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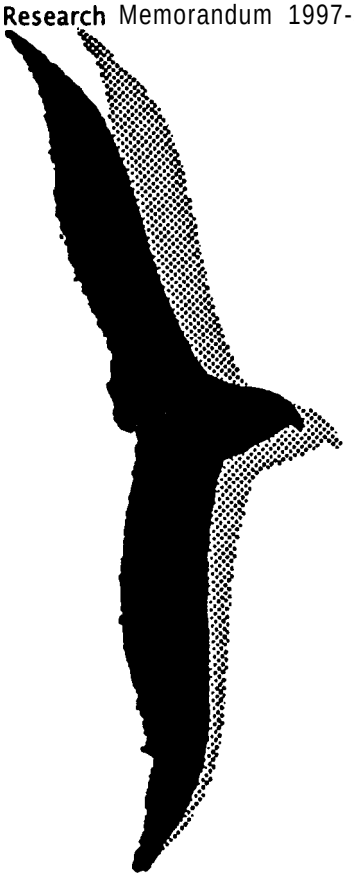

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PREFERENCE SHIFTS IN CONSUMER DEMAND FOR BEER AND WINE

by F.A.G. den Butter, A. Delifotis and R.H. Koning*

Summary

Preference shifts in the demand for beer and wine are empirically investigated for Germany, the Netherlands, France and Italy. With the rise in disposable income we see a shift from the demand for beer to the demand for wine notably in the Netherlands and somewhat less clearly in Germany, and a shift in opposite direction in France and Italy during the reference period 1973-1994. These shifts cannot be explained by observed changes in relative prices but should be attributed to autonomous changes in preferences. The first step of the empirical analysis is the estimation of a demand function for beer and wine taken together. Given total demand for beer and wine we specify a function for the relative demand for beer (or wine) which is derived from a utility function with shifting parameters. The estimation results indicate that by taking these preference shifts into account we are able to estimate price elasticities for the relative demand for beer and wine.

key words:
consumer demand, preference shifts, relative prices elasticities.

1. Introduction

Neoclassical theory of consumer choice usually takes preferences as given. The theory focuses on the derivation of consumer demand functions from various types of utility functions, and restrictions on these functions, which represent consumer preferences. Hypotheses about these preferences are empirically tested by estimating (systems of) derived demand equations. However, as yet not much attention has been paid to estimating consumer demand when noticeable shifts occurred in consumer preferences.

In this paper we study the demand for two goods, namely beer and wine, which are rather close substitutes and which have been subject to considerable shifts in consumer preferences in the last decades. Traditionally beer was the most popular alcoholic beverage in the Anglo-Saxon, Germanic, and Nordic part of Europe, whereas wine played that role in Southern Europe. The dividing line between beer drinking countries and wine drinking countries almost coincided with the degree of latitude above which growing of grapes is impossible. The increasing tourism and the resulting internationalisation of tastes have, much more than marketing efforts and reduction in transportation costs, contributed to a shift in these traditional consumption patterns. A kind of opposite development occurred, which is

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interesting from the perspective of consumer demand. In the Northern countries, where beer was the traditional drink, wine became a luxurious alternative, whereas in the Southern countries, where wine was regarded as a plain drink, drinking beer became more and more fashionable.

Our study provides an empirical analysis of these opposite shifts in preferences for four countries. namely France and Italy as representatives of Southern countries and Germany and the Netherlands as representatives from the North. We note, however, that at first sight these preference shifts are less apparent in Germany, maybe because the Southern part of that country has some tradition in growing grapes and drinking wine.

The remainder of this paper is organized as follows. The next section discusses the time series data which we collected on the demand for wine and beer in the four countries mentioned above. These are annual data for the reference period 1973-1994. We derive some stylized facts from these data and give a graphical analysis of the shifts in preferences. Moreover, we show the developments in relative prices of beer and wine which suggest that the shifts in preferences cannot be attributed to changes in relative prices. Next, in section 3, we discuss some previous results on demand systems for alcoholic beverages from the literature and we elaborate the theoretical framework for preference shifts. This theoretical framework suggests a specification which can be estimated using the time series data that we avail of. The results of this estimation procedure are discussed in section 4. The first step is to estimate a demand function for beer and wine taken together and in the second step the separate demand functions for beer and wine respectively are estimated, given total expenditures on beer and wine. We find that it is necessary to take the preference shifts into account in order to obtain (more or less) plausible estimates for the influence of relative prices on the demand for beer and wine. Finally section 5 concludes.

2. Preliminary data analysis

For our empirical analysis we have collected annual data over the period 1973-1994 on the total volumes of the demand for beer and wine in Germany, the Netherlands, France, and Italy. Volumes are measured as total consumption in liters. Data were also collected on price indices for wine and beer for three countries of our study: we were unable to find appropriate price data for Italy. These prices are taken either from the consumer price statistics or are calculated as total nominal expenditure divided by the volumes of consumption in liters. Moreover, we used data on disposable income from the national accounts and data from population from (Eurostat) population statistics. Appendix A summarizes the sources of our data.

In order to get some impression of the time pattern of consumption of wine and beer in the four countries under investigation, figure la shows the per capita demand for wine and beer in these countries. As our study focuses on relative shifts in consumption patterns we have depicted these consumption patterns through indices with 1973 = 100.

The chart for Germany shows that the demand for wine in this country has been much more variable than the demand for beer. Perhaps differences in harvest account for this variability. As demand for beer in Germany is much larger than demand for wine, the variations in the demand for wine hardly show up in the index for the sum of demands for wine and beer. Yet the chart does not suggest a clear upward or downward trend in the German demand for these two beverages. Another picture appears for the Netherlands. Here the demand for wine clearly shows an upward trend. The demand for beer, and hence total demand for both beverages has increased somewhat in the 1970's but remained almost constant thereafter.

The chart for France again illustrates a different trend. This country witnessed a considerable decrease in the total demand for wine plus beer. A large decrease in the demand for wine coincided with almost no decrease in the per capita demand for beer. Finally Italy also witnessed a decreasing demand for wine plus beer. Here a considerable increase in the demand for beer was more than offset by an even much larger fall in the demand for wine.

Figure lb provides further information on the shifts in the demand for wine and beer and on the relative importance of wine and beer consumption in the respective countries. The chart for Germany shows that the share of the consumption of wine in total consumption of both beverages varies between 14% and 19% only. The ratio of wine consumption to beer consumption exhibits a slight upward trend which is, as we will see, a first indication for a shift in preferences from beer to wine in this country. It is obvious that such shift from beer to wine took place in the Netherlands. Whereas in the start of the reference period wine accounted for only for 11% of total consumption it has risen to almost 15% in the mid 1990's.

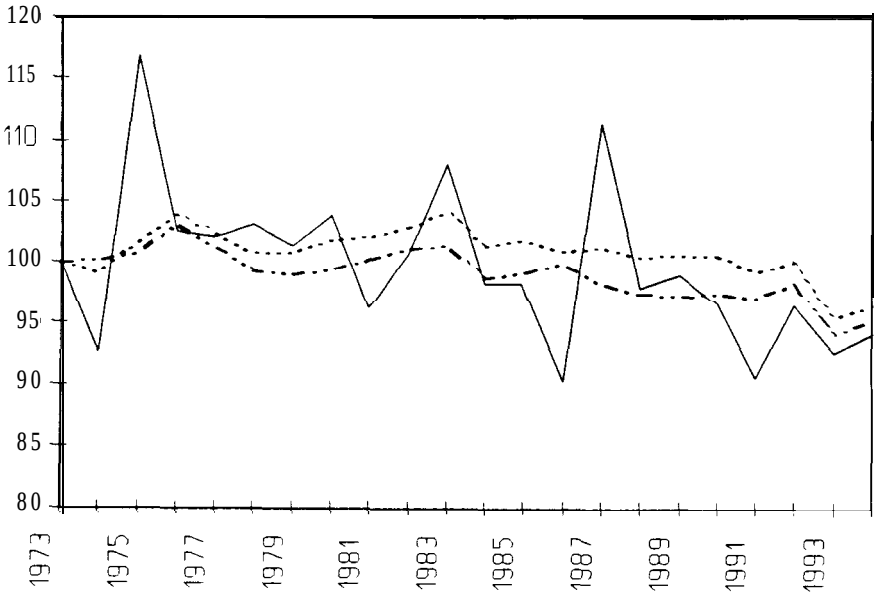
Here the charts for France and Italy, at first sight, picture an almost identical trend. There has been a clear shift from the demand for wine to the demand for beer. In the 1970's the French were drinking almost 2 1/2 times as much wine as beer. This ratio has decreased to 1.5 in the 1990's. Traditionally beer has even been less popular in Italy. In 1975 the consumption of wine was almost eight times that of beer. In 1995 this ratio has decreased to somewhat over 2.

In addition to the graphs, table 1 gives some keynote data which indicate the order of magnitude of total per capita demands for wine and beer in the countries of our study. It shows that the consumption of beer has been, and still is, by far the largest in Germany. The Germans drink more wine than the Dutch, although consumption of wine has increased with approximately 50% in the Netherlands over the last two decades. Total demand for both alcoholic beverages taken together was high in France and Germany in the 1970's whereas in recent years the French have moderated their drinking habits so much that nowadays the Dutch are more heavy drinkers than the French.

Figure la. Demand for beer and wine per capita (1973=100)

legenda: - - - - = wine
— · · — = deer
●●●●●●●● = wine + beer

Germany



The Netherlands

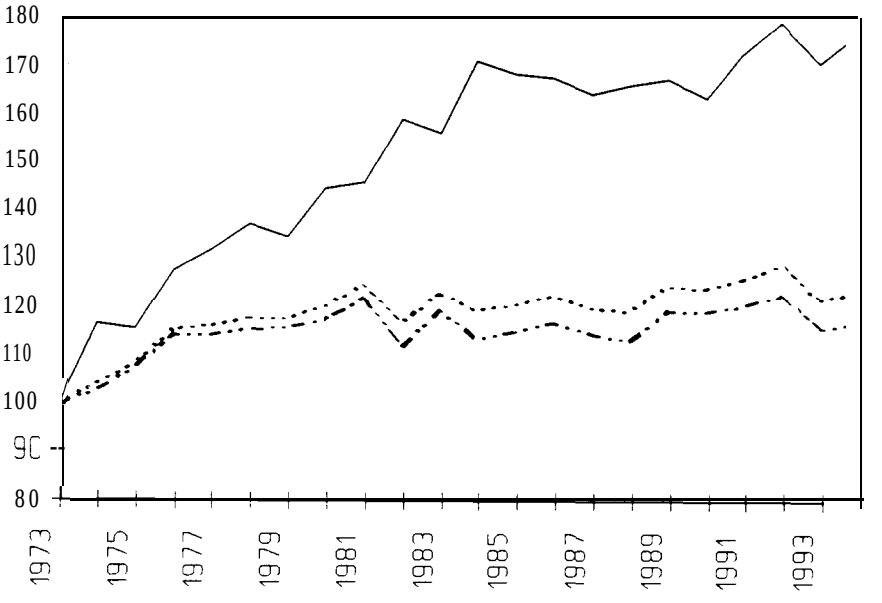
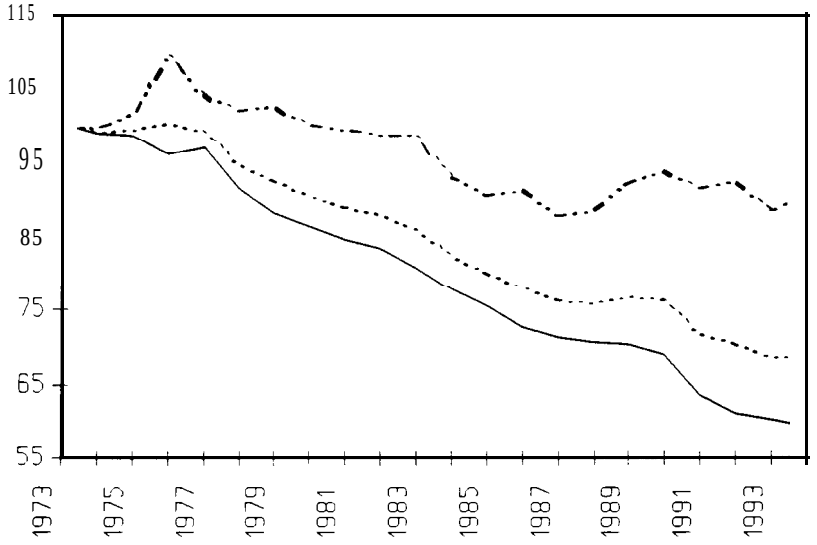


Figure la (cont.)

France



Italy

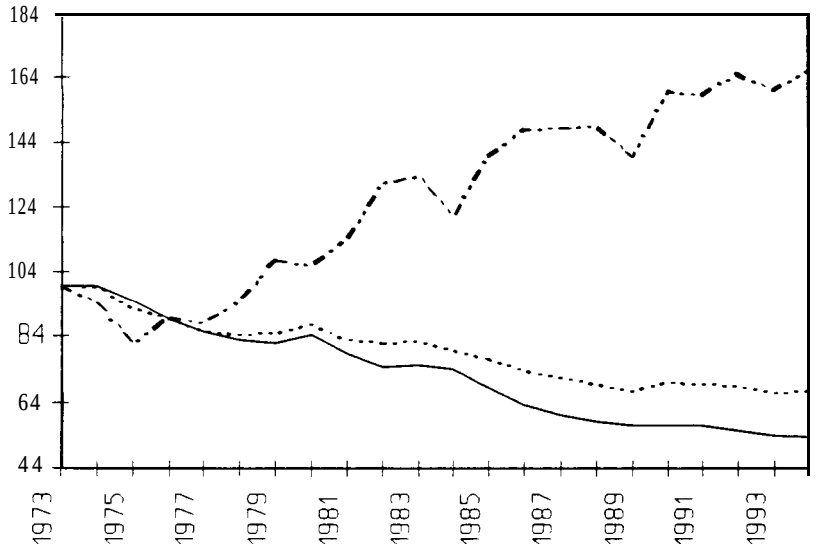
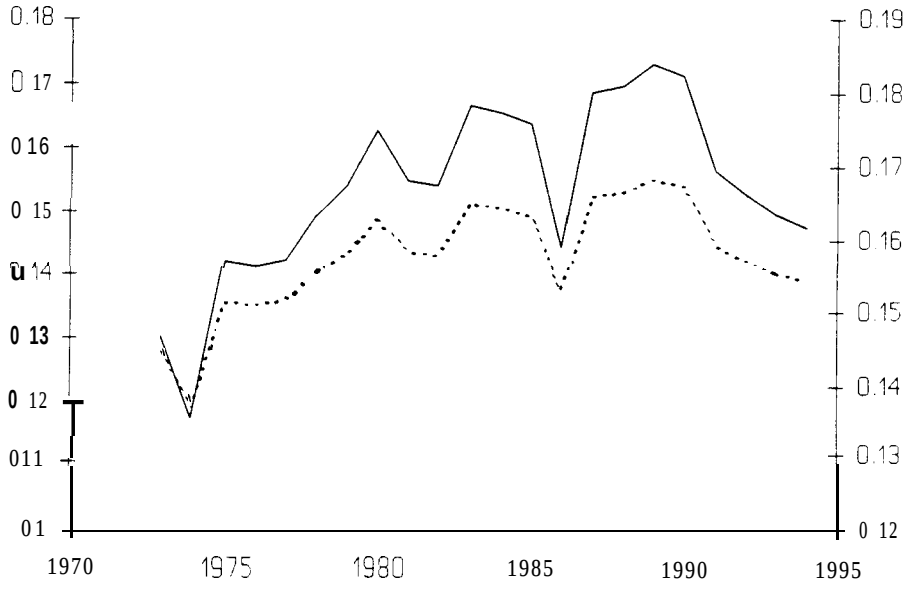


Figure lb. Relative demand for wine as share of beer and as share of beer+wine

legenda: - - - - = wine/(beer + wine) [left]
●●●●●●●● = wine/beer [right]

Germany



The Netherlands

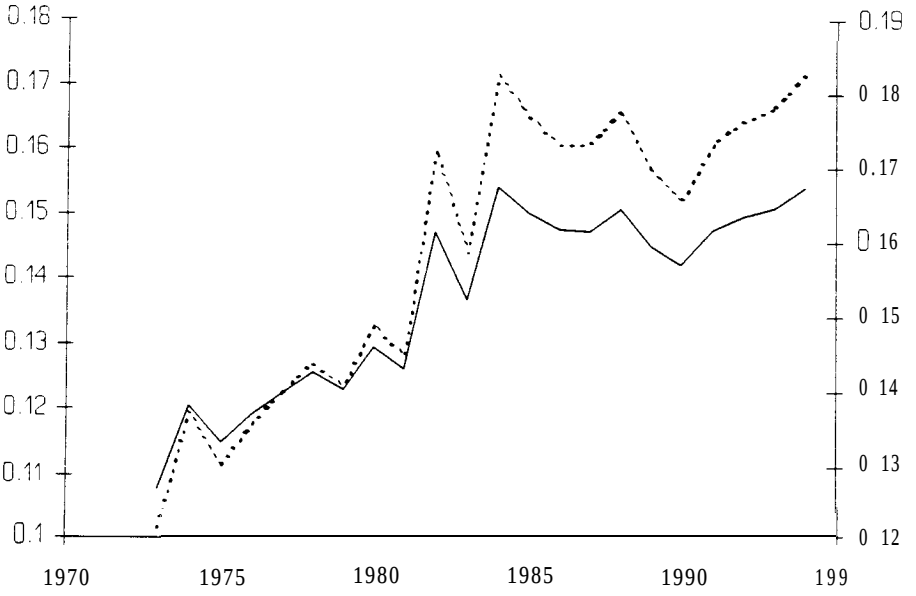
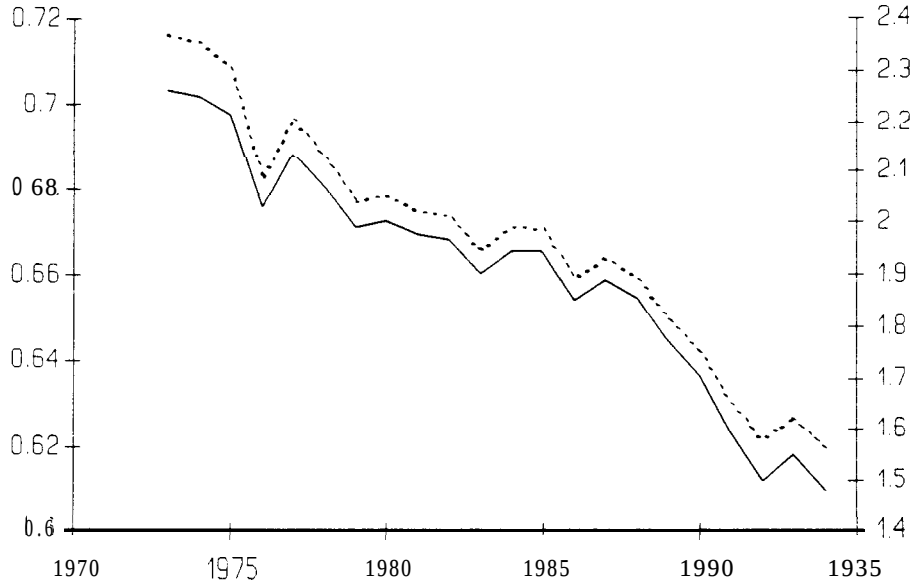


Figure lb (cont.)

France



Italy

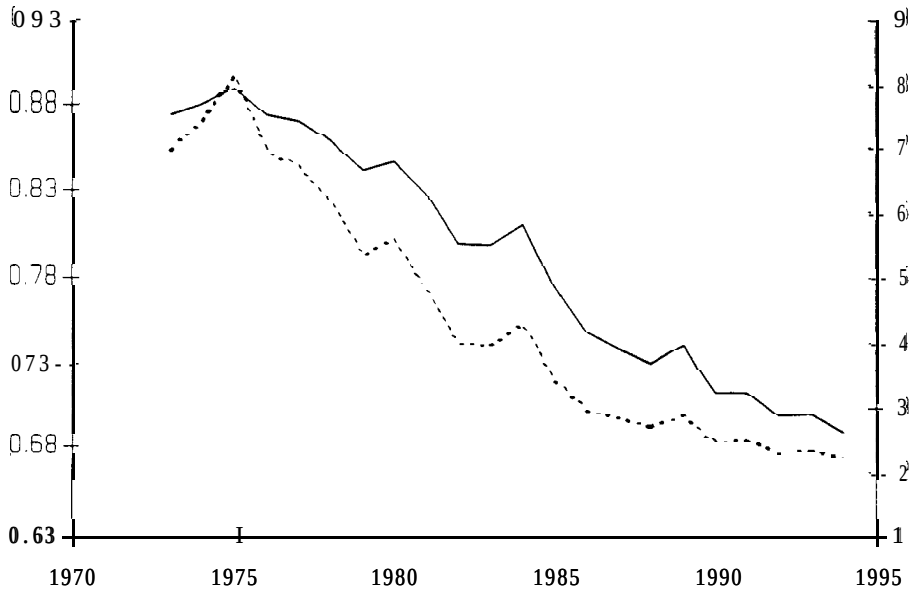


Figure 2. Relative price of beer as compared with price of wine (p_b/p_w)

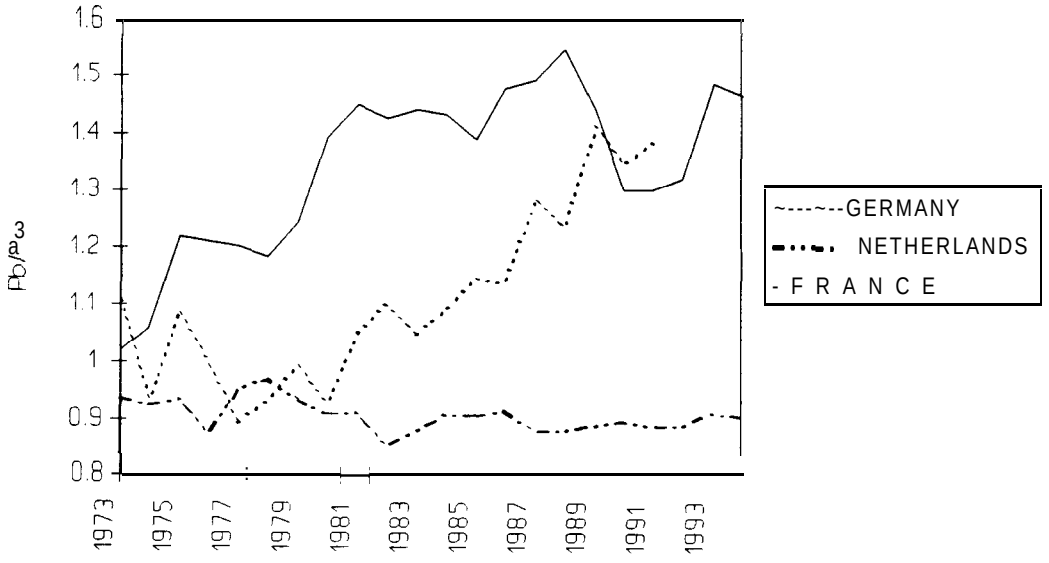


Figure 2 pictures the development of the price of beer relative to the price of wine. The relative price increased somewhat in France and Germany and remained almost constant in the Netherlands. Of course it should be noted that these time series of relative prices at the macro level may not take sufficiently account of differences in quality. When, in one of these counties, there has been a general tendency towards purchase of a higher quality of wine, or of beer, this would have been registered as a relative increase in the price of wine, or of beer. Anyhow, the relative price movements pictured in figure 2 will be unable to explain the shifts in the shares of these alcoholic beverages which were revealed in the previous graphs.

Table 1. Keynote data on the demand for beer and wine

	Germany	Netherlands	France	Italy
P.c. consumption of beer, 1975 (litres)	147.8	79.0	**44.9**	12.8
P.c. consumption of beer, 1985 (,,)	145.5	84.5	40.1	21.9
P.c. consumption of beer, 1994 (,,)	139.6	86.0	40.0	26.2
P.c. consumption of wine, 1975 (litres)	23.2	10.3	103.7	103.9
P.c. consumption of wine, 1985 (,,)	25.6	15.0	79.7	75.0
P.c. consumption of wine, 1994 (,,)	22.6	15.7	62.5	58.5
Share of wine in tot. cons., 1975	0.186	0.115	**0.698**	**0.890**
Share of wine in tot. cons., 1985	0.150	0.150	0.665	0.774
Share of wine in tot. cons., 1994	0.139	0.154	0.610	0.691

3. **The model**

3.1 Survey of the literature

A number of other empirical studies has investigated the demand for beer and/or wine as part of a system of demand equations. In this vein Clements and Johnson (1983) considered the demand for beer, wine, and spirits as a full demand system, given the total demand for these three alcoholic beverages. Hence, their methodological approach resembles our two step procedure where we start to estimate an equation for the demand for beer and wine together and next consider the distribution of total demand over wine and beer. As our study concentrates on preference shifts between the demand for wine and beer, we deliberately disregard the demand for spirits in our analysis.

In the demand system estimated by Uri (1986), beer and wine are amongst seven different beverages distinguished in the demand system. Here the emphasis is on measuring the substitution between those beverages. The objective is to shed some light on the relevant market for antitrust purposes. However, no clear indication could be obtained which of the beverages considered in the study are so close substitutes that they are in the same product market.

Johnson and Oksanen (1974) also estimate the demand for beer, wine and spirits as a closed system of demand equations. In their study for Canada they consider, besides relative prices and income, a number of socio-economic characteristics, such as region, ethnic group and religious affiliation, as determinants of the demand for alcoholic beverages. A similar study was conducted for the United States by Pompelli and Heien (1982). Although both studies find a significant contribution of socio-economic determinants in the explanation of the demand for alcoholic beverages, these studies are not concerned with preference shifts. The major motivation for these studies is the fact that governments usually raise considerable revenues from taxing alcoholic beverages. (See also the study on the demand for beer by Hogarty and Elzinga, 1972).

In their micro study on the demand for domestic and imported white wine in the United States, Pompelli and Heien (1991) use a two-step procedure. First they consider whether a household consumes white wine or not, and if so, the second step is to determine how much wine is purchased by the household. They distinguish between heavy users and light users. Apart from prices and income they also consider a number of demographic determinants. Like many other studies they found inelastic price and income elasticities.

3.2 Modelling preference shifts in consumer demand functions

Of course, the eyeball tests in section 2 (rising relative wine consumption in the Nordic countries and declining relative wine consumption in the Mediteranean countries) are informal and not very sophisticated. In fact, other phenomena may be able to explain the findings in figures la and lb. For instance, in our interpretation so far we have not allowed for changing relative prices of wine and beer, nor for changes in income. First, suppose that relative prices have changed over time. In that case one would expect a shift towards the good that has become cheaper. In fact, this shift towards the cheaper good would be caused by preferences that are stable over time and would not be any indication of a preference shift. Another confounding factor may be changes in income. Suppose for the moment that the income elasticity of wine exceeds the income elasticity of beer. In that case, if income increases, one expects increased relative demand for wine. However, these two arguments are not a convincing explanantion of the trends depicted in figures la and lb. It seems unlikely that the relative price of wine has dropped in The Netherlands (leading to an increase of relative demand for wine) and has increased in Italy (leading to a decrease of relative demand for wine) during a period of ever tighter European integration. In order to

allow for changing demand patterns caused by changes of prices or income we need a more structured approach. To this end we discuss a simple utility maximization model.

We assume that preferences are separable between wine and beer on the one hand and other goods on the other hand. Of course, the separability assumption imposes restrictions on the substition patterns of the consumer but this need not be a problem of practical significance since beer and wine are close substitutes (the implications of the separability assumption are discussed in detail in Deaton and Muellbauer, 1980). The practical advantage of this assumption is that we can concentrate our modelling efforts on the choice between wine and beer consumption taking total expenditures on wine and beer as given. Hence, we can assume that demand for wine and beer demand follows from maximization of the utility function

$$u = u\,(q_w,\ q_b,\ \theta)$$

subject to the budget constraint

$$p_w q_w + p_b q_b = y_{wb}$$

where θ denotes the vector of parameters of the utility function, and y_{wb} are the total expenditures on wine and beer. Total consumption y_{wb} depends on the relative preference for wine and beer versus other goods, all prices in the economy, and on total income. Using this model we can be more explicit about the hypothesis we would like to test. If wine has become more popular relative to beer one would find that the marginal rate of substitution of beer for wine α (CY = u_{qb}'/u_{qw}', i.e. the amount of wine one requires to remain on the same utility indifference curve if beer consumption is decreased by 1 unit) has increased over time. Of course, this marginal rate of subsitution depends on the parameters θ of the utility function and in general on the amount of wine and beer consumed as well.

An ideal approach to an empirical examination of our hypothesis would be to estimate α (perhaps non-parametrically) on a yearly basis for each country. Such an estimate could be obtained by fitting a demand system to a yearly series of cross-section data. If one would allow for addiction to wine or beer (see for instance Becker and Murphy, 1988), data requirements are even stronger: one would need a panel dataset so that lagged consumption can be included in the demand system. The development of the estimated α's over time would provide the information we are looking for.

Unfortunately, our data do not permit such a detailed approach. Instead, we will estimate demand functions on an aggregate level and see whether they change over time. To fix ideas, consider a utility maximization model with preferences

$$u(q_w,q_b) = \left(\frac{q_w}{\beta_1} + \frac{\beta_2}{\beta_1^2}\right) \cdot \exp\left(\frac{\beta_1^2 q_b - \beta_1 q_w + \beta_0\beta_1}{\beta_2 + \beta_1 q_w}\right)$$

Maximizing this utility function subject to the budget constraint

$$p_w q_w + p_b q_b = y_{wb}$$

gives the linear demand function

$$4, = \beta_0 + \beta_1 \bar{y} + \beta_2 \bar{p}$$

where

$$\bar{y} = y_{wb} / p_b \quad and \quad \bar{p} = p_w / p_b$$

Of course, the demand for beer follows directly from the budget restriction. In this model of choice there is no unobserved heterogeneity: every two households with the same income are making the same choice. That is not realistic, of course. To allow for heterogeneity one can assume that β_0 follows a normal distribution with

$$\beta_0 \sim N(\overline{\beta_0}, \sigma^2_b)$$

so that the demand equation becomes

$$q_{wt} = \overline{\beta_0} + \beta_1 \bar{y}_t + \beta_2 \bar{p}_t + \varepsilon_t.$$

where ϵ follows a normal distribution with mean 0 and variance σ^2. This specification is more fit to estimation as it allows for deviations from predicted beer consumption. In this specification the marginal rate of subsitution of wine for beer is

$$a = u'_{q_b} / u'_{q_w} = - \frac{\beta_1 q_w + \beta_2}{\beta_1 q_b - q_w + \beta_0}$$

If we assume that the Slutsky condition is satisfied (i.e. $\beta_1 q_w + \beta_2 < 0$), then this rate of substitution decreases with β_0, so that changing preferences over time can be modeled by

parametrizing the mean of β_0 as a function of time. For example, we could estimate the regression function

$$4_{,} = \delta_0 + \delta_1 t + \beta_1 \overline{y_t} + \beta_2 \overline{p_t} + \varepsilon_t.$$

The sign and the magnitude of δ_1 indicates whether demand for beer has increased or decreased over time, if we allow for changes of relative prices over time and changes of income.

Our empirical analysis in the next section will be based on aggregate data so we cannot follow the structural model described above precisely. The main idea of adding a time trend to a demand specification will be followed, though. Of course, one can interpret the aggregate relations estimated as behavioral relationships of a representative agent.

Even though micro data would be ideal to examine the issue of changing preferences over time, use of macro data need not necessarily be disadvantageous. The use of aggregate data has two advantages over the use of micro data. First, we are able to add lagged consumption as an explanatory variable while this variable is usually missing in micro datasets. Second, aggregate data on the consumption of alcoholic beverages may be more reliable than micro data. Individual persons may be embarrassed when asked about their consumption of wine or beer, and may be likely to understate their true consumption. Aggregate data are based on data from retail outlets, importers, exporters, and producers and therefore may be more reliable.

4. Empirical analysis

This section discusses the estimation results for a number of specifications of the demand equations for wine and beer, which are based on the previous theoretical argumentation. A preliminary question when estimating the specifications that theory suggests is whether all series used in the estimation are stationary. Inspection of graphs 1 and 2 makes us suspicious that it is not the case for all series considered. Formal testing for stationarity using the augmented Dickey-Fuller test confirms this suspicion for at least some series. The power of this test is, however, rather low if the number of observations is as limited as in our study. Therefore we keep our estimation procedure simple and in line with the theoretical specification in levels derived above, and do not use a more elaborate estimation strategy (see e.g. Hamilton, 1994).

Table 2 shows the estimation results for the simple log-linear regression equation for total demand for wine and beer taken together. Disposable income is the explanatory variable and a Koyck-lag is included in the specification in order to allow for partial adjustment to long run equilibrium. It is shown that in all countries considered demand for beer plus wine is inelastic and in France the income elasticity is negative which indicates that the sum of these alcoholic beverages is even an inferior good in this country. The latter is in conformity with

the decreasing trend in per capita consumption as depicted in figure la for France, and the fact that this decrease coincided with an increase in disposable income. The highest income elasticity is found for the Netherlands where its long run value is estimated to be 0.72. The estimation result for France shows the largest recognition lag: the mean lag is somewhat longer than one year. The R^2 and the standard deviation of the residuals indicate that the fit is much better in the equations for the Netherlands and for France than for Germany and Italy. From the small values found for the normally distributed Durbin's h-test on residual autocorrelation it appears that there is no much autocorrelation left after inclusion of the lagged dependent variable as determinant.

Table 2. **Determinants of the total demand for beer and wine** (t-values in parentheses)

$\ln q = c + \alpha_L \ln q_{-1} + \alpha_1 \ln y_d$

Explanatory variables	c	α_L	α_1	R^2	SR	Durb. h alt.
Total (q)						
Germany	32.22 (3.07)	0.20 (0.74)	0.11 (1.72)	0.47	0.0506	-0.03
Netherlands	15.07 (6.25)	0.27 (1.93)	0.53 (4.08)	0.98	0.036	-1.02
France	18.76 (2.78)	***0.64*** (4.92)	-0.11 (-2.89)	0.96	0.035	1.46
Italy	23.65 (3.08)	0.41 (2.16)	0.0506 (0.24)	0.56	0.065	0.50

Tables 3 to 6 give the estimation results for the demand for wine (tables 3 and 5) and beer (tables 4 and 6), given the aggregated demand for wine and beer. Here the variable y_{wb} represent the total expenditures on wine and beer deflated by the price of wine, whereas y_{bw} is computed as total expenditures deflated by the price of beer. The focus of this empirical analysis is on measuring the elasticity of the demand for beer and wine with respect to the relative prices, where we allow in our specification for autonomous preference shifts. In tables 3 and 4 this preference shift is represented by a simple time trend, whereas in tables 5 and 6 we have taken disposable income as indicator of preference shifts. The idea behind the latter specification is that the shift of preferences concurs with the increasing welfare, where in the Southern countries beer becomes a respectable alternative for drinking wine and in the

Northern countries drinking wine instead of beer becomes fashionable. It is noticable that, whereas in the Northern countries wine has to be imported for the South, locally brewed beers in the Southern countries often have a German brand name.

In the demand-for-wine equations of table 3 all shift parameters obtain significant values. They suggest a shift from beer to wine in the Netherlands, and also in Germany (in spite of the fact that this shift is not clear from inspection of figure la) and a shift from wine to beer in France. According to this specification France exhibits the highest price elasticity (in absolute value). The coefficient value for the price variable obtains the wrong sign in the equation for the Netherlands. Another somewhat unexpected outcome of this equation, which may be related to the wrong sign of the price elasticity, is the negative value for the coefficient β_1, which we expect to be close to unity (as in the equations for Germany and France).

Table 5 shows that the estimation results do not differ very much when the time trend is replaced by disposable income as indicated of preference shifts. Again the price elasticity in France is the highest. And again the value for the price elasticity in the Netherlands obtains the wrong sign. As in table 3, the Durbin-Watson statistic for France suggests some autocorrelation of residuals, even though it is still above the lower critical value of 0.773.

Table 3. Determinants of the total demand for wine with a time trend representing preference shifts. (t-values in parentheses)

$$\ln q_w = \delta_0 + \delta_1 \ln t + \beta_1 \ln y_{bw} + \beta_2 \ln p_w/p_b$$

Explanatory variables	δ_0	δ_1	β_1	β_2	R^2	SR	DW
Wine (q_w)							
Germany	-9.08	0.071	1.30	-0.21	0.76	0.04	2.12
	(-0.56)	(4.97)	(1.86)	(-1.67)			
Netherlands	21.47	0.25	-0.14	0.36	0.97	0.04	1.39
	(2.62)	(5.22)	(-0.36)	(1.16)			
France	-9.10	-0.03	1.38	-1.00	0.96	0.02	1.03
	(-4.15)	(-2.09)	(14.44)	(-12.48)			

The estimation results for the demand for beer in tables 4 and 6 are more in conformity with our a priori expectations. Again all parameters for the preference shifts obtain significant

values. We again estimate a shift from beer to wine in Germany and the Netherlands and a shift from wine to beer in France. Now all values of the coefficients of the price elasticities have the expected negative signs. Here the highest price elasticy (in absolute value) is found for the Netherlands, whereas the price elasticity in France is the lowest of the three countries considered. It may seem that the apparent asymmetry in the estimation results for the demand equations for beer as compared to the demand for wine is somewhat puzzling. However, this asymmetry can be explained when considering the utility function of section 3.2. The utility parameters β_0, β_1, and β_3 measure the trade-off between wine and beer. If one imposes the preference structure $u(q_w, q_b)$, demand for wine will be

$$q_w = \beta_0 + \beta_1 \frac{y}{p_b} + \beta_2 \frac{p_w}{p_b}$$

and the demand for beer is

$$q_b = \frac{y}{p_b} - p_w q_w$$

Of course, these p-parameters are different from the ones one would find if the equation

$$q_b = \gamma_0 + \gamma_1 \frac{y}{p_w} + \gamma_2 \frac{p_b}{p_w}$$

were to be estimated. The latter specification corresponds to preferences $u(q_b, q_w; \gamma_0, \gamma_1, \gamma_2)$. For that reason, the results in table 4 are, after all, not a mirror image of those in table 3, because they correspond to a different preference ordering. The same applies for the results in table 5 as compared to those of table 6. Yet, in these demand equations for beer the values of the coefficient β_1 are remarkably close to unity in comparison to the results of demand-for-wine equations. The similarity of the results in tables 3 and 5, and in tables 4 and 6, indicate that the regression results are quite robust with respect to the specification of the shift indicator.

The specifications in tables 2 to 6 have the volumes of consumption of beer and wine as dependent variables. Tables 2a to 6a in Appendix B give the estimation result for similar specifications where the per capita volumes of consumption are taken instead of the volumes of consumption uncorrected for the size of population. However, the interpretation of the regression result does not alter much in case of this specification change, so that it can be concluded that the estimation results are also quite robust in this with respect.

Table 4. **Determinants of the total demand for beer with a time trend representing preference shifts.** (t-values in parentheses)

$\ln q_b = \delta_0 + \delta_1 \ln t + \beta_1 \ln y_{wb} + \beta_2 \ln p_b/p_w$

Explanatory variables	δ_0	δ_1	β_1	β_2	R^2	SR	DW
Beer (q_b)							
Germany	1.32 (0.52)	-0.01 (-5.00)	0.94 (8.55)	-0.82 (-8.2)	0.87	0.01	2.15
Netherlands	-4.39 (-2.91)	-0.04 (-4.44)	1.21 (1.73)	-0.97 (-10.78)	0.99	0.01	1.30
France	-5.95 (-2.00)	0.08 (4.00)	0.68 (5.67)	-0.51 (-4.64)	0.72	0.02	1.34

Table 5. **Determinants of the total demand for wine with the size of disposable income as indicator for preference shifts.** (t-values in parentheses)

$\ln q_w = \delta_0 + \delta_1 \ln y_d + \beta_1 \ln y_{bw} + \beta_2 \ln p_w/p_b$

Explanatory variables	δ_0	δ_1	β_1	β_2	R^2	SR	DW
Wine (q_w)							
Germany	-15.88 (-0.82)	0.20 (3.55)	1.36 (1.62)	-0.11 (-0.66)	0.66	0.05	1.83
Netherlands	2.20 (0.42)	0.52 (4.60)	0.15 (0.39)	0.53 (1.59)	0.96	0.04	1.21
France	-4.37 (-0.92)	-0.06 (-1.81)	1.25 (7.21)	-0.90 (-8.79)	0.98	0.02	0.82

Table 6. **Determinants of the total demand for beer with the size of disposable income as indicator for preference shifts.** (t-values in parentheses)

$$\ln q_b = \delta_0 + \delta_1 \ln y_d + \beta_1 \ln y_{wb} + \beta_2 \ln p_b/p_w$$

Explanatory variables	δ_0	δ_1	β_1	β_2	R^2	SR	DW
Beer (q_b)							
Germany	2.36	-0.03	0.93	-0.79	0.83	0.007	1.94
	(0.81)	(-3.75)	(7.32)	(-7.12)			
Netherlands	-1.31	-0.10	1.18	-0.91	0.99	0.007	1.24
	(-1.48)	(-5.03)	(18.14)	(-11.72)			
France	-.644	0.15	1.05	-0.59	0.66	0.03	0.90
	(-0.99)	(3.48)	(4.45)	(-4.03)			

5. Conclusion

This paper gives an empirical analysis of preference shifts and relative price and income elasticities in the demand for beer and wine. In the Netherlands and Germany beer has been the traditional alcoholic beverage, whereas wine played this role in Southern European countries like France and Italy. Growing welfare and increasing integration have resulted in some convergency in drinking habits in the European countries. In the Northern countries it became fashionable to drink wine, whereas in the Southern countries there has been a preference shift in the opposite direction, namely from wine to beer. Our estimation results show that it is necessary to take these preference shifts into account when measuring the price elasticities for the demand for beer and wine. According to almost all specifications the demand for beer and wine appears to be inelastic with respect to prices. The highest price elasticity (in absolute value) in the demand for beer equations are found for the Netherlands, whereas price elasticities are highest for France in case of the demand for wine. In the demand-for-wine equations the coefficient value for relative prices obtained the wrong sign in the Netherlands. Income elasticities for the demand for beer and wine taken together are below unity in all countries considered, and are even negative in France, which indicates that these alcoholic beverages are, in the terminology of consumer theory, an inferior good in this country.

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Appendix A Sources of data

	Q_b	Q_w	P_b	P_w	Y_d	POP
Nethld.	World drink trends 1995	World drink trends 1995	Statistical Yearbook of the Nethld.	Statistical Yearbook of the Nethld.	National Accounts (OECD)	Eurostat
Ger.	World drink trends 1995	World drink trends 1995	Statistical Yearbook of Germany	Statistical Yearbook of Germany	National Accounts (OECD)	Eurostat
Fr.	World drink trends 1995	World drink trends 1995	Statisitcal Yearbook of France	Statistical Yearbook of France	National Accounts (OECD)	Eurostat
It.	World drink trends 1995	World drink trends 1995	not available	not available	National Accounts (OECD)	Eurostat

OECD: Organization of Economic Co-operation and Development.

Q_b = Per capita consumption of beer
Q_w = Per capita consumption of wine
P_b = Consumption price index of beer
P_w = Consumption price index of wine
Y_d = National disposable income
POP = Population

Appendix B Alternative specifications for regression equations

Table 2a. Determinants of the total demand for beer and wine (t-values in parentheses)

$\ln (q/Pop) = c + \alpha_L \ln (q/Pop)_{-1} + \alpha_1 \ln (y_d/Pop)$

Explanatory variables	c	α_L	α_1	R^2	SR	Durb. h alt.
Total (q/Pop)						
Germany	4.78 (2.60)	0.35 (1.25)	0.06 (0.82)	0.35	0.055	-0.49
Netherlands	1.14 (3.35)	0.39 (2.60)	0.32 (2.91)	0.95	0.039	-1.13
France	3.68 (2.62)	0.72 (6.55)	-0.13 (-2.60)	0.98	0.035	0.86
Italy	3.64 (2.76)	*0.44* (2.44)	0.027 (1.50)	0.35	0.066	0.57

Table 3a Determinants of the per capita demand for wine with a time trend representing preference shifts (t-values in parentheses)

$\ln (q_w/Pop) = \delta_0 + \delta_1 \ln t + \beta_1 \ln (y_{bw}/Pop) + \beta_2 \ln p_w/p_b$

Explanatory variables	δ_0	δ_1	β_1	82	R^2	SR	DW
Wine (q_w/Pop)							
Germany	-8.71 (-2.26)	*0.06* (4.59)	2.29 (3.05)	-0.41 (-2.56)	0.80	0.02	1.91
Netherlands	3.15 (2.12)	0.20 (7.73)	-0.23 (-0.67)	0.37 (1.29)	0.96	0.03	1.60
France	-2.01 (-5.47)	-0.02 (-1.46)	1.33 (18.58)	-0.95 (-14.11)	0.99	0.02	1.07

Table 4a. **Determinants of the per capita demand for beer with a time trend representing preference shifts** (t-values in parentheses)

$\ln (q_b/Pop) = \delta_0 + \delta_1 \ln t + \beta_1 \ln (y_{wb}/Pop) + \beta_2 \ln p_b/p_{wb}$

Explanatory variables	δ_0	δ_1	β_1	β_2	R^2	SR	DW
Beer (q_b/Pop)							
Germany	0.77 (1.24)	-0.01 (-5.00)	0.82 (6.83)	-0.73 (-7.3)	0.88	0.005	1.93
Netherlands	-1.14 (-4.38)	-0.04 (-8.00)	1.23 (20.5)	-1.00 (-12.5)	0.99	0.01	1.58
France	0.18 (0.38)	0.07 (3 SO)	0.72 (8.00)	-0.51 (-2.98)	0.89	0.02	1.38

Table 5a **Determinants of the per capita demand for wine with the size of disposable income as indicator for preference shifts.** (t-values in parentheses)

$\ln (q_w/Pop) = \delta_0 + \delta_1 \ln (y_d/Pop) + \beta_1 \ln (y_{bw}/Pop) + \beta_2 \ln p_w/p_b$

Explanatory variables	δ_0	δ_1	β_1	82	R^2	SR	D W
Wine (q_w/Pop)							
Germany	-13.80 (-3.53)	0.19 (4.05)	2.94 (3.82)	-0.42 (-2.42)	0.77	0.04	1.84
Netherlands	-3.52 (-3.65)	0.43 (5.98)	0.38 (1.12)	0.49 (1.42)	0.94	0.03	1.25
France	-1.77 (-1.68)	-0.03 (-0.66)	1.33 (9.54)	-0.91 (-11.46)	0.99	0.02	0.92

Table 6a. **Determinants of the per capita demand for beer with the size of disposable income as indicator for preference shifts.** (t-values in parentheses)

$$\ln (q_b/Pop) = \delta_0 + \delta_1 \ln (y_d/Pop) + \beta_1 \ln (y_{wb}/Pop) + \beta_2 \ln p_b/p_{wb}$$

Explanatory variables	δ_0	δ_1	β_1	β_2	R^2	SR	DW
Beer (q_b/Pop)							
Germany	1.56 (2.57)	-0.03 (-4.17)	0.72 (6.04)	-0.63 (-6.34)	0.87	0.006	1.90
Netherlands	0.025 (0.15)	-0.08 (-6.28)	1.13 (19.72)	-0.88 (-11.59)	0.98	0.007	1.25
France	-1.88 (-1.22)	0.13 (2.33)	0.89 (4.38)	-0.51 (-3.46)	0.85	0.03	0.89