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Did the French nuclear tests under the Mururoa atoll affect the export of French wine to Denmark?

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Abstract

In the spring of 1995 the French military announced a series of nuclear tests to take place later that year. The main test site was the 30-km-long Mururoa atoll 1,200 km away from Tahiti. Despite worldwide protests and opposition from nearly 63% of the French population a nuclear test series of six bombs was carried out from September 1995 to January 1996. In some countries, e.g. Denmark, the public reaction to the test series was quite strong and during the nuclear testing period in the South Pacific many consumers substituted goods from other countries, especially wine, for French goods.

The purpose of this paper is to analyse the demand for French wine in Denmark with focus on the question of whether the nuclear tests had any effects on the Danish import of French wine. The effects, if any, may be temporary, i.e. a 'bubble' incident, or there may have been more permanent, long-run effects concerning the consumption of French wine in Denmark. By the use of monthly data for the Danish import of red wine and white wine, the long-run trends in these variables are extracted by applying both the X-11 seasonal adjustment program and the Hodrick-Prescott-filter; the latter known primarily from business cycle analysis. When eliminating seasonal and irregular components from the wine import data there seems to be empirical evidence in favour of boycott effects of a temporary nature in late 1995 and early 1996.

Additionally, the paper addresses questions related to market shares and market segments concerning wine consumption patterns in Denmark. The market share of French wine was declining during the 1990s and the nuclear testing certainly did no good for the marketing of French wine. Data from a survey of approximately 350 Danish executive director's ranking of wine products is used in order to investigate consumer preferences concerning country of origin and willingness to pay.

1. Introduction

In the spring 1995, the French military announced a series of nuclear tests under the Tuamotu group 1,200 km from Tahiti. The main site was the 30-km-long Mururoa atoll. Despite world-wide opposition and opposition from nearly 63% of the French population, the test series of explosions was carried out and from 5th September 1995 to 27th January 1996, the French military conducted 6 nuclear explosions.

In some countries, e.g. Denmark, the public reaction was quite resolute even in the period up to the test series. From June 1995 the debate (protests) on the nuclear tests escalated in Danish newspapers and other media. Huge amounts of letters to the editor were published in the Danish newspapers - all of them against the nuclear tests. In addition all the Danish political parties joined the protest movements and signed a protest letter to the French Government. On behalf of the Danish Government the Danish Minister of the Environment wrote a letter to his French colleague in July, trying to persuade the French Government not to carry out the test series. At that time headlines like 'Boycott French Products' were seen in the Danish media, and one of the major Danish retail chains for daily goods decided to refrain from marketing French products, e.g. wine. Other Danish retailers joined this action.

The Danish protests in the 'pre nuclear-test period' were at their most intensive level around late June/early August, and the Danish TV could at the same time broadcast the story of the Australian Prime Minister Mr. Bolger sending an open protest letter to the French government and also show dramatic pictures of the French Navy 's boarding of Rainbow Warrior II. Under massive attention from the press, on 1st August 1995 the Danish Prime Minister, Mr. Nyrup Rasmussen, took part in the first 30 km of a 3 week long protest cycling tour from Denmark to Paris, and at that time it certainly was not 'politically correct' to drink e.g. French wine.

After the first explosion on 5th September the international protests were enormous and the Danish protests became even more intense. On 6th September the Nordic countries sent a joint letter of protest to the French Government. During the rest of 1995 there was much negative attention on the French actions in the South Pacific. Only after President Chirac on 29th January announced an end to French nuclear tests did things start to become normal for importers of French products into Denmark.

During the period of the explosions under the South Pacific, many consumers changed their demand away from French goods towards goods from other origins. Wine was no exception to this rule. Traditionally France has held a strong position on the Danish market for (still) wine, see below for further details. In 1988 the overall French market share on the Danish wine market was as high as 65 percent. But, at the turn of the millennium the French market share was below 40

percent! Obviously French wine has become less competitive on the Danish market.

The aim of this paper is to analyse the demand for French wine in Denmark paying attention to the influence from the nuclear tests in the fall 1995. First, did the nuclear tests have any influence on the demand for French wine? Secondly, were these effects of a permanent character, changing the French position on the Danish market (as measured by import figures for wine)? Another possibility could be that the influence was more temporary, i.e. like a 'bubble' incident from - as will be shown below - the negative development in the market for French wine, which in general took place on the Danish market for a number of years even before Mururoa. Looking at the incident in more detail the paper address the question whether the nuclear tests did affect various market segments differently, i.e. the market for red and white wine or the market for quality wine versus non-quality wine. Besides changes in quantities, nuclear effects could potentially show up in changes in the relative import prices for wine, i.e. France versus the rest of the world.

In the next section the development in the Danish wine consumption is described and particular attention is paid to the market share of French wine. The section addresses the questions related to the market share for red and white wine, and the structure of the French wine is illustrated.

Section 3 includes a discussion of the relevant theoretical framework to deal with the Mururoa incident and the French sale in Denmark. The concept of the political consumer is compared with the traditional concept of 'The Economic man' known from the microeconomic theory.

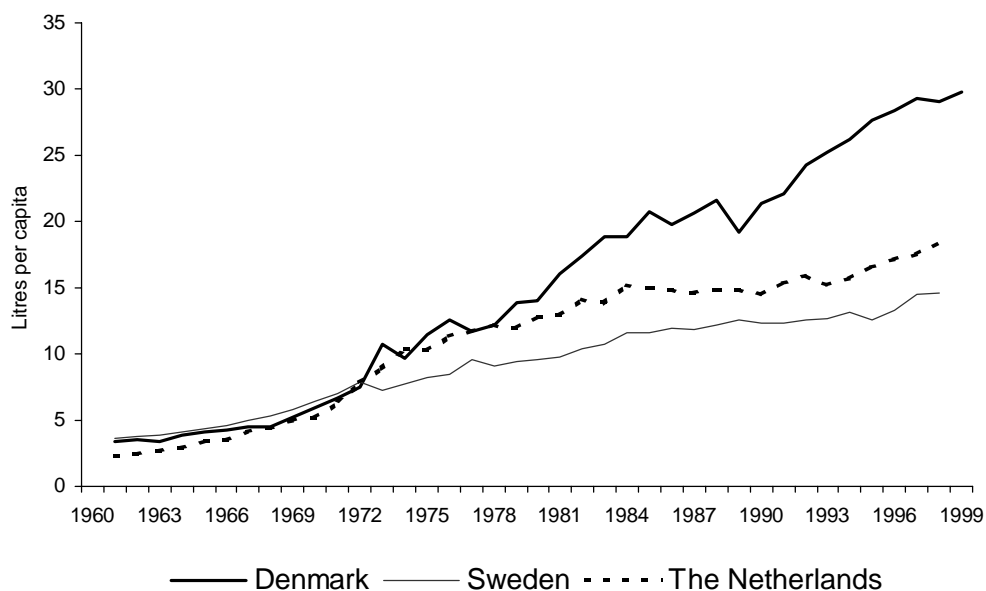
By the use of monthly data for the import of red and white wine the following sections (4 and 5) includes the analyses, which are performed for both red and white wine. Various tools for extracting the precise information from the monthly data have been used, i.e. the trend-cycle component (X-11) and various types of the Hodrick-Prescott-filter. In order to verify whether the incident was a bubble, the section ends by showing the results of model simulation (based on an ARIMA-process) across the critical month in 1995 and onwards. Section 6 concludes.

2. Developments in the Danish consumption of wine

Figure 1 illustrates the development on the market for wine in Denmark. Denmark is compared with Sweden and The Netherlands, because they are small North European countries and can be considered as non-wine producing countries. Yet it is easily seen that the consumption of wine has grown much faster in Denmark than in the other two countries. In the beginning of the 1960s the Danish wine consumption was on the same level as the other two countries, around 3.3 litres per capita. However at the end of the century per capita wine consumption was nearly 29 litres

in Denmark, whereas the Swedish and Dutch only grew to 15 and 18 respectively.¹

Figure 1. Per capita wine consumption¹⁾, Denmark, Sweden and The Netherlands, 1961-1999.



1) Still wine.

Source: *World Drink Trends 1999* and The Danish Bureau of Statistics: SE, 2000:18 *Income, Consumption and prices*.

The absolute size of the Danish market for wine corresponds to 158.8 million litres in 1999, of which nearly 3/4 is consumption of red wine (incl. rosé). In the beginning of the 1960s the corresponding figure was only 14 million litres, meaning that the consumption of wine in Denmark has expanded by a yearly growth rate of 6.2 percent. Over the last 20 years, i.e. from 1990 an up till now, the total consumption of wine in Denmark has grown by nearly 50 percent, meaning that even recently the Danish market for wine has been rather expansive.

2.1 The market for French wine in Denmark

Table 1 illustrates the development in the 4-country concentration index on the market for wine in Denmark since 1989 as measured by imports by country. In general, the concentration² seems

¹ See Bentzen et al. (2001) for an analysis of potential convergence in alcohol consumption between the European countries. The modest development in the market for wine in Sweden is due to drinking habits and the rather restrictive Swedish retail sale system, characterized by state monopoly and consequently a limited number of retail stores allowed to sell spirits and wine. Furthermore, according to *World Drink Trend 1999*, by november 1999 the Swedish excise duty on wine was 2855 EURO per hectolitre pure alcohol, whereas the Danish and Dutch Duties on wine were considerably lower, namely 862 and 443 Euro respectively.

² The “concentration index” should not be interpreted as a general measure of competition, because exporters from a particular country also compete with each other.

to be rather significant. At the beginning of the 1990s the 4 largest countries in the Danish wine import accounted for around 85 percent of the total import. Though concentration has become smaller around 80 percent of the Danish import of wine still comes from the 4 exporting countries. In order of importance the most significant exporters to Denmark were France, Spain, Italy and Germany, with France as the dominating country.³ Thus the market share of French wine was 39.6 percent in 2000, i.e. roughly half the value of the CR₄ index.

Table 1. 4-country market concentration index (percent), Danish import of (still) wine 1989-1999.

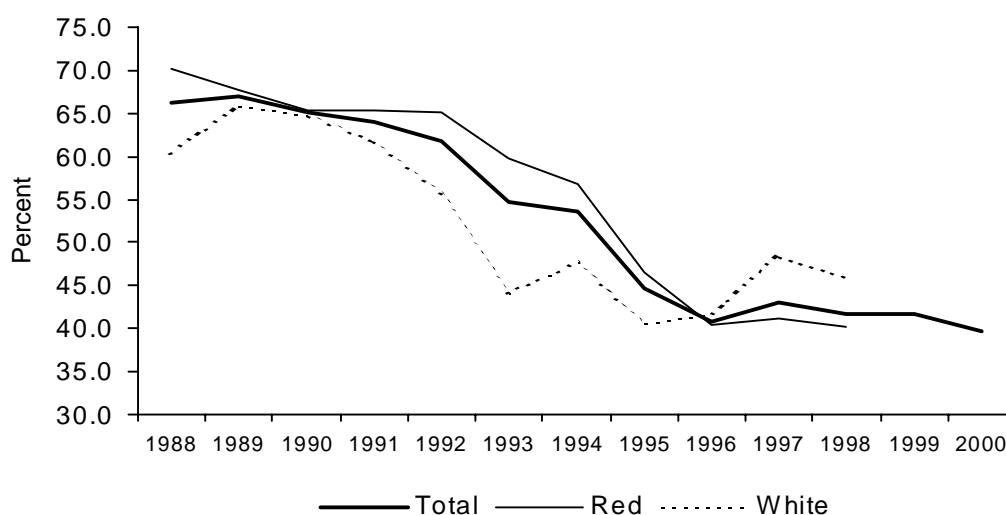
Period	1989	1990	1991	1998	1999	2000
CR ₄	87.0	85.9	84.2	79.9	80.0	79.5 ¹⁾

Source: The Danish organisation for wine and spirits, VSOD and own computations.

1) First six month of 2000

Traditionally, French wine has dominated the Danish market for wine. In fact Figure 2 shows that the French market share used to be significantly higher even within the last ten years. Thus in the late 1980s French wine accounted for two thirds of the Danish wine market. However during the first part of the 1990s the market share dropped to 55 percent, and the decline continued until 1996 with a temporary minimum of approximately 40 percent, which has been the market share since.

Figure 2. The market share for French wine in Denmark, 1988-2000, percent.



Source: The Wine and Spirits Organisation in Denmark, (V.S.O.D), Statistics Denmark: *Foreign Trade Statistics* and own computations.

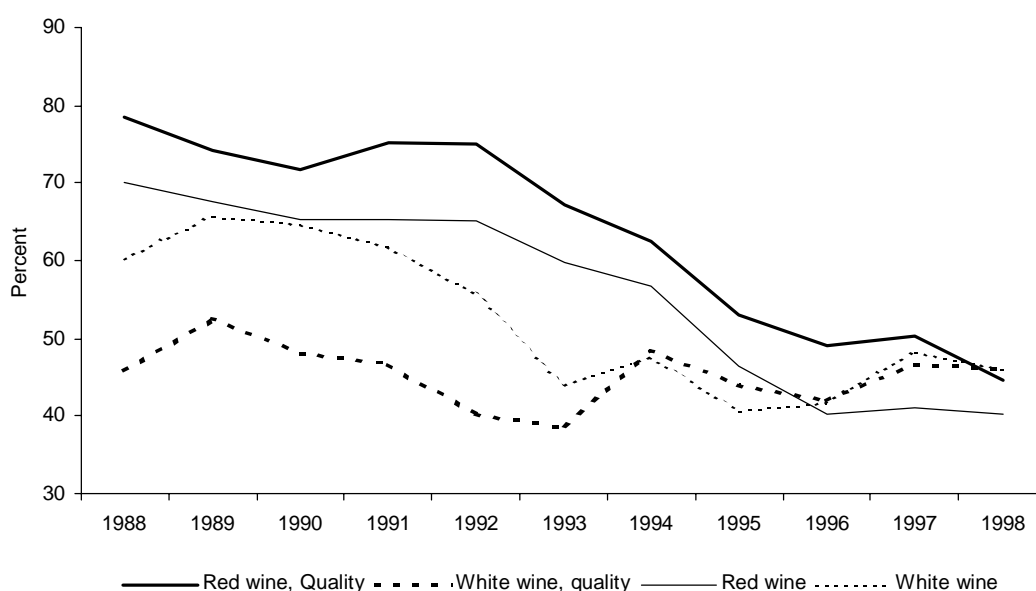
³ See Annex 1 for the market shares on the Danish market of the 10 most important export countries.

The figure also illustrates the development in the French market share on the Danish market for red⁴ and white wine. In general, the import of red wine from all countries is much larger than the import of white wine. Thus, red wine accounted for 64 percent of the wine import in 1989, and this share increased steadily the next 10 years ending close to 73-74 percent in 1998. During the last couple of years the import of white wine has regained part of its position, i.e. the share of red wine fell to 70 percent in 2000.

France's share of the red wine market in Denmark was as high as 70 percent in 1988. But since then the competition from other wine producing countries has become significant - in particular Spain and Italy but also Chile has a noteworthy position on the Danish market for red wine. Consequently in 1988 the French market share of the Danish red wine had decreased to 40 percent.

A similar development for French white wine can be seen in the figure too. Yet, the drop in the market share of French white wine has not been so pronounced as the French red wine. And by the end of the 1990s France held a stronger position on the Danish market for white wine than for red wine.

Figure 3. The market share for French wine on the Danish market, quality wine vs. all wine, 1988-1998, percent.



Source: The Wine and Spirits Organisation in Denmark, (V.S.O.D), Statistics Denmark: *Foreign Trade Statistics* and own computations.

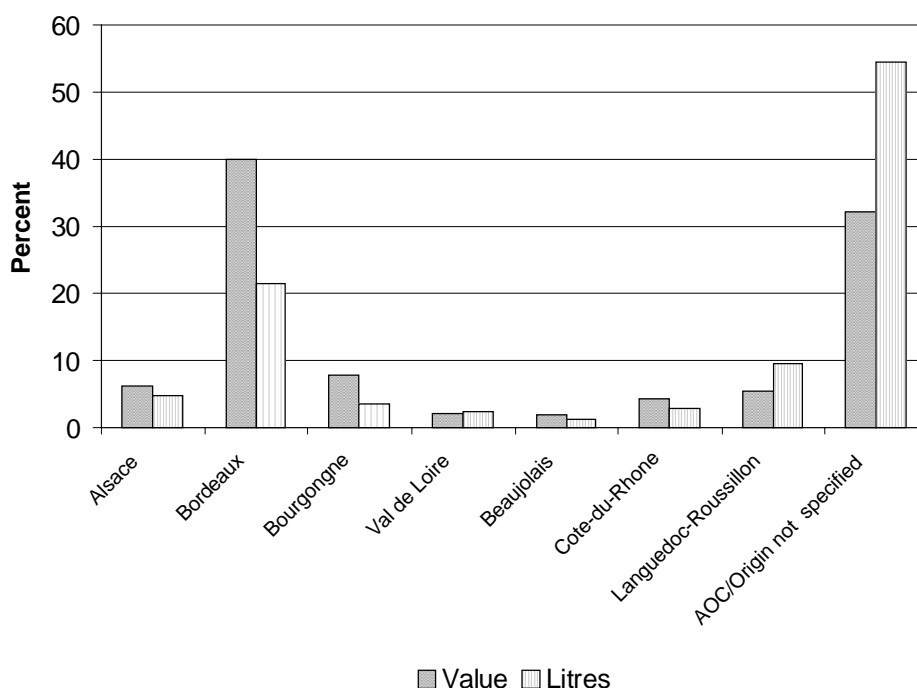
⁴ 'Red' wine includes red wine and rosé.

The Danish tax authorities categorize the wine import into quality and ordinary wines. Quality wines are defined as wines coming from a specific area in the country of origin. In general, the share of quality wines has increased around 50 percent, of which 4/5 is import in bottles containing less than 2 litres. Figure 3 sums up the French market shares of total red and white wine import. In addition the figure includes the corresponding market shares for quality wine. It is easily seen that the French market position in quality red wine is relative strong and that its position on the market for quality white wine has become relatively weak. As is the case for the overall French market shares France lost importance in the quality segment of the market until 1993. But in the rest of the 1990s there seems to have been a recovery of the French position on the quality segment for white wine.

2.2 Wine Imports from France – by origin

Figure 4 shows the distribution of Danish wine imports from France. Looking at the measures in litres, more than half of the wine import is classified as coming from other AOC's or being Vin de Table. Among the known districts wine from Bordeaux seems to be preferred in Denmark and there is a big jump to imports from Bourgogne and Alsace, the latter including mainly white wine.

Figure 4. Wine Imports from France, distribution by origin 1998.



The picture changes somewhat with regard to the import expenditure (c.i.f exclusive taxes and

duties). Bordeaux accounts for the largest share of the values, i.e. 40 percent, and naturally the import value of Bourgogne is much larger than its quantity share. Thus the value share for Bourgogne is nearly twice its quantity share.

Table 2. Average import price, wine from France, 1998.

Districts	Average import price*
Alsace	21.71
Bordeaux	30.73
Bourgogne	35.95
Val de Loire	14.69
Beaujolais	26.01
Cote-du-Rhone	24.69
Languedoc-Roussillon	9.72
AOC/Origin not specified	9.68
TOTAL	16.43

*c.i.f.

Source: See Annex 1, Table A2.

The differences in the distributions in Figure 4 reflects variations in import prices from the various districts in France. Therefore the price structure is shown in Table 2 and the price ranking corresponds to a priori expectations, i.e. wines from Bourgogne are the most expensive, followed by wine from Bordeaux etc. Note however, that the variance between the known districts is a little less than expected, suggesting that the average quality of imports from particularly Beaujolais and Cote du Rhone seems to be relatively high for those areas. In other words the imports from Bordeaux and Bourgogne are relatively cheaper representatives of those areas – on average.

3. Some reflections on the potential influence from nuclear tests on consumer behaviour

The reaction of the Danish consumers to the French nuclear tests can be analysed within the standard framework of consumers purchase behaviour; see Howard & Sleth (1969). In accordance with this line of thought the consumers inhibitors might adjust to the impulse coming from the media exposure of the French nuclear tests. Of course the reactions depend on the consumers attitude towards nuclear tests in general. In this paper it is assumed that the consumers are against nuclear tests. Consequently the consumers will be under the influence of a negative inhibitor in their purchase of wine and the result will be decreasing consumption of French wine even though they a priori had a favourable attitude towards French wine as a brand.

Furthermore, if the negative inhibitor becomes internalised, the negative attitude towards French products could become permanent, and a structural break in the import of French wine to Denmark is then to be expected.

A more direct way of analysing the influence of the French nuclear tests on the Danish wine import is in terms of the concept of 'The Political Consumer', which has been developed more recently. According to this theory, the political consumer is a person who takes political, ethical and social reasons into consideration in their decisions as buyers. Obviously the nuclear tests in general and especially the location of the particular French test series most likely affected the political consumers negatively in their decision as consumers on French products versus products from other countries of origin. A decrease in sale of French wine from June and onwards would naturally be the consequence.

Jensen (1998) analyses the importance of 'political consumer' on the market for consumer goods in Denmark and argues that *'In the middle of the 1990s the concept "the political consumer" turned up in the Danish mass media in relation to Shell's plan to sink the oil-drilling platform "Brent Spar" in the Atlantic, and the French Government's decision to resume the nuclear tests in the Pacific'*.

Furthermore, Jensen (1998) gives a survey of various empirical analyses of the concept of the political consumer in Denmark. According to (Danish weekly) Mandag Morgen (1995) and AIM-Nielsen Research Institute between 30% and 35% of the Danes would definitely include political, social or ethical considerations in their decision to buy goods. In the other end of the spectrum, the analysis shows, that only 10% of the Danes would not at all include political matters in their consumption decisions. In addition Jensen (1998) mentions the RISC-model, which has been used for classifying the Danish population according to their values and attitudes and it is shown that nearly half the Danish population belongs to the so-called green and pink segment. Consumers belonging to the green segment (25 percent) are idealistic and *'highly motivated for self-actualisation together with other people. Moreover, they are well educated and well informed of what happens in their surroundings. Party-politically their affiliations are to the left'*, Jensen (1998). Furthermore, consumers belonging to the pink segment (18 percent) are characterized as *'individuals who also have an idealistic and social attitude towards life. They are, however, characterized by more traditional values than the consumers in the green segment, and they have a lower level of education'*, Jensen (1998).

Finally Tulstrup (1997) analyses the Danes' attitudes, behaviour and intentions. In June (1996) 29 percent of the respondents had omitted to buy certain products for political reasons. However three month later the corresponding figure was 17 percent. Jensen (1998) concludes that *'this indicates that the interest in political consumption is not constant, and that it probably is very sensitive to what the mass media put on the agenda'*. Recognizing the massive media coverage of the French nuclear tests during 1995 it is most likely that political consumption took place on the market for wine. However, if political consumption is sensitive to mass media coverage, the effect on French wine import to Denmark should be expected to be more like a bubble instead of

being permanent. The mass media coverage of French nuclear politics ceased rather quickly after the last tests in the early 1996.

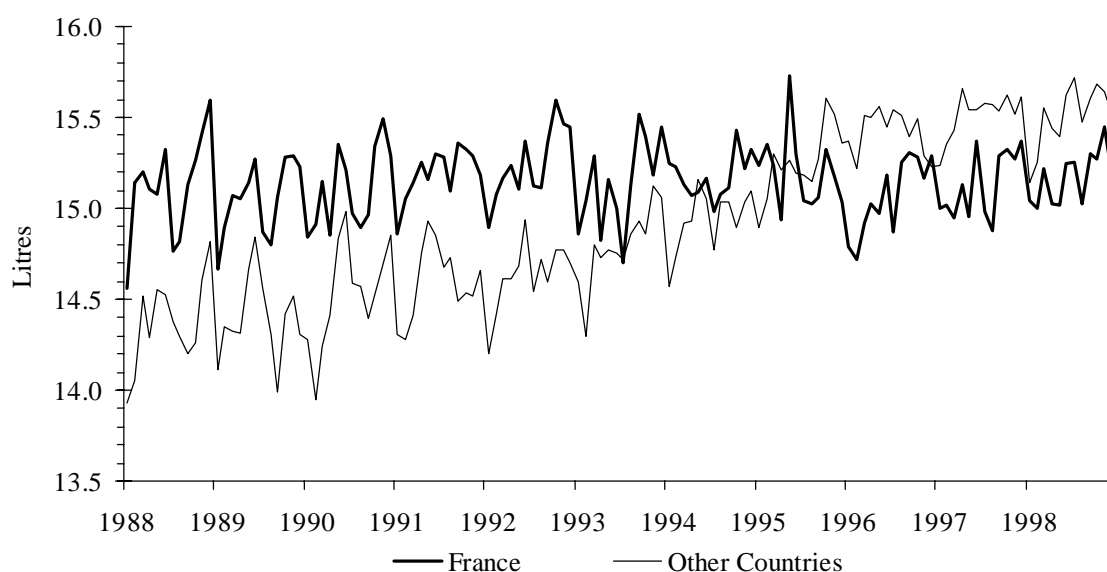
Other factors affect the wine consumption and structure too. The competition on the Danish market for wine became more intensive especially from 1990 onwards. In particular campaigns were driven for Italian wines, which at the same time improved considerably in quality, pushing the sale up. In recognition of the fact that the Italian wine style is different from the style characterizing wine from e.g. Bordeaux, new brands were introduced to the Danish market and the consumer's utility function had to change. In addition, a huge number of wines - made in the international style - coming from abroad were introduced to the Danish consumer, challenging French wine and making it easier to switch away from wine produced in France.

This argument makes the explanation of the decline in the French market share is much more simple and more in line with the concept of 'the economic man'. Thus the Danish consumers reacted positively to new and differentiated (competitive) wines from Italy. Next, overseas competitors challenged the traditional French segment on its own territory. Therefore, the nuclear tests came at the wrong point in time and opened the door for potential entrants, so from this line of thinking the influence of the nuclear tests should be more than just a bubble.

4. Testing for coincidence between nuclear testing and turning points in the Danish wine import from France

In order to address the question of whether there was an effect from the Mururoa nuclear testing on the French wine export to Denmark high-frequency data - i.e. monthly data - are used in the analysis. Also, as the influence is most likely related to the red wine import, the analysis deals with both the red wine and the white wine import from France. The total wine import from other countries is included in the analysis as a decline in the consumption of French wine will probably induce increases in the wine import from other countries as Denmark has no wine production at all. Figures 5 and 6 exhibit the time series of these variables for the monthly time span 1988:01 to 1998:12.

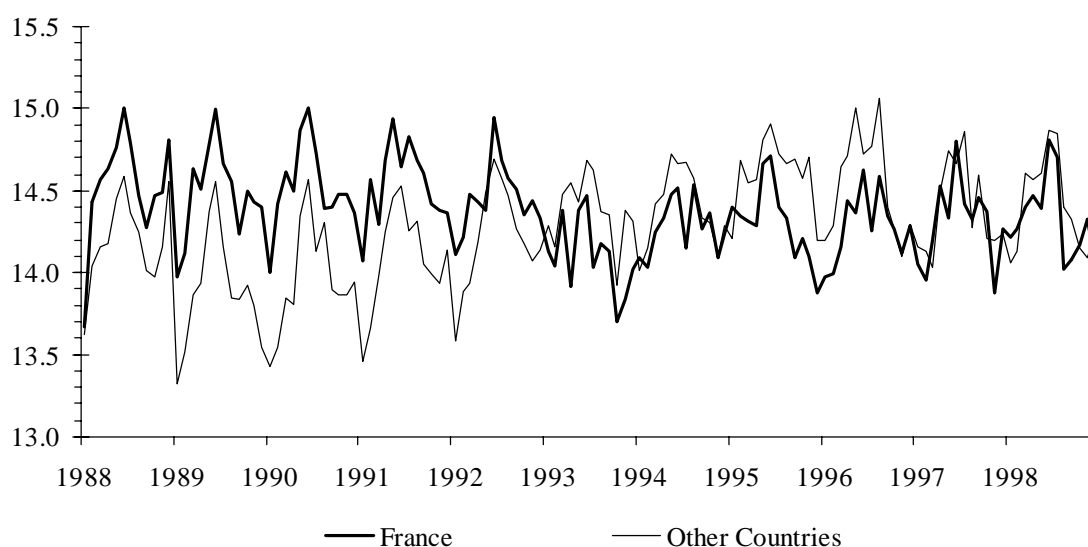
Figure 5. The Danish red wine import from France and 'other countries', 1988:01-1998:12 (Log values of quantities).



Notes: The data used in the graphs are log of quantities, originally measured in kilograms (say litres). 'Other countries' is the rest of the world - i.e. the total import excluding French wine - and the two components make up total red wine consumption as no national production of wine takes place in Denmark.

Source: The Statistical Databank, Statistics Denmark, 2001.

Figure 6. The Danish white wine import from France and 'other countries', 1988:1-1998:12 (Log values of quantities).



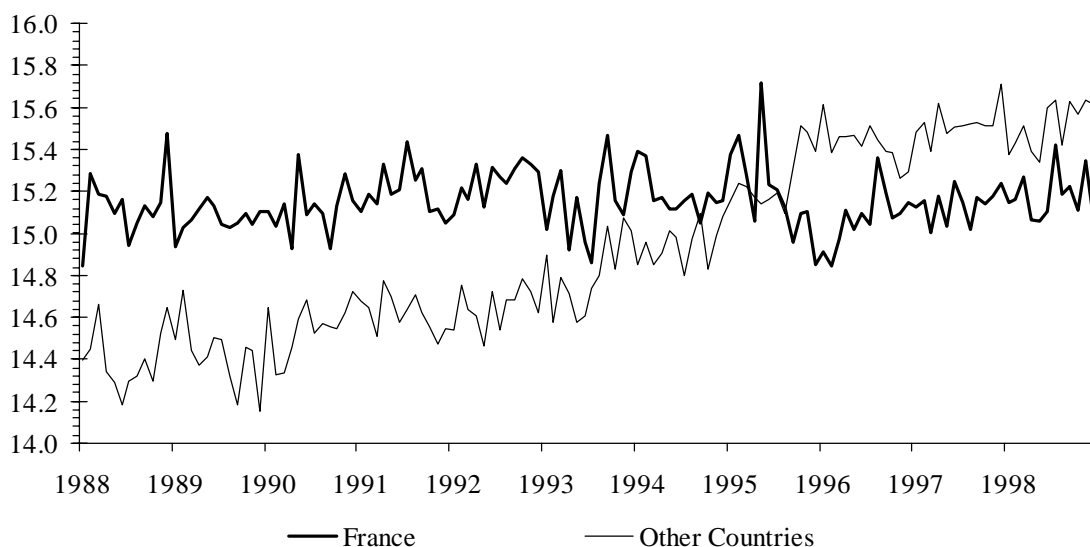
Note: see the note to Figure 5.

Source: The Statistical Databank, Statistics Denmark, 2001.

Some years before the Mururoa testing took place the import of both red wine and white wine from other countries increased remarkably and this trend towards consumption of non-French wine seems to be a dominant feature of the 1990s. From the graphs it is not easily detected whether the French wine import is negatively influenced by the nuclear testing in 1995. Especially for the white wine in Figure 6 a boycott effect is not obvious as the wine import from other countries also declines along with the French wine import in some of the months during the nuclear testing period.

With monthly data there might be some seasonal effects that will blur the analysis concerning the correct ‘timing’ between the boycott and the French wine import to Denmark. An obvious solution to this problem would be to seasonally correct the data and this is consequently done using the X-11 procedure (US Bureau of the Census) with the result for red wine import depicted in Figure 7. As the main effects of the Danish boycott may be related to the red wine import - and also due to space limitations - the following analysis is mainly concentrated on the Danish red wine import.

Figure 7. The Danish red wine import from France and ‘other countries’, seasonally adjusted, 1988:01-1998:12 (Log values of quantities).



Note: The data from Figure 5 seasonally adjusted using X-11 (US Bureau of the Census) from the SAS statistical software.

From the seasonally corrected data in Figure 7 it is now more obvious that the boycott seemed to influence the red wine import from France as there is a ‘bubble’ in the data close to the time of the nuclear testing. French red wine import declines relatively much in late 1995 and correspondingly, the import of red wine from other countries reaches a local maximum in exactly

the same period.

The tests took place between September 1995 and January 1996 but were announced in early 1995 and the political protests - from Denmark and some other countries - gained momentum from June 1995. Additionally, there may be a time lag of some months between a decision to buy (i.e. import) wine from France and till the transaction eventually takes place.⁵ Therefore, it is not obvious that a boycott of French wine will show up as a decline in import quantities in exactly the time period of the political protests and nuclear testing, i.e. from May/June 1995 to January 1996. Assuming a time lag of 3-4 months in wine imports a possible boycott effect should show up in the data from late 1995 and such a hypothesis fits reasonably well with the data from Figure 7 as the minimum of the French red wine import is obtained in the last months of 1995.

Comparing Figure 1 with Figure 3 it is obvious that the monthly data for wine import are characterized by strong irregular components as the seasonal adjustment procedure does not result in a smoothed curvature for the wine data. The seasonal data in Figure 7 are still somewhat fluctuating - seemingly along deterministic time trends. When testing the data for unit roots applying the Dickey-Fuller test, the conclusion is that for all variables presented in Figures 5, 6 and 7 the null hypothesis of non-stationarity is rejected in favour of a stationary - or trend-stationary - alternative.⁶

Another unit root test methodology that might be appropriate in the present context is the Perron (1989, 1997) tests for unit roots allowing for structural breaks in the data series. As the Dickey-Fuller test indicates stationary/trend-stationary time series data, this should also be the result obtained from the Perron tests, but an appealing feature of the latter technique is the possibility of including breaks in the deterministic parts of the test, i.e. the intercept term and the time trend. If the nuclear testing has induced a structural break in the Danish import of French wine this should be revealed when applying the Perron (1997) test, where the break point is determined endogenously and not imposed on test as an a priori restriction.⁷ According to this type of test the import of French red wine - using the seasonally corrected time series - is found to be trend-stationary with a structural break in July 1995 at the five per cent level of significance (- the test performed for the original time series sets the break date at November 1995, but the test statistic is not indicating significance neither at the five per cent nor at the ten per cent level of significance). For the white wine import from France the same conclusion is reached, but in this

⁵ There will, of course, be a further delay before the transactions are recorded in the trade statistics but this lag has no relevance for the topic analysed.

⁶ A standard DF unit root test has been applied and the data have not been tested with respect to seasonal unit roots.

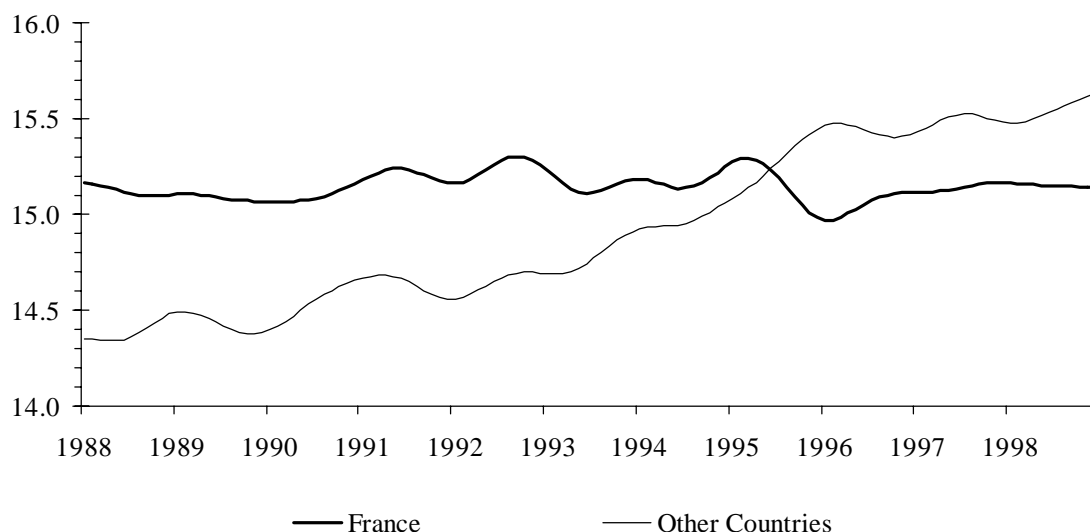
⁷ A further description of the test may be found in Perron (1989, 1997) and e.g. also Li and Papell (1999) with an application to income data.

case the time of the break is estimated to be November 1992 which hardly can be caused by the Muroroa incident. One drawback of the structural break methodology in the present analysis seems to be that when more than one structural break appear in the data or the data includes some highly irregular components, which might be the case for white wine, it will be more difficult to verify the correct timing of possible structural breaks. Therefore, the conclusion of whether the boycott was effective will not be based on the unit root test methodology, but the analysis of the time series data will be further extended in the next part in the direction of determining the trend or trend-cycle components in the Danish wine import.

5. The trend-cycle component in the wine import and nuclear testing

The X-11 seasonal adjustment program also allows for an estimate of the trend-cycle (TC) component of the monthly time series data as both the seasonal component and the irregular component ('outliers') may be eliminated from the original data. The final X-11 TC-component concerning the Danish red wine import are shown in Figure 8 along with the original and seasonal adjusted time series from Figures 5 and 7, respectively.

Figure 8. The Danish red wine import from France and 'other countries', Trend-Cycle components, 1988-1998 (Log values of quantities).



Note: The X-11 procedure used for extracting the trend-cycle component, assuming a multiplicative model concerning trend, cycle, seasonal and irregular components.

Extracting the TC-component from the monthly data certainly seems to confirm a hypothesis of an effective Danish boycott of French red wine - although this is not a formal statistical test. The best description of the incident is most likely a 'bubble' where the temporary decline for French

red wine is symmetrically offset by a similar increase in import of red wine from other countries. The timing is late 1995/early 1996 which corresponds reasonably well with the expectations as discussed above.

As a supplement to the TC-component from the X-11 procedure the Hodrick-Prescott (HP) filter is also applied to the data to further investigate for turning points around the timing of the nuclear testing. The HP-filter has been used in connection with analysing business cycle topics and is calculated for a time period (1...T) as:

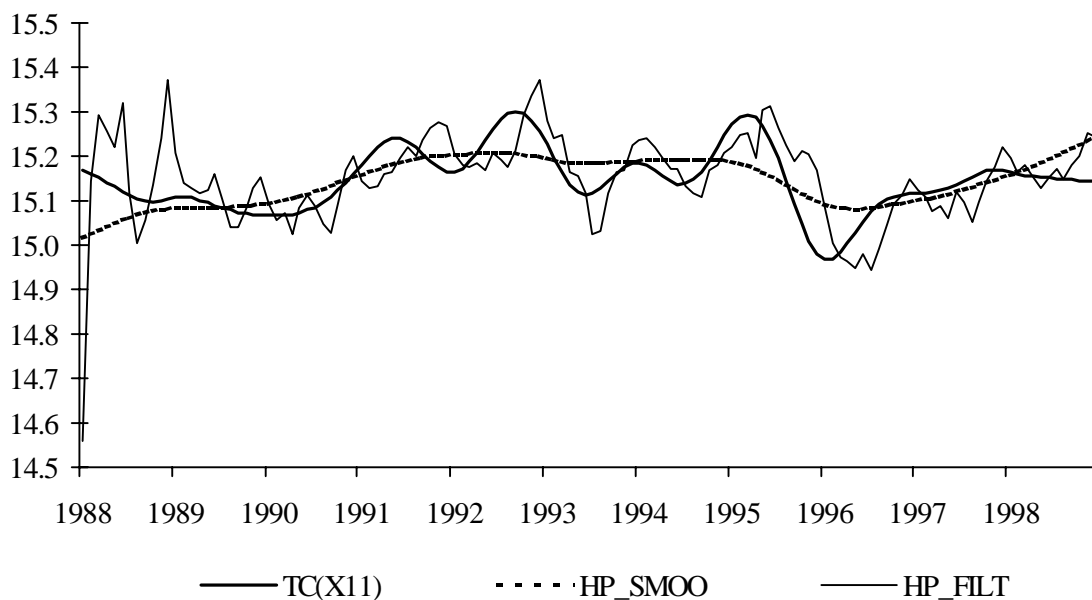
$$(1 / T) \sum_{t=1}^T (X_t - \mu_t)^2 + (\lambda / T) \sum_{t=2}^{T-1} [(\mu_{t+1} - \mu_t) - (\mu_t - \mu_{t-1})]^2 \quad (1)$$

The time series is decomposed into a trend component μ_t and a stationary component $X_t - \mu_t$, where μ_t is selected in such a way that the expression in (1) is minimized. The constant Lambda (set equal to 1600 in the following calculations) is somewhat arbitrary and reflects the cost of including fluctuations in the trend component. The extremes of this HP-trend is the original series ($\lambda=0$) and a linear trend ($\lambda = \infty$).

As discussed in Razzak (1997) it is important to distinguish between the HP-filter as a smoother and a filter, respectively. When the minimization problem in (1) is applied to the whole time span of the data the HP-filter acts as a smoother as the μ_t -trend is fitted to the complete data set. Alternatively, the calculations may be done from a subset of the data representing the beginning of the time period and then subsequently adding one observation at a time and each time repeating the calculation. This gives a 'real filter' and the results from using this procedure - both the HP-smoother and the HP-filter - are depicted in Figure 9.

The TC-component from X-11 and the HP-smoother are both calculated from the complete data set and it is obvious that these trend estimates establish turning points relatively early compared to the nuclear testing in late 1995. The reason for this is, of course, that when the data from the last part of the sample (1996-1998) - where the wine import stagnates - are used in the calculations this tends to produce an early turning point for the curvature in these cases (i.e. the TC-component and the HP-smoother, where the latter is seen to 'smooth' much more than the X-11 procedure; the HP-procedure concentrates on the trend component). The HP-filter reveals a later decline in the wine import which may be seen more in accordance with an assumption of a relatively long time lag between a boycott decision and the actual import of wine from France.

Figure 9. Trend-cycle component (X-11), HP-smoother and HP-filter: Danish red wine import from France.

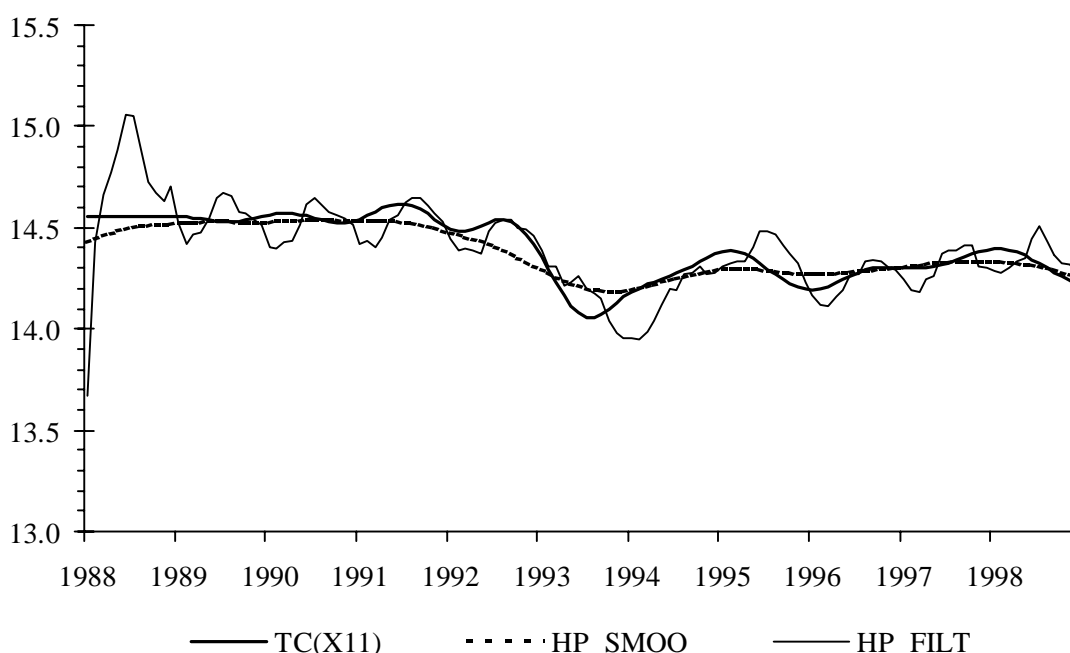


Note: A value of Lambda=1600 used in the calculations, but the conclusions reached are not (very) sensitive to the Lambda-value.

Finally, there may be differences between high-quality and low-quality red wine import with respect to the boycott effects. Dividing the import of French red wine into these two components and submitting the data to the same kind of analysis as presented in Figure 9 does not reveal any major differences compared with the development in the import of the total amounts of red wine - a negative effect seems to take place at the end of 1995 - but the long-run trends in low-quality red wine deviate somewhat from the counterparts concerning high-quality red wine. Especially the low-quality French red wine consumption has increased during the last part of the 1990s - recovering after a very negative trend behaviour until 1995/96 - whereas the long-run trend concerning the more expensive qualities from distinctive districts does not point towards increasing tendencies in the later years.

A similar analysis is also performed for the import of French white wine. In this case only the TC-component and the HP-filter are reported as these approaches seemed to perform well in the former analysis, with the results presented in Figure 10.

Figure 10. Trend-cycle component (X-11), HP-smoother and HP-filter: Danish white wine import from France.



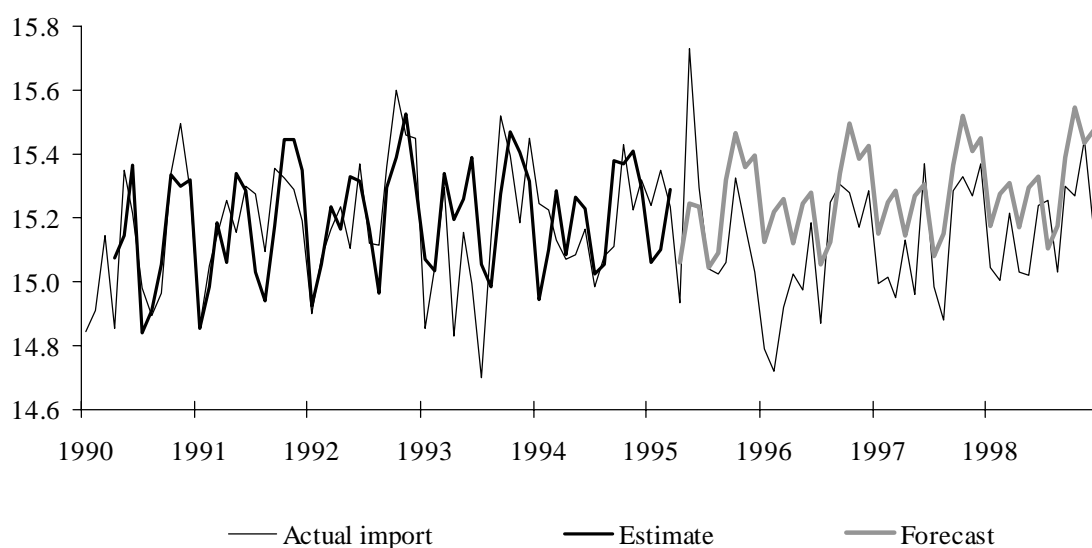
Note: A value of Lambda=1600 used in the calculations.

Again, the presumed effect related to the nuclear testing is visible in the graphs but these fluctuations are relatively small compared to the events in 1993-94. The slowdown in this part of the French white wine import takes place in the last months of 1995 and the first quarter of 1996, quite consistent with the a priori expectations. Again, the HP-filter depicts a ‘bubble’ a little bit later than the trend-cycle component extracted from X-11 but in both cases the (local) minimum level of white wine consumption is reached in the same time period.

Additionally, one argument against ‘the boycott hypothesis’ may be that price effects are the reasons behind fluctuations in the import of especially French wine. By using the very detailed trade statistics reporting both values and quantities of the total wine import it can be verified that the relative price of French red wine - compared with red wine from other countries - increased slightly until 1993/94 but thereafter remained very stable. In the mid-90s high-quality French red wine became more expensive compared with high-quality red wine from other countries (the increase beginning in 1996), but the relative price also went up when comparing with low-quality red wine from France itself (this increase begins in 1995). Hence, it can not be excluded that some price effects are also taking place around 1995-96 - although the French red wine compared with red wine from other countries is not showing any increasing price tendencies in the period when the nuclear testing took place.

Another question - assuming the 'boycott hypothesis' is valid - is whether the effects on the Danish red wine import from France was a 'bubble' or whether there were also more pronounced, negative long-run effects. To address this question an ARIMA model is fit to a subsample of the data spanning the time period 1988:01-1995:03, i.e. prior to any effects that may be related to the topic analysed. This model is subsequently used to forecast the red wine import from France covering the period 1995:4-1998:12. This is exhibited in Figure 11 - along with the actual development in the red wine import - where the model fits reasonably well for the estimation period up to 1995:03.

Figure 11. ARIMA-model estimates and forecasts of red wine import from France.



Note: The estimated model is an ARIMA(1,1,2)(0,1,1)₁₂ model that is both stationary and invertible and includes highly significant parameters.

Using the model for forecasting purposes reveals that the information in the data prior to 1995:03 results in a forecast that consistently lies slightly above the development in the actual red wine import in the last part of the 1990s. Hence, there is some evidence in favour of a hypothesis of a *small, negative long-run effect* from the nuclear tests. One of the explanations behind the more permanent shifts in consumer behaviour is the fact that once consumers have shifted towards e.g. Spanish or Italian red wine they might permanently diversify their wine consumption between the respective wine exporting countries and show less 'loyalty' towards French wine.

What makes it difficult to evaluate the likely effects of the boycott is the fact that there is a slight tendency towards stagnating - or even declining - import of French red wine during the 1990s as demonstrated in the figures. Certainly, the nuclear bombs did not benefit French wine export and in the case of Denmark a likely conclusion is that the nuclear testing caused a negative short-run

effect in 1995/1996 and additionally, for the subsequent time period (1996-1998) the Danish import of french red wine is still slightly below what should be expected from a forecast based on data covering the period 1988-1994/95.

6. Conclusion

In this paper it is demonstrated that the French nuclear tests at the Mururoa atoll, which took place from September 1995 to January 1996, affected the demand for French wine in Denmark. It is argued that consumers include political considerations in their choice between goods which are substitutes, e.g. wine from different countries. In Denmark the mass media coverage of the protests ex ante the test series was overwhelming and even the Danish Prime Minister participated in protest actions against France. Consequently, it is argued that potential success exists for The 'boycott-French product'-movement to have effect on the demand for wine.

In the empirical part of the paper it is shown that the Danish market for wine has been growing by an annual (real) growth rate of 6 percent since 1960. Accordingly the Danish market should be considered a high growth market. France has traditionally held a strong position on the Danish market, but during the last decade its market share has declined. Thus the empirical analysis shows that its share on the Danish wine market declined for a number of years, from nearly 66 percent in 1988 to 40 percent in 2000. This took place probably due to competition from Spain and Italy but also from other countries.

On the basis of monthly data for the Danish import of red and white wine by country of origin the paper addresses the question whether the Mururoa incident had an accelerating influence on the declining tendency for French wine at the Danish market. Or alternatively, whether the effect was temporary, i.e. a 'bubble' incident?

The empirical evidence is mixed and relies heavily on the decomposing technique used in the analyses. Using the X-11 technique for identifying the trend-cycle component of the wine time series confirms an effective Danish boycott of French red wine. But the best description of the incidence is like a 'bubble', i.e. a non-permanent effect. Using a Hodrick-Prescott filter methodology gives some evidence in favour of a boycott effect too - from late 1995 to early 1996. However, dividing the sample into quality and table wine did not give evidence in favour of more pronounced effects in the high quality segment of the market for red wine. A similar analysis for white wine (a market of more limited size in Denmark) depicts a bubble in the last month of 1995 and in the beginning of 1996, but the conclusion is blurred because a local minimum of white wine consumption is reached at the same time.

Focussing on relative prices, French wine versus wine from the rest of the world, the analyses suggests that the existence of price effects in 1995-1996 cannot be rejected.

Finally forecasts made on an ARIMA-model, which was estimated on data up till March 1995, show that the forecasted values for the rest of the period until 1998 lie slightly, but systematically, above the actual values for the wine import, suggesting a small negative long-run effect from the nuclear tests on the Danish demand for French wine.

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Annex 1.

Table A1. Market share on the Danish market in various years for the top 10 importers in 1999.

Country	Market shares in Denmark, percent		
	1989	1995	1999
France	67.0	44.6	41.8
Spain	7.5	16.3	21.8
Italy	4.7	10.3	9.8
Chile	1.3	3.3	7.2
Germany	7.6	10.2	6.4
USA	2.0	4.2	3.1
Portugal	4.9	4.5	2.5
South Africa	**	1.6	1.8
Argentina	1.1	0.2	1.6
Australia	1.2	1.6	1.5
Other countries	3.8	3.2	3.1
Total percent & (million litres)	100 (122.8)	100 (131.1)	100 (159.3)

Source: The Wine and Spirits Organisation in Denmark, (V.S.O.D), Statistics Denmark: *Foreign Trade Statistics* and own computations.

** Included under 'other countries.'

Table A2. Wine Imports from France, 1998.

Districts	Import Value (1000 DKK)	Import Volume (1000 litres)	Average import price (DKK)
Alsace	68122	3137.8	21.71
Bordeaux	442046	14383.3	30.73
Bourgogne	87104	2422,9	35,95
Val de Loire	22895	1558.4	14.69
Beaujolais	21537	828.1	26.01
Cote-du-Rhone	47458	1922.2	24.69
Languedoc-Roussillon	61817	6356.7	9.72
AOC/Origin not specified	356176	36778.4	9.68
TOTAL	1107157	67388.1	16.43

1 US\$ = 8.25 DKK

Source: Statistics Denmark: Foreign Trade Statistics and own computations.

‘Epilogues¹

Looking at the Danish market for wine in the winter 2001 - 5 years later: How are the consumer's preferences for wine from different countries of origin? Did the nuclear tests have any permanent effects for some consumers groups? In order to answer this question precisely a survey, which includes questions on the drinking habits and preferences for French and Italian wine and wine from other countries is needed. As a starting point, data from private marketing research has been analysed. The data derives from Ferdinand Pieroth A/S, which is a private, Danish Retail Company on the wine market selling on the market for home sales mainly to executive officers. Thus the survey is not representative for the entire Danish wine market. However it gives an indication of the upper income segment of the Danish wine market.

In Ferdinand Pieroth's survey, questionnaires are sent to the executive managers on a recurring basis, meaning that each month through the year new questionnaires are sent to potential customers. The data used below were collected over a 3-month period running from November 2000 to February 2001. According to Ferdinand Pieroth A/S the response rate was a little less than 15 percent, which unfortunately is rather low and consequently, points towards self-selection problems in the sample. The survey includes 354 records, of which 284 were males and 58 were females.

The drinking habits are shown in Table E1. The table suggests that wine has become considered as a daily good. More than half of the respondents - of which 90 percent were executive directors - often drink wine. In addition the survey reveals that only 10 percent drink wine, which can be considered as sweet, 50 percent drink medium dry wine and another 50 percent drink dry wine.

Table E1. Drinking habits: How often do you drink wine, percentage distribution?

Rarely	Once a week	Often	Total
17.7%	27.4%	54.9%	100.0%

351 answers

94 percent of the respondents drink red wine, 51 percent drink white wine. Rosé is less popular. Only 12 percent of the respondents drink rosé now and then. The most popular way of buying wine is in a supermarket (77 percent). 43 percent of the respondents also buy wine in wine and liqueur stores. 20 percent buy by post order or in other ways.

¹ We thank the private Danish Company Ferdinand Pieroth A/S, Aarhus, who kindly offered data from their marketing surveys to the project group.

Table E2. Willingness to pay: How much do you pay on average for a bottle of wine?

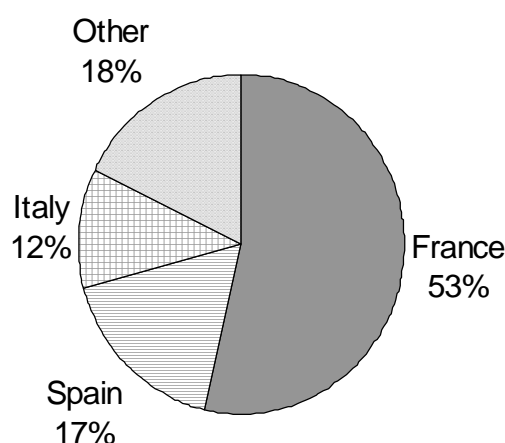
Below 50 DKK	Between 50 and 70 DKK	More than 70 DKK
33.2%	55.5%	11.3%

346 answers

The survey also includes questions on country of origin specific preferences for wine. Thus the respondents were asked to reveal their mutual ranking of the wines from the most important countries on the Danish market for wine (except Chile, probably because the particular wine company does not sell these wines).

Figure E3 shows that French wine is considered to be the most interesting among the respondents. In fact the share of executive directors ranging French wine highest is significantly larger than the actual share of wine imports from France in 2000 (40 percent).

Figure E3. Ranking of wine coming from various countries.



Note: The figure shows the percentage of the respondents having e.g. French Wine as favourite.
349 answers.

Table E4 shows the distribution on the ranking of French wine. The table includes only records actually ranking France and therefore the total number of answers is less than in Figure E3. However the distribution indicates that the respondents seem to like the wines coming from France. A rather high fraction ranks French wine as their favourite France also holds a position as number 2 and 3 in 27 percent of the cases.

Table E4 Ranking of French wine (Distribution on a Likert scale 1-6, 1: Favourite, 6: less interesting).

1. Favourite	2	3	4	5	6. Less interesting
58.1%	19.6%	8.1%	6.2%	3.1%	5%

322 answers

Despite the relative popularity of French wine the average price, which the respondents pay for a bottle of wine from France is nearly the same as for wine from other countries. As can be seen from Table E5 the distributions in the 3 columns are quite alike. One third of the respondents pay on average below DKK 50 and one tenth pay more than DKK 70.

Table E5. Willingness to pay: How much do you pay on average for a bottle of wine, French wine versus wine from other countries.

	France	Other countries	All countries
Below DKK 50	32.8	33.8	33.2
DKK 50-70	56.5	54.4	55.5
More than DKK 70	10.8	11.9	11.3
Total	100	100	100

346 answers

Summing up. Even though the market share of French wine on the Danish market has declined, the preliminary analysis of the survey data for Danish executive officers suggests a more solid position of French wine in the winter 2001 than was expected a priori.