptions of consumer interest and the effect of ingredient lists on demand.

	Bottling wineries	Cooperatives	Estate wineries	F-statistic	p-value
Perceived consumer interest in ingredient lists					
There is a need for consumers to receive an ingredient list for wine.	−0.8	−0.8	−0.6	1.2	0.30
Consumers have the right to know about ingredients in wine.	0.4 ^a	−0.2 ^b	0.1	3.8	0.02
The wine industry has nothing to hide, and should openly communicate all ingredients in order to be transparent and honest.	−0.2	−0.2	−0.1	0.4	0.69
Expected effects on wine demand					
Consumers are already familiar with ingredient labelling from other foods and, as with the labelling of sulphites, a list of ingredients for wine will have no effect on wine consumption.	−0.2	−0.3	−0.2	0.3	0.72
Consumers cannot correctly interpret the chemical names of ingredients on wine labels, and there will be much need for explanations.	0.8	0.9	0.8	0.4	0.69
Wine loses its image as a natural product and wine consumption will decline.	0.3	0.3	0.3	0.1	0.87

Note: Values are averages from the three-point Likert scale (agree, neither agree nor disagree, disagree). The average can take the maximum value of 1.0 (agreement of all respondents) and minimum of −1.0 (disagreement of all respondents).

Different superscripts indicate significantly different groups for Post-hoc Tukey-b test at $p < 0.05$.

with food retail and greater experience of export markets where ingredient labelling is required.

Producers' views on whether the wine industry has nothing to hide, and thus should communicate openly in order to be transparent and honest, are heterogeneous and cancel each other out. About half of producers are neutral and around a third do not agree. Here, there is a clear discrepancy between the views of producers and consumers. For wine-involved consumers it was found in focus group research that fairness and transparency are the main reasons why they request an ingredient list (Pabst et al., 2019).

When it comes to the expected effects of ingredient labelling on wine demand, there is strong and uniform agreement that consumers cannot correctly interpret the chemical names and ingredients, and that there will be a great need for explanations. In their open comments, producers stated that *"hardly any consumer has sufficient knowledge to correctly interpret this information. It will only cause confusion"*. This expectation is confirmed by findings from consumer studies, where consumers were confused and uncertain about the products in question (Cowburn and Stockley, 2005; Hieke and Taylor, 2012; Pabst et al., 2019). Many open comments relate to the difference between additives and the processing aids that are not present in the end product. Similarly, some producers find it very hard to explain to consumers that certain chemicals naturally present in wine (e.g. tartaric acid) have to be labelled when their concentration is increased by addition.

There is slight disagreement between producers regarding whether consumers are already familiar with ingredient labelling from other foods, and whether there will be no effect on wine consumption, as was the case when introducing the labelling of sulphites. As one open comment showed: *"This is very different for normal food because wine is a luxury or vice good."* Producers slightly agree that wine will lose its image as a natural product, and that wine consumption will decline, as was emphasised in the comments: *"Wine loses its myth the more the labelling of wine approaches that of the food industry."* Consumer studies confirm that consumers question the naturalness of wine when confronted with extensive ingredient lists (Grunert et al., 2018; Pabst et al., 2019). Nevertheless, consumer focus groups stated that they would not reduce their wine consumption (Pabst et al., 2019).

Several producers also fear that consumers will increasingly use labelling information when choosing wine, and decreasingly trust their own taste: *"Consumers will orientate by analytical values and not by their taste"*; *"As we can observe with the current trend [of] consumers choosing dry wine against their preference for off-dry ones, consumers choose the product they believe has a higher value – in this case it is the product with the shorter ingredient list."*

4.4. Effect of ingredient labelling on production processes, costs and competitive advantages

About half of producers expect the mandatory declaration of ingredients to lead to changes in oenological practices in the wine industry (Table 5). A significantly greater number of

large bottlers than cooperatives expect those changes. While almost half of producers agree that wine producers will try to avoid declarable substances in the future, there is less agreement that using fewer additives will be a positive distinguishing feature.

Questions related to oenological practices were commented on extensively. Many producers agree that *"the currently used additives are not used out of [a] joke and madness, but because they are necessary. Consumers do not tolerate wine with tartar crystals at the bottom or flavours of oxidation"*; *"... Not using those additives will deteriorate wine quality. Not everybody likes orange wine."* Most commenters concur that substituting existing additives is often impossible: *"Neither technical procedures (expensive) nor substituting additives will be able to replace proven and tested additives."* More than 50% of producers currently using the following additives stated that they would continue to do so, even if they had to label them as additives: acidification (tartaric acid, lactic acid, malic acid, ascorbic acid), prevention of oxidation (sulphites, carbon dioxide, aroma from wood chips), most additives to stabilise wine and those to increase alcohol content (sugar, grape concentrate). Producers expect the labelling of the ingredient "sugar" in particular to cause lasting damage to the demand for wine in Germany. The majority of producers stated that they would consider replacing or stopping using additives such as sorbic acid, lysozyme, dimethylcarbonate, casein and wheat protein: *"[The] declaration will induce bypassing, but substitutes are most times only additives of second or third best choice."*

When it comes to the effects of mandatory labelling on labelling processes, a majority of producers (57%) expect higher costs. Regarding the necessary introduction of back labels to display all mandatory information, there seems to be an equal split between the number of bottling wineries and wine estates already using a back label and those who do not. According to their statements, all cooperatives already seem to use back labels. Producers commented extensively on questions regarding labelling processes. One stream of comments related to the back labels already being full of information useless to consumers (e.g. legal terms). In the case of mandatory nutritional and ingredient labelling, useful information such as sensory descriptions or food pairings can no longer be displayed because of space limitations. In focus group interviews, both of these producer arguments were also supported by consumer assessments (Pabst et al., 2019). Other comments related to the need for larger back or side labels that are unsuitable from a design perspective: *"Possibly we have to replace bottles [with a] tetra pack; there is more room to display information."* Producers servicing retailers with a presence in various international markets (e.g. discount chains Lidl or Aldi) question how all of the information required can be displayed simultaneously in several languages. Providing separate labels for each market will increase costs and reduce retailer flexibility to sell stock in various markets.

Will any producer group benefit more from mandatory labels than others? Producers uniformly agree that any producer buying bulk wine will face the higher laboratory costs required

Table 5
Producers' perceptions on the expected effects on industry processes and competitive advantages.

	Bottling wineries	Cooperatives	Estate wineries	F-statistic	p-value
Expected effects on oenological practices					
The mandatory declaration of an ingredient list would lead to changes in oenological practices in the wine industry.	0.5 ^a	−0.1 ^b	0.4	4.0	0.02
Many wine producers would try to avoid declarable substances in the future.	0.4	0.1	0.4	1.3	0.26
Mandatory nutrition labelling offers the opportunity to use few additives as a positive distinguishing feature.	−0.1	−0.5	−0.2	1.5	0.22
Expected consequences for the labelling process					
Our company has to introduce a back label, as our wines are currently only marketed with a front label.	0.3 ^a	−1.0 ^b	0.0 ^a	10.7	0.00
Mandatory labelling is hardly a problem for us in terms of the labelling process.	−0.6	−0.4	−0.4	0.2	0.82
The changes in labelling would lead to higher costs.	0.5	0.1	0.4	1.3	0.27
Expected effects on competitive advantages					
Producers who market directly would have a competitive advantage, as they could explain the additional information to their customers in person.	−0.1	0.2	0.1	0.4	0.69
Small companies would have a competitive advantage, as it would be easier for them to work without additives.	−0.3	−0.4	−0.3	0.1	0.93
Large companies and wineries would have a competitive advantage, as investments in equipment that helps to avoid additives would more quickly amortise.	0.1	−0.4 ^b	0.3 ^a	7.4	0.00
Mandatory labelling of additives leads to high costs for companies buying bulk wine, as all purchased batches would have to be analysed by a laboratory.	1.0	0.7	0.6	2.3	0.11

Note: Values are averages from the three-point Likert scale (agree, neither agree nor disagree, disagree). The average can take the maximum value of 1.0 (agreement of all respondents) and minimum of −1.0 (disagreement of all respondents).

Different superscripts indicate significantly different groups for Post-hoc Tukey-b test at $p < 0.05$.

to analyse each batch for ingredients. This is mainly the case for larger bottlers or large estate wineries servicing food retail. There is less agreement regarding whether producers that sell directly to consumers will benefit because it is easier for them to explain new label information. While the direct contact can be a benefit to cellar door marketers, they also market to highly involved wine consumers who were shown to care most about ingredient information (Pabst et al., 2019). Accordingly, the advantages and disadvantages might cancel themselves out for these producers.

There is moderate and uniform disagreement that small producers can benefit because they work in a more traditional manner and can work without additives more easily. Opinions differ significantly regarding whether large producers will benefit because they can amortise investments in physical processing equipment more quickly, allowing them to avoid additives. Cooperatives largely disagree, but smaller wine estates agree that “the large others” have an advantage. Those large bottlers to whom the statement refers are rather neutral in their assessment.

When the degree of agreement with factors affecting wine producers is compared across different producer types, the following pattern appears: large bottlers are most strongly affected by increased laboratory costs, followed by similar effects from changes in oenological practices and higher costs for labelling processes. For wine estates, the rank order of affected areas is identical, although the degree of agreement, and hence the view of their severity, is less strong than for

bottlers. Cooperatives view higher laboratory costs as most important, but see themselves less affected by labelling costs and changes in oenological practices.

4.5. Producer support for nutritional and ingredient labelling

Finally, when producers were asked about their support for nutrition and ingredient labelling, their response was mainly strongly negative. Bottlers' rejection of indicating caloric values on the label was significantly lower than that of cooperatives and estates. Disagreement with labelling the big seven nutritional values (energy, fat, saturated fatty acids, carbohydrates, sugar, protein, salt) was stronger than that for calories alone. Producers were somewhat open to, but undecided about, using off-label solutions to provide detailed information in a database or similar. (Table 6)

5. Practical implications

Mandatory nutrition and ingredient labelling will affect all wine producers. Nevertheless, not every wine producer had heard about the topic prior to taking part in the survey. Larger producers are generally well informed and potentially better prepared to react to changes. Overall, few companies have prior experience of labelling nutritional values and ingredients from exporting their wines to countries where such labelling is already mandatory.

Table 6
Producers' support for ingredient and nutrition labelling for wine.

	Bottling wineries	Cooperatives	Estate wineries	F-statistic	p-value
Support for nutrition labelling					
I support the indication of the calorific value (energy content) on the wine label.	−0.3 ^a	−0.8 ^b	−0.8 ^b	8.8	0.00
I support the indication of the seven most important nutritional values (energy content, fat, saturated fatty acids, carbohydrates, sugar, protein, salt) on the wine label.	−1.0	−1.0	−0.9	1.1	0.33
Support for ingredient labelling					
I support the labelling of all ingredients in wine.	−0.9	−1.0	−0.8	1.6	0.21
I am in favour of labelling all ingredients in wine; however, the information should not be available to the consumer on the label, but instead in a database or similar.	0.3	−0.2	−0.1	1.5	0.22

Note: Values are averages from the three-point Likert scale (agree, neither agree nor disagree, disagree). The average can take the maximum value of 1.0 (agreement of all respondents) and minimum of −1.0 (disagreement of all respondents).

Different superscripts indicate significantly different groups for Post-hoc Tukey-b test at $p < 0.05$.

The extent to which mandatory nutrition and ingredient labelling will affect wine demand remains questionable. Depending on the research method utilised, there are mixed opinions regarding whether consumers will actually consume less wine due to the declaration of nutritional values. While the results gleaned from directly asking consumers suggest a reduction in wine demand (Himmelsbach et al., 2014), indirect research proposes that consumers do not care about the calories contained in a vice or luxury good such as wine (Pabst et al., 2019). The majority of producers share this view. Producers are well aware of the difficulties consumers face when interpreting nutrition and ingredient information (Cowburn and Stockley, 2005; Hieke and Taylor, 2012; Pabst et al., 2019) and consumers' perception of the risks associated with unfamiliar chemical terms (Yeung and Morris, 2001). Similarly, producers' concern that the natural image of wine might be at risk aligns with findings from a number of consumer studies (Grunert et al., 2018; Pabst et al., 2019). It is uncertain whether the feared decline in wine demand after the introduction of mandatory ingredient lists will only be a temporary effect or will have long-term consequences. Demand for wines that contain sulphites and are labelled as such suggests that consumers adapt to new-to-them food labelling (Costanigro et al., 2014).

Producers underestimate the interest in ingredient information of highly involved wine consumers that is based on fairness and transparency considerations. This consumer group is extremely relevant in terms of the volume and value of wine sold (Szolnoki and Hoffmann, 2014), and very vulnerable to the likely negative press reports. Therefore, the wine industry should adapt strategies to better inform consumers about realistic wine production methods to best use the time until labelling becomes mandatory. Young consumers are the main driver behind the demand for clean-labelled food (Asioli et al., 2017), but in most European traditional wine markets drink less wine than older age groups (Mueller et al., 2011). Consumer interest in wine ingredients will therefore increase when younger generations become more wine involved as they age. It is therefore time for the wine industry to clarify the realities of wine production.

Mandatory nutrition and ingredient labelling will greatly change production processes in the wine industry. Research results suggest that a considerable number of wine producers plan to change their oenological practices to avoid the use of declarable substances in wine production. This move away from chemical treatments to physical treatments is not based on cost considerations, but rather on the dropping of methods that require declarable substances. Some producers are seriously concerned that this will result in lower wine quality and higher production costs. However, the degree to which oenological practices are going to change and declarable substances are going to be avoided will strongly depend on the categorisation of substances into additives and processing aids. While the aim of mandatory nutrition and ingredient labelling for wine is to protect consumers' interests (European Commission, 2017), both lower wine quality and higher production costs could actually negatively affect consumers.

In terms of consequences for the bottling process, it is clear that some producers will have to introduce a back label to display the additional information required. Today, bottling wineries in particular, which mostly sell wine at entry-level prices in retail stores, often only use front labels in order to keep costs at a minimum. Nevertheless, all company types agree that the labelling process will become more problematic due to mandatory nutrition and ingredient labelling, and hence costs will rise.

Mandatory nutrition and ingredient labelling will likely result in competitive advantages for some wine producers. According to estate wineries, bigger producers are more likely to gain competitive advantages from being able to more quickly amortise investments in equipment that helps avoid the need for declarable substances. Although large bottlers do not agree with that opinion, there is an ongoing trend of higher capital investments in large wineries that allows them cost advantages (Sellers and Alampi-Sottini, 2016; Urso et al., 2018). However, it is also likely that small wineries will be able to access physical treatments in the future, even though the possible time lag could be a disadvantage. Service providers will emerge that offer the temporary use of highly advanced technical devices at

affordable rates to smaller wineries, as they already do now for bottling services. Technical progress will likely further reduce the costs of physical treatment devices for which there is currently only a limited demand. Most companies agree that smaller wine producers are unlikely to gain competitive advantages. They are not seen as being able to work with less or no additives, and nor are they perceived to benefit from their close relationship with end consumers because those are highly involved and demanding customers. Costs will certainly increase for companies that buy bulk wine due to the additional laboratory analysis that will be necessary to test every batch.

The study illustrates very clearly that producers do not support mandatory nutrition and ingredient labelling for wine. While some producers would support an off-labelling system for ingredients, it is unclear whether the EC would agree to such a system, which is not common for other food products. Despite producers' unwillingness to converge with general food labelling, a further extension of the exemption for the mandatory labelling of wine is unlikely to be justified by the EC due to consumer protection issues. It would therefore be helpful if wine producers were to start thinking about their potential courses of action.

6. Conclusion

It is likely that mandatory nutrition and ingredient labelling will soon be introduced to the wine industry. This study concludes that such labelling will have several far-reaching effects. From a production point of view, it is likely to have a significant effect on current standards. Higher production costs due to changes in oenological practices, more laboratory analyses and more demanding labelling processes could result in higher wine prices, and favours producers dealing with larger volumes that are able to spread costs. At the same time, there is a risk that wine quality might deteriorate due to changes in the oenological practices. Whether wine demand will be affected in the long term mainly depends on consumers' reaction to the nutrition and ingredient labelling. There is a risk of a short-term reduction in demand when wine loses its natural image due to ingredient labelling, potentially fuelled by negative media reports. The degree to which these negative effects will be realised will not only depend on legal decisions relating to the definition of processing aids versus additives, but also on producers' willingness and ability to adapt to these changes and act proactively.

7. Limitations and future research

Findings of this study are limited to German wine producers and are therefore not generalizable to other wine producing countries. Future research should focus on further countries and ideally employ cross-national producer samples to test the generalisability of the results. The effect of information campaigns and media reports on consumer reactions towards nutritional and ingredient labelling should be analysed in an experimental setting.

Declarations of interest

None.

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