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Drinking and protecting – A market approach to the preservation of cork oak landscapes

Michael Ahlheim* and Oliver Frör**

Abstract:

With the availability of new techniques to close wine bottles avoiding the risk of "corky" taste the tradition of closing wine bottles with cork stoppers is on the retreat. As a consequence the Mediterranean cork oak forests with their rich biodiversity are endangered since their cultivation is not profitable anymore. This paper explores the viability of a market approach to the preservation of these ecologically valuable landscapes. In an internet-based Contingent Valuation survey we assess wine consumers' willingness to pay a higher price for wine bottles closed with high-quality cork stoppers instead of buying wine with alternative stoppers in order to preserve the cork oak landscapes. We find that though many wine consumers have experience with tainted wine they are, nevertheless, willing to buy wine with (high-quality) cork stoppers at higher prices. Their average WTP is, however, not sufficient to cover the additional costs of these stoppers. Thus, we propose a financing mix of market returns and government subsidies for preserving the cork oaks. As a precondition for this market approach to be successful bottles with high-quality cork stoppers must be clearly identifiable in the shops, and consumers must be informed about the ecological consequences of supporting the cork production.

Keywords: Provision of Public Goods, Cost-benefit Analysis, Contingent Valuation, Cork Oak Landscapes

JEL-classification: D6, H4, Q27, Q51, Q57

1. Introduction

The traditional method of closing a wine bottle is to cork it up. This method which looks back on a tradition of many centuries has started to retreat a couple of years ago. Today, especially in the low price segment of the wine market, natural cork is more and more superseded by plastic or glass stoppers or by screw caps. These techniques have been

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improved over the past years so that the taste of the wine is not impaired as long as it is consumed within a reasonable period of time which is not long for low-price wines anyway.

While the traditionalists among wine connoisseurs are still disgusted with this development the new method of sealing wine bottles has become more and more accepted by the wide public. Wine producers welcomed this development because for them it means a reduction in costs and a possibility to keep prices low in a market which has become increasingly competitive during the last years. Ten thousands of litres of wine have to be taken back every year by wine traders and winegrowers because it is corked due to bad corks.

Cork producers, on the other hand, are not happy with this development. They suffer from reduced demand while wages are high so that they cannot lower their prices. As a consequence more and more cork producers in Southern France, Spain and Portugal drop out of the market and former cork oak plantations are abandoned by their owners. Vast areas of land are running wild or – even worse - are bought up by land developers who build holiday complexes in former cork oak forests. This change towards a much more intensive land use does not only destroy the former beauty of the landscape and its tranquil atmosphere but leads also to severe damages to the ecosystem and a distortion of the ecological balance in the respective regions. Most importantly, due to their exceptional fire resistance cork oak forests function as a barrier against desertification in Southwest Europe.

Like so often in an environmental context we have to deal with the problem of market failure here (cf. Bator 1958), i. e. the problem that markets fail to reward the total social benefits accruing from a certain commodity because they do not take into account the externalities it creates. In the context of cork the market price covers only the use value of cork in its function as a bottle top (or as insulation corkboard, cork parquet etc.) while the environmental values accruing from cork production, i. e. from the cork landscapes and their unique ecosystems, are ignored and not rewarded by markets. This leads to an undersupply of cork from a social point of view since the ecosystem services (ESS) provided by the cork landscapes are nearly as important as cork itself today and, differently from cork, there is no substitute for them.

The "classical" remedy for this kind of problem is to subsidize cork oak plantations in order to internalize the positive externalities created by cork oak cultivation. Such a subsidy would be in accordance with the recommendations of the OECD to recognize the multifunctionality of agriculture and to subsidize its non-market production which is not rewarded by private markets (cf. OECD 2001 and 2003 or Ahlheim and Frör 2003). The downside of such a solution would be that the market incomes of the once independent cork growers would be substituted more and more by government money (in this case EU government money), so that they would be increasingly dependent on government. The market-driven incentives to produce high quality cork as a free entrepreneur would be crowded out by the desire to lie back and enjoy a fixed income from government as a landscape gardener. This would mean another increase of the government sector within the economy which is, in general, not desirable. Especially in the agricultural sector the influence of national governments as well as of the EU administration is far too dominant already today.

A more market-oriented approach to the preservation of cork oak woodlands in the Mediterranean would be to increase the attractiveness of cork in private markets in order to raise the demand for natural cork. Necessary conditions for the success of such a policy

would be to improve the quality of cork, especially of cork stoppers, on the one hand and to increase consumers' awareness of the ecological externalities created by cork oak landscapes on the other. With high-quality cork stoppers the risk that the wine has a mouldy taste is nearly as low as with plastic or glass stoppers or with screwtops. But high quality natural cork stoppers cost around 1 Euro per cork while plastic stoppers are available for an average price of about 35 ct. (cf. Steiner 2009, p. 11). The resulting price difference between wine bottles with different kinds of stoppers needs to be explained to consumers: they should be aware of the fact that by buying a bottle of wine with a natural cork stopper they pay not only for the famous "plop" when the bottle is uncorked but also for the preservation of the cork oak landscapes in the Mediterranean with their unique ecosystems. This market solution to the cork oak preservation problem can be successful only if consumers are willing to pay higher prices for wine bottles with high-quality natural cork stoppers than for wine bottles with alternative stoppers in order to save the cork oak landscapes.

In our study we want to test if there is a possibility to realize such a market solution to the cork oak problem. Therefore, we assessed wine drinkers' willingness to pay a higher price for wine closed with natural cork stoppers than for wine with alternative stoppers in order to preserve the cork oak landscapes in the Mediterranean. As an assessment technique we used the Contingent Valuation Method (CVM) which is still one of the most popular techniques for the appraisal of environmental values. In an internet-based CVM survey we assessed German wine drinkers' awareness of the ecological consequences of a receding use of natural cork stoppers and tried to find out their attitudes towards different kinds of stoppers as well as their willingness to pay to save the cork oak forests.

The paper is organized as follows: in the next section we have a closer look at the market for wine bottle stoppers and at the ecological problems resulting from a reduced demand for natural cork stoppers. In section 3 we explain our survey and in section 4 we present our results. Section 5 offers some concluding remarks.

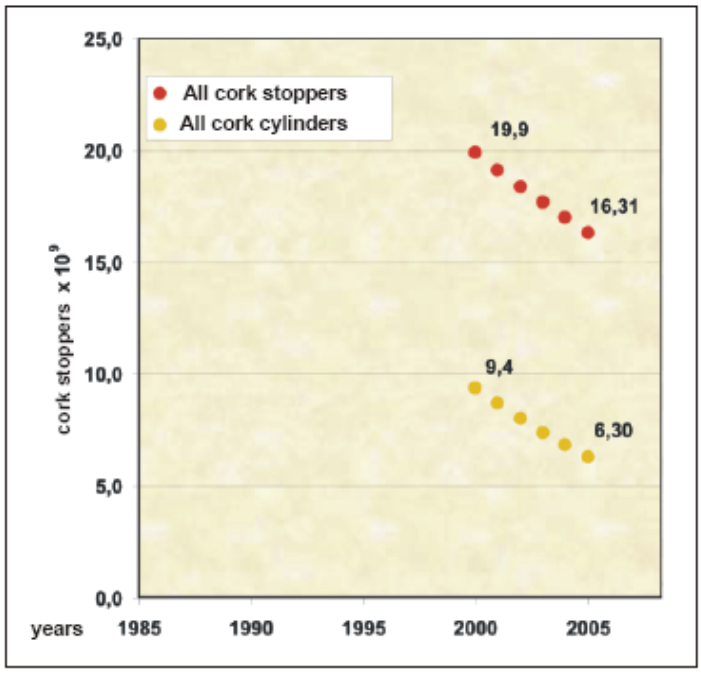
2. Natural cork – economic and ecological importance

Natural cork has many different uses in modern economies: it is used for the production of insulation materials, decorative cork boards, cork parquets, gaskets etc., but most important is the production of cork stoppers for wine bottles. About 13 billion cork stoppers are produced worldwide every year accounting for about 70% of the total value of the cork market (Natural Cork Quality Council 1999). The main part of the world production of cork comes from the Mediterranean where Portugal alone provides 50% of the world cork harvest. Other important cork growing countries are Spain, Italy, Morocco, Algeria, Tunisia and France. The European cork industry produces 340,000 tons of cork a year, with a value of 1.5 billion Euros and provides jobs for 30,000 people (WWF 2006).

During the past years the world market for cork stoppers has slumped dramatically (cf. fig. 1). Between 2000 and 2005 the worldwide sales of cork stoppers have dropped by more than 18% (WWF 2006, p. 19). The main reasons for this development are the relatively high risk that wine which is corked up with a natural cork stopper shows a tainted taste after the bottle is opened and the fact that the quality of alternative wine stoppers has improved over the past years. Traders say that around 10% of all wine bottles sold are returned because the

wine has a cork taint. This means, of course, a considerable loss to traders which makes them look for alternatives. Such alternatives are e. g. plastic or glass stoppers or aluminium screwtops. The originally poor quality of these stoppers could be improved over the past ten years and their prices are much lower than the price of high quality cork stoppers so that the latter have increasingly been superseded even as stoppers for high-quality wine.

The mouldy or "corky" taste of wine from bottles closed with natural cork stoppers is mainly due to a contamination of the wine with trichloranisole (TCA). Typically the cork stoppers are blamed for this contamination (Fischer and Fischer 1997, Juanola et al. 2004). Experiments showed that also wines which did not contain any TCA and which were not corked up with natural cork stoppers were sometimes rejected by consumers for having a "corky" taste. Potential causes for a musty taste of wine which have nothing to do with cork or TCA are e. g. oxidation of the wine, storage conditions, bottling conditions, and, of course, human subjectivity. Nevertheless, TCA is the single most prevalent wine defect associated with natural cork. The formation of TCA can have various causes - most commonly fungal metabolisms of chlorophenols. Therefore, TCA is a good indicator of most sensory defects in cork and, thereby, for the main causes of rejections of wine by consumers (Sefton and Simpson 2005). As a consequence, most efforts of the wine industry to reduce the number of consumer complaints aim at a reduction of TCA in wine. Since natural cork is blamed for bringing TCA into the wine many wine growers and traders started to use alternative closures for their wine bottles like plastic or glass stoppers or using aluminium screw tops.



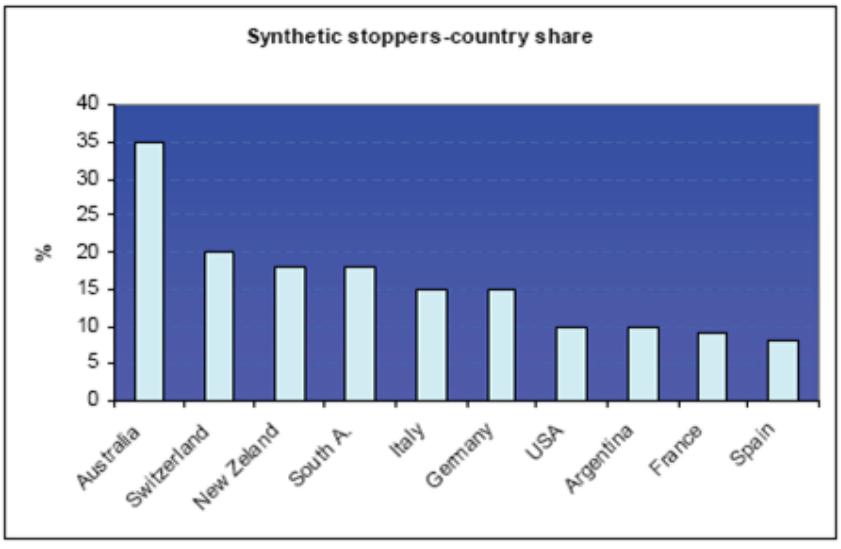
Source: ICMC, 2005

- Figure 1: Development of the worldwide cork stopper market -

In the beginning the acceptance of these alternatives among "true" wine drinkers was rather low because among them the idea prevailed that a high-quality wine bottle should be closed

with a natural cork stopper and that the typical "plop" is an indispensible part of the ceremony of opening a decent bottle (Murray and Lockshin 1997). The quality of alternative stoppers was also rather unreliable in the initial phase of their introduction. The wine often showed a musty taste because of oxidation or because it was infiltrated with components from the materials of the bottle closure. Since these initial defects have been eliminated to a large extent by now alternative wine stoppers have become more and more popular also among wine drinkers with a refined taste. This development has been, of course, promoted by the wine growers and traders because of the considerable economic losses they had to suffer due to returned wine bottles. In the EU alone these losses add up to approximately 500 million Euros, worldwide an amount of 2.5 billion Euros is estimated (cf. Steiner 2009, p. 11).

There has been extensive research on the origins of the mouldy taste caused by natural cork stoppers and on technical possibilities to prevent it. Nevertheless, no clear-cut answer to this question has been found until today. The cork taint may be due to a contamination of the cork with bacteria, fungi etc. during the storage phase or later during the processing phase (Hill et al. 1995). Sometimes even if no TCA could be detected at the cork at the moment when a bottle was closed the tainted taste developed later inside the closed bottle. So, the origins of the corky taste are still mysterious today. Nevertheless, better and more sterile procedures of storing, transporting and processing cork have been developed so that the risk of spoiling the taste of the wine by using cork stoppers can be reduced dramatically. Unfortunately, these treatments increase the cost of high-quality cork stoppers dramatically as compared to the traditional treatment still applied to low-cost cork stoppers where cork often is stored in the open air after harvesting and transported in open lorries where hygienic standards are rather low. Further, wine stoppers made of granulated and agglomerated cork are, of course, cheaper than high quality stoppers punched out in one piece from sufficiently thick cork panels. Obviously, these agglomerated low-cost cork stoppers are much more likely to cause cork taint than one-piece cork stoppers, which adds to the bad reputation of cork, since most people cannot judge the difference between different cork qualities.



Source: ICMC, 2005

- Figure 2: Country shares of alternative stoppers -

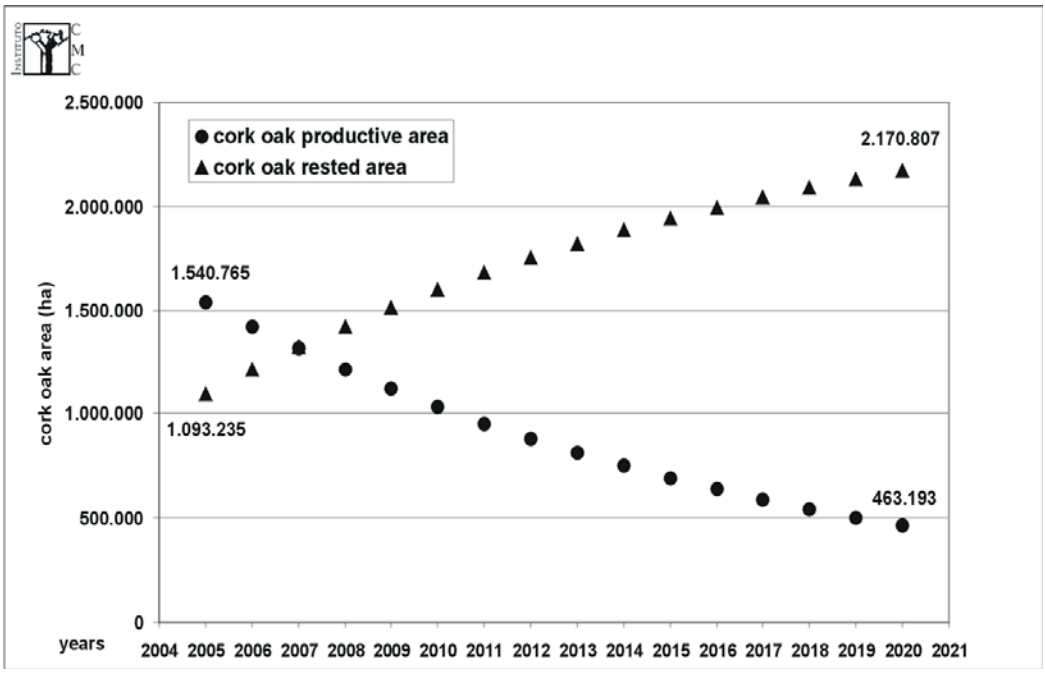
Summing up, low-cost cork stoppers are available at approximately the same price as alternative wine closures like plastic stoppers or screw tops but they bear a considerable risk of tainting the taste of the wine. Cork taint means financial losses to wine traders and wine growers due to returned bottles and the ensuing damage to their image. It means also an annoyance to consumers because it is a nuisance to return bottles with tainted wine and often it is not even possible or extremely costly, if the wine comes from far away. This risk is not completely eliminated but drastically reduced when alternative closures are used. Therefore, wine producers and traders have made great efforts over the past years to promote the acceptance of alternative wine closures. If high-quality natural cork stoppers are used the risk of cork-tainted wine is also dramatically reduced as compared to low cost cork stoppers, but the price of around one Euro is nearly three times the price of alternative closures on average. Since 75% of all wine bottles worldwide are sold at a price not higher than 3 Euros (cf. Steiner 2009, p. 11) it is clear that a price of approximately 1 Euro for a high quality cork stopper does not fit into this picture. This explains the increasing success of alternative wine bottle closures all over the world (cf. fig. 2).

An important consequence of the reduced use of natural cork stoppers is that in cork producing countries like Portugal, Spain, Italy, Morocco, Algeria, Tunisia and France the cultivation of cork oak forests has become less and less attractive from an economic point of view over the past years (Campos and Caparrós 2006). This development leads to a dramatic reduction of the area covered with traditional cork oak forests in the Mediterranean, as is shown in fig. 3. Former cork oak forests were abandoned and are now exposed to forest fires, cork oak diseases or changing landuses like grazing meadows, or they are cut down to make room for the development of recreation facilities with hotels, swimming pools etc. The changing use of the former cork oak landscapes leads to the destruction of the ecosystems which have been native to these regions for many centuries (Caparrós et al. 2010). Valuable ecosystem services are lost for future generations. This has consequences for the microclimate in these regions as well as for the vegetation and the animal life there (cf. Castro and Freitas 2009). The treetops of cork oaks create a microclimate that is less extreme in winter and summer and allows a longer growing season for the herbaceous vegetation (Quilchano et al. 2008). Cork oak trees also reduce wind speed, and hence its drying effects through evaporation and transpiration. This means a reduced risk of desertification of the respective areas. Since cork oak trees intercept on average around a quarter of total precipitation, they decrease the amount of water runoff, thus preventing soil erosion (Mateos and Schnabel 1998). Soil erosion is also reduced by the fact that cork oaks have a high water retention capacity, due to their porosity, and organic content (cf. Joffre and Rambal 1988). The trees supply large amounts of material which rots as humus into the upper soil and are able to bring a large amount of nutrients from the lower to the upper soil levels, which are otherwise inaccessible to herbaceous vegetation.[1] When cork is harvested the trees are only barked and not cut down, their bark recovers soon until it can be harvested again, so cork is a truly sustainable product, renewable and also biodegradable.

Cork oak forests make a decisive contribution to the preservation of the biological diversity in the respective regions (cf. Huntsinger and Bartolome 1992). In cork oak landscapes, plant diversity can reach a level of 135 species per square metre, while animal diversity is also high. Cork oak landscapes are also important for a large number of migratory and wintering birds from Northern Europe. They contain a rich diversity of fauna, including endemic

[1] For more details see e. g. WWF (2006).

spiders, geckos, vipers, wild cats like the Iberian Lynx, boars, birds like the Imperial Eagle, the Black Vulture or the Black-shouldered Kite (for more details see WWF 2006, p. 5).



- Figure 3: Prognosticated landuse change in cork oak landscapes (WWF 2006) -

All these different species are endangered if cork oak forests are abandoned or cleared to make room for new forms of landuse. As explained above subsidizing the cultivation of cork oak landscapes with government or EU money would be one possibility to save these unique ecosystems. Another and more market-oriented strategy would be to increase the awareness of consumers regarding the ecological benefits accruing from cork oak landscapes to make them understand that with a bottle of wine with a natural cork stopper they do not only buy the use value of this stopper but also the nonuse value of preserving an endangered ecosystem. This should motivate them to pay the higher price of high-quality cork stoppers instead of going for the cheaper, but unsustainable solutions. High quality cork stoppers bear a low risk of tainting the wine and are, therefore, a feasible alternative to plastic stoppers or screw tops but they are considerably more expensive. Only if consumers have a sufficiently high willingness to pay for the preservation of cork oak landscapes and for the ESS they produce such a market-oriented preservation strategy can be successful. In an online CVM survey we tried to assess German wine consumers' WTP for the preservation of the cork oak landscapes. This survey will be presented in the following section.

3. The Survey

The assessment method

For our purpose here, i. e. the assessment of wine consumers' WTP for the preservation of cork oak landscapes, the Contingent Valuation Method seemed to be the most appropriate assessment technique. The CVM is a stated-preference method that aims at the appraisal of the social value generated by an environmental project like the preservation of the cork oak landscapes in the Mediterranean (Bateman and Turner 1993). This social value is measured in terms of the sum of the individual WTPs of all people potentially affected by this project. For a CVM survey typically a random sample of the respective households is drawn. Then the average WTP of this sample is assessed in a series of personal interviews (face-to-face, mail, by telephone or online). The average WTP of the sample is then multiplied by the total number of all households affected by the public good in order to calculate its social value. The basic idea of CVM interviews is to create hypothetical or "contingent" markets for the public good in question (e. g. the ESS accruing from cork oak landscapes) and to assess respondents' WTP for that good.[2]

Strategic considerations

In this study here we wanted to assess the average WTP of German wine consumers for the preservation of the cork oak landscapes in the Mediterranean. We wanted to find out if the average WTP for this environmental good would be sufficient to cover the price difference between non-cork closures of wine bottles on the one hand and high-quality cork stoppers (which are equally "safe" with respect to TCA and the resulting cork taint of the wine) on the other. If wine consumers' WTP for the preservation of the cork oak forests is sufficient to cover this price difference, a possible strategy for their preservation could be to mark all wine bottles which have a natural cork stopper noticeably and to explain to consumers (e. g. on the label and also in the course of suitable marketing campaigns) the environmental importance of buying wine corked up with natural cork stoppers. Today consumers typically cannot tell if the wine they buy is corked up with plastic or glass stoppers, with cheap cork stoppers made of granulated cork or with high-quality one-piece cork stoppers. Therefore, they cannot reasonably make the kind of closure of the bottle a criterion for their choice. Only screw caps can clearly be identified by consumers before the bottle is bought and opened.

In order to make an environmentally motivated markup on the price of alternative stoppers plausible and acceptable to consumers it would be necessary to (i) explain to them the environmental importance of natural cork stoppers and (ii) to mark wine bottles with natural cork stoppers clearly so that the kind of closure of a wine bottle becomes an independent item of wine marketing. This could lead to a kind of "fair trade" marketing campaign with respect to the preservation of cork oaks.

The survey structure

In 2009 we carried out an online CVM survey using the software "Enterprise Feedback Suite 6.0" from Globalpark©. For the sampling we cooperated with "Greenfield online Ciao

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[2] For a comprehensive presentation of the state of the art of CVM see e. g. Carson and Hanemann (2005).

Surveys". This cooperation had the advantage that we had access to the online community entertained by Greenfield online© and that we were able to design the sample of our survey according to the typical characteristics of our target group. We made sure that approximately half of our respondents were male and female, respectively. We also fixed quotas for different age groups as shown in table 1. The quotas were determined so as to replicate the age structure of the German population. Under-age consumers were, of course, excluded from our sample. Due to the fact that people aged 65 and older generally use the internet much less than younger people, their share in the online sample needed to be reduced. Altogether 5.019 e-mails were sent out yielding a total of 548 completed questionnaires. This corresponds to a response rate of 11%, which is typical for such a survey.

Age group	**% in the sample**
18 to 29 years	20.2
30 to 39 years	20.0
40 to 49 years	22.7
50 to 59 years	17.9
60 to 64 years	8.3
65 years and older	10.9

- Table 1: Age quotas fixed for the sample -

The general structure of our questionnaire deviated from the traditional structure of a typical CVM questionnaire in that we asked questions regarding the age, sex and educational background of respondents already in the beginning, immediately after the introductory text where we explained the overall problem motivating our survey. The main reason why we started with these questions was that it allowed us to screen out already in the beginning respondents who were e. g. under-age or belonged to a group whose quota had already been exhausted. After these socio-demographic questions we followed the traditional structure of CVM interviews. Our main focus in the next couple of questions was on the informational and experiential background of respondents with respect to wine and wine stoppers as well as respondents' personal attitudes towards these issues. We wanted to know how much wine (if at all) was consumed per month in their respective households, what kinds of wine they prefer and how much money they spend on average on a bottle of wine for different purposes. Then we wanted to find out about their experience with and awareness of the problem of various kinds of bottle closures and if according to their experience the different closures had an influence on the taste of the wine. Further we wanted to find out about respondents' attitudes towards different kinds of closures (e. g. "Do you think that expensive wines should be closed with a natural cork?" etc.) and their opinions regarding the respective advantages and disadvantages of these closures in order to detect potential prejudices which are typical in this context.

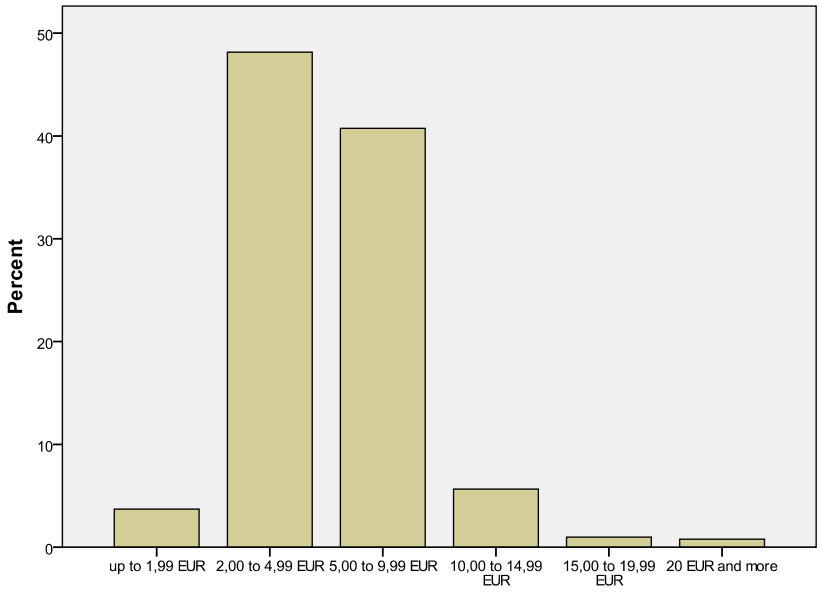
After that we presented a short text describing the ecological implications of a reduced demand for natural cork stoppers (project scenario). In this text we explained that the reduced demand for cork wine stoppers makes the cultivation of cork oak forests less

profitable so that many of these forests, which typically are privately owned, are abandoned by their owners and fall victim to forest fires, tree diseases and general degradation. We described the ecosystem services accruing from cork oak forests and showed pictures of the plants and animals which are endangered by the extinction of oak forest landscapes. Then we explained that 70% of the overall cork production is used for wine stoppers, so that the best way of preserving the cork oak landscapes would be to buy wine with natural cork stoppers, even if it is more expensive than wine with alternative closures. Then we asked respondents how high a markup per bottle of wine they would be willing to pay in order to prevent a further retreat of cork oak landscapes in the Mediterranean. For this elicitation question we used the payment card format (Cameron and Huppert 1989, Haab and McConnell 2002). We asked respondents to mark on the payment card the interval containing the maximum amount of money they would be willing to pay for a reliable high-quality cork stopper in excess of the price of an alternative bottle closure, in order to contribute to the preservation of cork oak landscapes. After some additional questions checking the understanding of the environmental scenario, we asked respondents if they preferred to donate a certain lump-sum amount of money for the preservation of the cork oaks instead of paying a markup on the wine prices and, if yes, how much money they would be willing to contribute. With this question we wanted to find out if there were any resentments against our payment vehicle (environmental markup on wine prices) which might bias our results. The questionnaire concluded with questions regarding a possible membership in an environmental organization and the amount of the household's net monthly income. In the next section we discus the result obtained from this survey.

4. Results

Since we had the possibility to fix quotas for different socio-demographic groups we could make sure that nearly one half of our respondents were male and female, respectively, and that the age structure of our sample corresponded to that of the overall adult population over 18 (except those 65 years and older). Nearly 95% of our respondents were wine drinkers, but most of them are rather moderate drinkers: in over 50% of the interviewed households no more than three bottles of wine are consumed per month, more than 90% do not drink more than ten bottles on average.

It showed that over 50% of our respondents spend up to 5 Euros per bottle for a bottle of everyday wine and up to 10 Euros for a "wine for special occasions" (cf. figures 4 and 5). Over 85% of respondents had experience with alternative wine stoppers, most of them with plastic stoppers as well as glass stoppers and screw tops. This shows that our respondents were sufficiently "competent" with respect to our topic. Nearly 70% of them had already experience with tainted wine but, nevertheless, nearly 90% of those respondents stated that also after this experience they do not pay attention to the kind of closure when buying a bottle of wine, which seems to be rather surprising at first sight. At the same time 56% of all respondents state that for them the kind of closure is important for the choice of wine. Over 40% of respondents even state that they would never give a bottle of wine with a screw top as a present, or open such a bottle when they have guests, while 54% of respondents hold that from a certain price on a wine bottle should have a cork stopper and nearly 60% are convinced that "a cork stopper is a signal for a good wine".



- Figure 4: Price paid for regular wine -

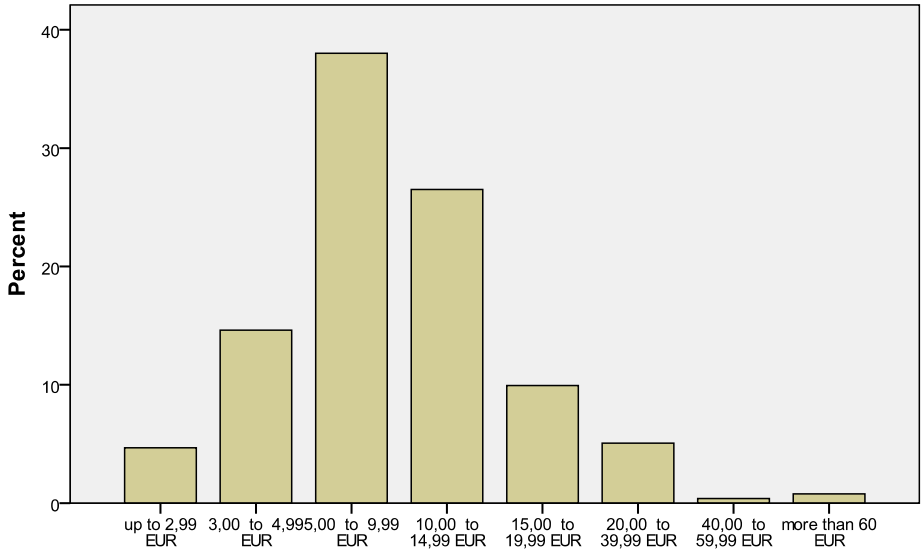
The importance consumers attach to the type of closure of a wine bottle becomes also apparent from the following correlations: our data showed that the more money a consumer spends on wine (everyday wine as well as wine for special occasions) …

- … the more important is the kind of bottle closure for him,
- … the less he would be willing to give a wine with a screw cap as a present or open such a bottle in front of his guests,
- … the more he is convinced that the kind of closure influences the taste of the wine,
- … the more he is convinced that from a certain price level on a wine bottle should be closed with a natural cork stopper.

It is interesting to note that obviously a considerable part of wine consumers think that the closure of a wine bottle is important while even those who had already experienced tainted wine did not take into account the type of closure when buying wine again after that unpleasant experience. A plausible explanation for this seeming contradiction could be that in fact it would be impossible to make the kind of closure a decision criterion for the choice of a wine in the store or in the supermarket. While screw caps can be identified rather easily it is in most cases impossible to tell what type and quality of stopper was used to close a bottle since the stopper is typically hidden under a foil or wrap. It could be a one-piece high-quality cork stopper bearing a very low risk of TCA contamination, but it could also be a multi-piece cork stopper (manufactured with two or more pieces of cork glued together) or a cheap agglomerated cork stopper made of granulated cork, both bearing a much higher risk of causing a musty taste of the wine than the one-piece stopper. Alternatively, the bottle could also be closed with a plastic stopper designed to look like a natural cork stopper and also offering the typical "plop" when the bottle is opened. It seems to be rather plausible that the

type of stopper cannot be a selection criterion for the purchase of a bottle of wine if it cannot be identified clearly by consumers.

An important lesson to be learned from these findings is that if we want to increase the demand for natural cork with the argument that this would help to preserve the cork oak forests we should make sure that consumers can identify in the shop the product they want to buy for the "good cause". Therefore, bottles closed with natural cork should be marked clearly, and also the quality of cork (which is a good indicator of the risk of buying tainted wine) should be obvious from the wine label.



- Figure 5: Price paid for wine for special events -

Another lesson to be learned from our survey follows from the fact that nearly 60% of our respondents stated that until the day when they read our questionnaire they had never heard of the ecological importance of cork oak forests and of the relationship between the demand for natural cork stoppers on the one hand and the preservation of endangered ecosystems in the Mediterranean on the other. Only 15% of the respondents had ever visited a cork oak landscape personally. The fact that most German wine consumers are not informed about the ecological consequences of their choice of a wine bottle shows that a comprehensive information campaign is necessary to close this gap in people's ecological knowledge. Without such an information campaign a market-oriented solution to the cork oak problem does not seem feasible.

An important precondition for a market-oriented approach to save the cork oak forests is, of course, that wine consumers care for the preservation of these landscapes. Otherwise they will not be willing to pay for it at all. Our data show that after they have been informed on that matter people have even a rather detailed and differentiated interest in the preservation of the ecosystems related to cork oak landscapes. It turned out that 76% of respondents find the protection of rare plant species in the cork oak landscapes especially important, while

55% care especially for the preservation of the Iberian lynx, 59% want to preserve the unique landscape beauty, and even 48% of respondents find the protection of the black vulture important. These data show clearly that the cork oak problem matters to wine consumers. Therefore, it seems rather promising to address this specific group in order to make them contribute to the preservation of cork oak landscapes.

Payment card amount / interval	**% of responses**
0 EUR	18.1
0.01 – 0.04 EUR	6.0
0.05 – 0.09 EUR	10.5
0.10 – 0.19 EUR	20.4
0.20 – 0.49 EUR	21.6
0.50 – 0.99 EUR	12.2
1.00 – 1.49 EUR	7.0
1.50 – 3.00 EUR	2.1
more than 3.00 EUR	2.1

- Table 2: Willingness to pay for the preservation of cork oak landscapes -

This impression is confirmed by the answers to our elicitation question. The results are presented in table 2. They show that wine consumers are indeed willing to contribute to the preservation of cork oak landscapes by paying a higher price for wine with a cork stopper. The data show that the average markup on the regular wine price respondents would be willing to pay for the preservation of the cork oak landscapes is 39 Euro cent per bottle, while the 95% confidence interval covers a range from 30 to 48 cent per bottle. This shows that a considerable part of the average price difference between the prices of high-quality cork stoppers and alternative closures (around 60 cent) can be covered by the voluntary contributions of wine consumers. Of course, this is only a first impression, since further and more comprehensive WTP surveys are necessary before one can draw reliable conclusions from these results. Nevertheless, if these results were confirmed by future studies this would indicate that a mix between public and private financing of a program for the preservation of the cork oak landscapes in the Mediterranean is feasible and promising.

The determinants of wine consumers' WTP for the preservation of the cork oak forests presented in table 3 give important hints with respect to the most promising target groups which should be addressed in an information campaign to improve people's knowledge on the ecological implications of a further degradation of cork oak landscapes. It can be seen from table 3 that age is significantly negatively related to stated WTP while household size is positively related to WTP. In Germany household size is positively related to the number of children (and not grandparents or other adults living in the household). Taking together these correlations implies that especially young families should be addressed by such an information campaign since after having been informed on the ecological background of cork oak forests in our questionnaire they stated a higher WTP than other households. Members of environmental organizations also stated a higher WTP than others which makes them

candidates for our target group. The fact that people who spend more money on everyday wine as well as on wine for special events state also a higher WTP than others shows that especially consumers who have a high WTP for wine, i. e. who appreciate good quality wine, are also willing to contribute to the protection of cork oak landscapes. Therefore, an information campaign addressing especially the market segment of high-quality wine consumers will be promising. This impression is supported by the result that these consumers believe that alternative stoppers have an influence on the taste of the wine. This implies that they have a double motivation to spend more money on high-quality cork stoppers since they will benefit from the use value of cork stoppers as well as from their nonuse values.

Variable	**Coefficient**	**Significance (p-value)**
BID[3]	-19.12***	0.0000
Age	-174.61***	0.0003
Education	-56.83	0.1195
Household size	96.45***	0.0303
Price of regular wine	217.54**	0.0408
Price of special wine	112.69*	0.0837
Wines with alternative stoppers have a different taste (Yes = 1, No = 0)	332.53**	0.0143
Importance of stopper for purchase decision	223.14**	0.0172
Affiliation with an environmental organization	269.94**	0.0408
CONSTANT	1.53***	0.0004
Log-Likelihood	-1018.905	-
χ^2-statistics	2038 (df = 10)	0.0000

***, **, * mean statistical significance at 1 %, 5 % and 10 %, respectively

- Table 3: Determinants of WTP for the preservation of cork oak landscapes -

[3] In the WTP regression model the significantly negative influence of the BID variable on WTP is a technical necessity and indicates that the proportion of respondents willing to pay a certain amount decreases with the proposed amount.

Further, it is plausible that WTP for high quality cork stoppers increases with the importance consumers attribute to the type of stopper when purchasing wine. Those consumers are aware of the relationship between the type of stopper and tainted taste of the wine so that their WTP to avoid such an unpleasant experience is high. Finally, respondents who are in some way affiliated with an environmental organization prove to have a higher WTP for a preservation of the ecosystem services of cork oak forests in the Mediterranean.

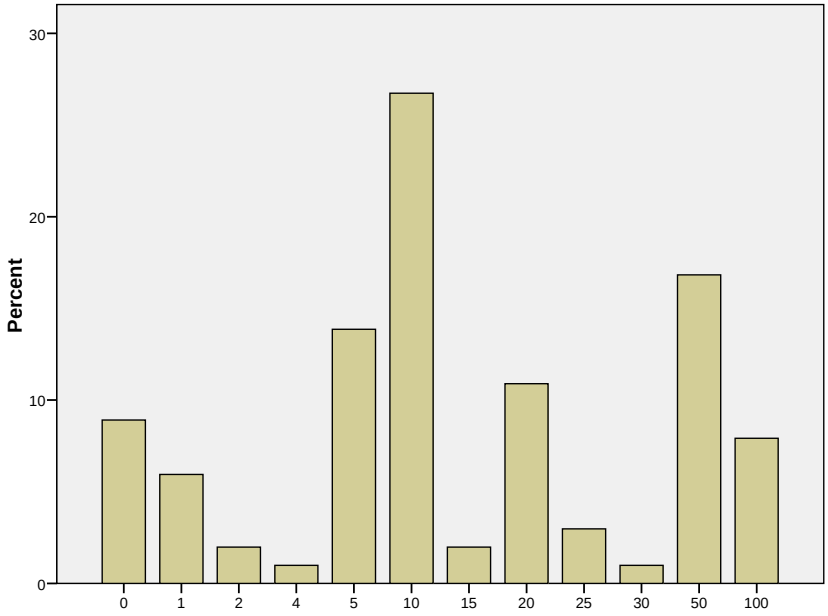


Figure 6: Donation amount (one-time payment in EUR)

Finally it should be mentioned that 20% of all respondents stated that they would prefer to make a lump-sum donation for the preservation of the cork oak forests instead of paying a higher price for their wine. The distribution of stated donations are shown in fig. 6, the average donation is estimated to be 23.36 EUR. This shows that in addition to the marketing campaign for natural cork stoppers a simple collection of donations among wine drinkers in the wine stores could be considered. The downside of such an instrument is the high transaction cost they cause. The collection of the money e. g. in a collection box in the shops is easily done, but then the money has to be administered, brought to a bank, suitable recipients have to be found etc. Therefore, this solution seems to be only viable if administration costs can be kept low e. g. by sending the money immediately to a cork oak-related foundation or NGO.

5. Concluding remarks

In this paper we discuss a market-oriented approach to the preservation of the endangered cork oak landscapes in the Mediterranean. We suggest to complement government subsidies for the protection of these landscapes by a policy leading to an increase in the demand for natural cork stoppers for wine bottles, since stoppers are the most important

product made from natural cork. An increase in the demand for cork makes the cultivation of cork oak forests more profitable and keeps the owners from abandoning their forests. Such a policy would serve to save the sensitive ecosystems of the cork oak landscapes from extinction.

In a CVM survey we assessed wine consumers' willingness to pay a higher price for high-quality cork stoppers (which bear a very low risk of tainting the taste of the wine) instead of buying wine with alternative stoppers in order to save the cork oaks. We find that the respondents of our survey show a considerable average WTP which would be sufficient to cover more than half the price difference between high-quality natural cork stoppers and alternative wine stoppers. Therefore, a mixed financing system where only a part of the costs to preserve the wine oak landscapes in the Mediterranean would have to come from government money while the main part could be earned in the private cork stopper market seems to be feasible. Such a market solution would also be attractive from a political point of view since the owners of cork oak forests could stay independent entrepreneurs.

Our study showed that a precondition of such a policy is that wine bottles closed with high-quality natural cork stoppers must be clearly identifiable from their label so that the type of bottle closure can become an independent purchase criterion for wine consumers. Further, since our study showed that most consumers do not know about the ecological importance of cork oak landscapes and their relation to the demand of wine bottle stoppers an information campaign highlighting these backgrounds is absolutely indispensible. Since we found that people who pay more money for wine than others are also willing to contribute more to the preservation of the cork oak landscapes it makes sense to try some kind of "image transfer" from high-quality wine to high-quality cork stoppers and from there to "high-quality eco-systems" in cork oak landscapes. Our study showed that already today many consumers see a close relationship between high-quality wine and cork stoppers and that exactly those people care for environmental protection. This makes our suggestion appear rather promising.

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