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JÖNKÖPING UNIVERSITY

In Vino Veritas

An Estimation of the Export Demand Function for Chile's Export of Wine
to 15 OECD Countries

Master's Thesis within Economics

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Sammanfattning

Denna uppsats undersöker hur efterfrågan av Chilenskt vin påverkas av importländernas inkomst, relativpriset på Chilenskt vin i förhållande till genomsnittspriset på den totala importen av vin, avståndet mellan handelsparterna och inhemsk vinproduktion i importlandet. Studien innefattar 15 OECD länder mellan åren 1998 och 2002.

En utökad exportefterfrågefunktion ligger till grund för den empiriska undersökningen och resultaten visar signifikanta variabler med förväntade tecken. Vidare utvidgas ekvationen för att beakta tidseffekter, nämligen genom att inkludera genomsnittsvärdet på den beroende variabeln och dummy variabler för treårsperioder. Genom detta stiger förklaringsgraden i regressionen från 27,8 till 58,1 procent. De estimerade långsiktiga effekterna i efterfrågan för Chilenskt vin visar att en ökning med en procent av importörernas inkomst också ökar efterfrågan på Chilenskt vin med ungefär 0,8 procent. En lika stor ökning i relativpriset minskar efterfrågan med ungefär 0,3 procent. Ökat avstånd mellan handelsparterna med 1000 kilometer minskar efterfrågan med 16,6 procent. Om importören är ett vinproducerande land är efterfrågan 85 procent lägre än om landet inte producerar vin.

Resultaten stämmer överens med teorierna om exportefterfrågan men skillnader mellan vinproducerande länder är i vissa fall stora. En anledning för detta kan vara skillnader i produktionsvolym av vin mellan länder, en annan att det finns starka kulturella associationer till inhemska produkter som gör att konsumenter föredrar inhemska produkter framför utländska.

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Abstract

This thesis examines how the export demand for Chilean wine is affected by importers income, relative prices, distance between trading partners and domestic wine production between 1988 and 2002 in 15 OECD countries.

The empirical test is based on an extended export demand function, and the results show significant estimates with expected signs. Adjusting for time period specific effects by including dummy variables for three year periods and running the regression on the average values of Chilean export of wine increased the coefficient of determination from 27.8 to 58.1 percent. The long run effect on demand for Chilean wine indicates that a one percent increase in importers' income raises demand for Chilean wine with about 0.8 percent. A similar increase in the relative price of Chilean wine to the world price of wine decreases demand with about 0.3 percent. Increasing distance with 1000 kilometres decreases demand for exports with approximately 16.6 percent. If the country is a wine producer demand is about 85 percent lower compared to non producing countries.

The results are in line with the theories on export demand, however among the wine producing countries there are large differences among countries in their demand for Chilean wine. One reason could be different volume of own production, another cultural associations to domestic products making preferences biased towards the domestic variety.

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1 Introduction

For developing countries the realisation of their comparative advantage and export possibilities could be of major importance for being able to increase growth and wealth. Meeting the world demand in the export products that are supplied by developing countries must be taken into consideration, production needs to match world demand for the exports to be beneficial for the country. To differentiate products to make them attractive at the world market plays an important role for exports to be a promoter of growth.

The Chilean case of export-led growth is interesting since it has focused on natural resource exports and agricultural exports and has been successful. Exports of natural resources has been and is vital in the developing world, however its dominance has declined over time, in 1965 the raw material export was 91 percent of total exports from the developing countries, in 1985 it had declined to 68 percent (Radetzki 1989).

Specializing partly in fruit production Chile has improved the wine industry towards one of the world's best. Between 1992 and 2002 the export of wine increased fivefold, during 2004 the increase was 25 percent (Olsson 2005). The way to successful export development lies to a large extent in realizing what determines the demand for exports and is interesting when discussing other countries development and path of economic growth.

In comparison to the four largest wine producers, France, Italy, Spain and the United States, Chile's wine production has been increasing with about 5.5 percent between 1997 and 2000 as the "traditional wine countries" has decreased their production with 3.4 to 12.7 percent. The total world production of wine decreased with 1.7 percent during the same period (Wine Institute 2004^a). Chile is today the fifth largest wine exporter in the world after Italy, France, Spain and Australia (Olsson 2005).

The wine industry has over time faced periods of flourishing export booms but also the effects of overproduction leading to excess supply and falling prices. For any industry it is important to identify the demand since it can have severe effects on the industry, employment, country growth and welfare.

Recently the Chilean wine export was debated in the daily press, stressing their extraordinary export performance. The industry uses high technology and is efficient, but at the same time the export value does not increase as much as the export volume. The number of brands on the market has increased, beneficial for the consumers at the expense of producers facing higher competition. The attractiveness of Chilean wines has decreased and they are now marketed to improve its brand and increase demand for it (Olsson 2005).

This thesis will examine the factors that determine demand for the exports of Chilean wine. It is an empirical study based on the export demand function covering 15 OECD countries' demand for Chilean wine during a 15 year period, 1988 to 2002. The sample includes both large and small wine producing countries as well as non wine producing countries, see Appendix 1.

1.1 Purpose

The purpose of this thesis is to analyse which factors that determined the demand for Chilean wine exports in 15 OECD countries between 1988 and 2002.

Importers GDP, the relative price of Chilean wine to the world price of wine, the distance to the importing country, and if the importing country is a wine producer or not are the factors that will be analysed in an export demand function.

1.2 Outline

An introduction to the Chilean economy and the development of the wine industry is presented in section two to provide the reader with a background on Chile, the history of its wine production, the variety of wines, and how production and exports looks like today. Further an explanation of the development of the prices of exported Chilean wines in the top five wine producing countries and the four non wine producing countries in the sample will be presented graphically.

In section three theories on export demand, international trade, product differentiation and demand for varieties are discussed. The logic behind the variables in the export demand function, GDP and relative price, and the extensions to include the variables distance and domestic wine production or not, are introduced in this section as well.

The model to be tested, the sample countries, the data, the years studied, and the results of the empirical analysis are summarized in section four.

The results are analysed to the theoretical framework in section five. The results open for a discussion on the importance of values for consumer preferences.

The conclusions and suggestions for further research are presented in section five.

2 On the Chilean Economy

Chile has through history been depending on exports of raw material from the mining and agricultural sectors. Copper mines were built in the 1930s. Ever since that period Chile has been depending on the world price of copper, being the world's largest exporter of copper. Copper's share of exports has declined through history and today Chile exports fruit, wine, forestry products, and fish (SIIA 2005). During the industrialisation the agricultural production became concentrated to the home market and the more intensive use of labour made the production of agricultural products increase progressively (Andersson 2003). The Chilean economy has been outward orientated and free trade policies have been applied, and it has through this become the most successful country in the Latin American region with stable growth, high exports, high investments, with inflation under control, and a decreasing foreign debt (SIIA 2005).

2.1 The Chilean Wine Industry

The Chilean wine production started off with the arrival of the Spanish conquerors, the catholic traditions of wine production begun in Chile in the 16th century. The first vineyard was registered in 1554 in Copiapó in the north of Chile. At this time the purpose of the small scale wine production was for sacramental wine production. The cultivation technique of wine spread south in Chile to the Bio Bio River, which basically is today's area of wine production.

In the 17th century king Felipe II of Spain forbid expansion of the wine production since it diminished the Spanish wine and beverage exports, however this was overseen by most producers. The export increased rapidly in during the 19th century, in 1831 19 million wine plants excised (Stahre 2005).

Since 1811, Chile has taken actions to develop the agricultural sector and its industry as a step to improve the economic growth in the country. This took the form of increasing knowledge in modern production techniques to intensify production together with diversification of the flora. Education of agronomists in a state run plant-school, Quinta Normal de Agricultura, started in 1830 by the French scientist Claude Gay. Grapes were imported from Italy and France to create the base of the wine production which has been effective in the agriculture sector output. Quinta Normal de Agricultura had over 40,000 different plants and 70 different types of grapes in 1850 (Morel-Astorga 2002, Sthare 2005). Cabernet Sauvignon, Merlot, Pinot Noir, Sauvignon, Sémillion and Riesling were planted and adopted well to the Chilean climate, these grape varieties made up for the base of the modern sector wine production in Chile. In 1889 the Chilean wines won the "Grand prix" of wines in Paris (Stahre 2005).

The modernization of the wine sector in Chile started in a beneficial time, the gold rush in America led to increased Chilean exports in wheat, and capital inflow which could be used to modernize the wine industry. The gains from increased mining activity resulted in investments in the agricultural sector and at the same time Europe's wine industry was in crisis.

The area of wine cultivation increased rapidly between 1873 and 1940, to become three times as large, about 300 million litres were produced at the end of the period. The increase in production at the end of the 19th century was both commercial and small scale production for private consumption (Morel-Astorga 2002). In 1930 restrictions on Chilean ex-

ports of wine were induced after pressure from other wine producing countries (Stahre 2005).

Never the less, the production increased steadily until 1974 with one single drop in 1952. The wine production then increased rapidly and peaked at 648 million litres in 1983. This culminated in an overproduction crisis which decreased output with 50 percent due to the fact that demand did not meet the production output. Since the early 1990s the production has increased slowly again.

The production of wine represented 10 percent of the value of agricultural output and used one percent of the agricultural land in 1947. This trend stayed until 1973 when the contribution from production of wine dropped to 6 percent of the sectoral GDP between 1973 and 1980. There were larger benefits in exporting fruits directly, under the over production crisis and some vineyards shifted production towards fruit during this period (Morel-Astorga 2002). The domestic consumption of wine decreased in the 1970s and 1980s, which led to a severe fall in the price of grapes. The exports of wine have since the 1980s flourished, and as from the beginning of 1990s Chilean wine export has been especially advantageous. The export boom was partly due to the continuous investments in new production technology that came after the shift in regime in 1990. The production has also shifted from domestic quantity production towards production for exports (Stahre 2005).

In 1999 the export value of wine was 500 million US dollar. The wine export has developed similarly to the production, starting as low-price table wines, with increasing average prices over time, in 2001 the average value was 2.61 US dollar per litre. The wines are taxed different from other agricultural products in Chile, both as an agricultural product and as an alcoholic product (Morel-Astorga 2002).

Chile was the 11th largest producer of wine by area in 2001. Chilean vineyards cover 178 hectares of the country, this could be compared with the area of the three largest producers; 1 190 hectares in Spain and 910 hectares in France and Italy (Wine Institute 2004^b).

The success of wine exports, innovations, and entrepreneurship in the wine sector was made possible through access to the market opportunities that the international markets provided (Morel-Astorga 2002).

2.2 Variety of Chilean Wines

The Chilean wine cultivation is characterized by a large variety of grapes, about ten different red grapes and seven white which provides the market with a large variety of wines with different character, taste and alcohol. Depending on, among other things, the grape, vintage, vinification, and growth regulations the quality and prices of wines are determined. Exported wine sells for approximately 3.50 US dollar to 70.0 US dollar a bottle (Wine Searcher 2005). Table wines produced for the domestic market sells at much lower prices, the lower quality being the reason.

The price of the wine per litre exported to the top five wine producing countries and the four non wine producing countries in the sample of this study are shown in diagram 2.1 and 2.2 below respectively. The price per litre of imported Chilean wine is higher in the wine producing countries than in the non wine producing countries. This could imply that wine of higher quality is imported to a higher extent in the wine producing countries in comparison to the non producing countries. One can see that the prices have increased in all wine producing countries except for France. Of the non producing countries the prices

has remained almost unchanged fluctuating slightly in Denmark and the Netherlands. In Norway and Sweden the prices have increased moderately after a large cut in prices in 1990. The price of Chilean wine has been higher in Spain compared to the other countries except for a drop in 1989.

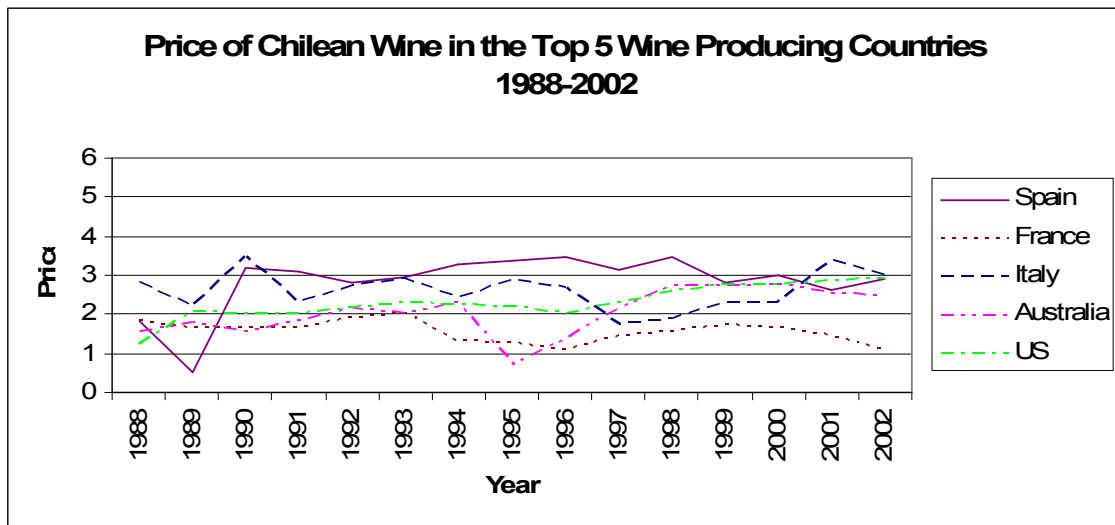


Diagram 2.1 Price (USD/Litre) of Chilean wine in the top 5 wine producing countries 2001 (Wine Institute 2004^a) between 1988 and 2002 (OECD 2005).

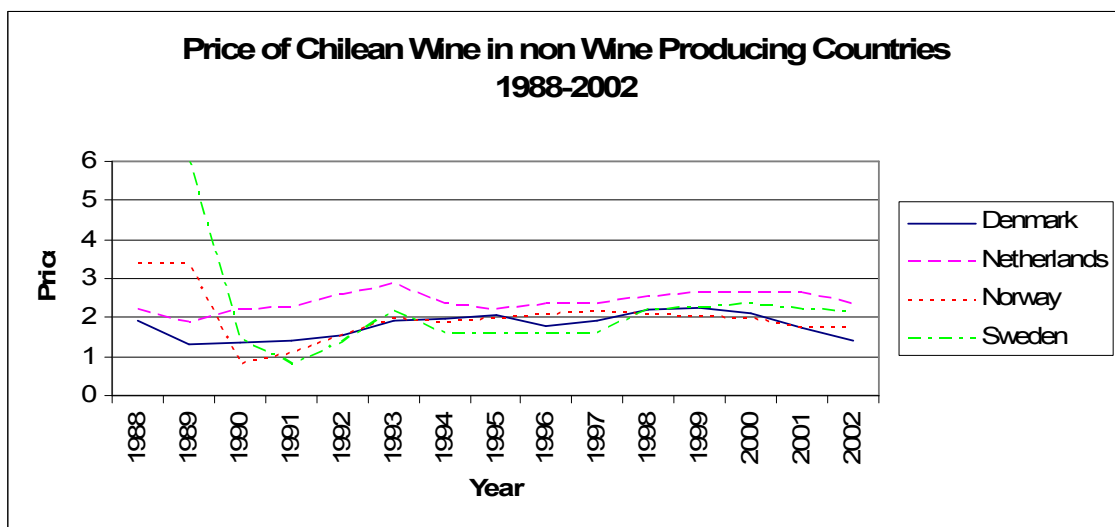


Diagram 2.2 Price (USD/Litre) of Chilean wine in the non wine producing countries 1988 to 2002 (OECD 2005).

3 Theoretical Framework

This section presents a theoretical framework on trade and demand, export demand theory, and the relations between varieties and demand. Moreover the export demand function which will be examined in the empirical test is explained.

3.1 International Trade and Demand

The essence of trading among countries is of course that it will be beneficial. Smith argued in 1776 that international trade would broaden the consumption opportunities in comparison to those of a closed economy. Ricardo presented the concept of comparative advantages in 1817, i.e. countries with the lowest relative price of production is said to have comparative advantage in production of that good, production and trade of those goods will be beneficial (Bowen, Hollander, Viaene 1998). It is therefore crucial for countries to realise their comparative advantage for beneficial trade in a world like Ricardo's.

However if comparative advantage is not met by demand, the production cannot be as beneficial as Ricardo predicted. Burenstam-Linder (1967) stressed contrary to the classical trade theorists that the existence of an export maximum hinders the benefits from trade to be present. His theory of representative demand determines the structure of relative prices for goods. Countries will be more advantageous in production if the demand for the commodity they produce is typical of the country's economic structure compared to other countries. Income per capita is according to Burenstam-Linder the main determinant of demand. Therefore, products in demand in developed countries have unfavourable production functions in underdeveloped countries (Burenstam-Linder 1967).

The existence of economies of scale is an important reason for specialization and trade. Trade is also stimulated by national differences in natural resource endowments and comparative advantages. Thus, international trade is caused not only by factor endowments or technological differences, but also by the presence and realisation of increasing returns to scale (Krugman 1990).

3.2 Export Development and Economic Growth

That factor productivity growth is demand driven is stressed in the neoclassical theory where demand for labour is derived from the demand for output. From a demand-oriented growth perspective as the Keynesian, the realisation of the major constraints on demand is important. This since the effects of demand probably sets in before the supply effects (Thirlwall 2002). If growth depends on the weighted sum of investment, consumption, and the balance of exports and imports, one can see the importance of exports in growth. Thirlwall (2002) argues that exports differ in three aspects from other components of demand. First, export is an exogenous component of demand, since it is determined abroad, whereas the demand for consumption and investment depend largely on the growth of income. Second, export solely is the component that can pay for the import required for growth. Consumption, government expenditure, and investment-led growth can only be defended a short period since they all include imports. Without exports that pay for the import content in the other growth components of expenditure the demand will be restricted. Exports are thus important for balance of payments equilibrium, and it further affects the demand both directly and indirectly since it makes it possible for the other components of demand to augment more rapidly than otherwise. Last, the supply argument for

export-led growth states that the imports allowed through exports might be more productive, since it makes possible the import of goods that are important for development, often specific capital goods that are produced more efficiently abroad.

The income elasticity of the demand for exports determines the development of exports that may spur growth. Normally, the income elasticity of primary commodities is lower than that of most manufactured goods. In a world divided in two parts, developed and developing, with perfect income elasticity ($=1$) prevailing, the world growth of income and the export growth will be equal. However in developing countries the income elasticities are often lower than one and in developed countries higher than one. The result will be that demand for developed countries' exports will be greater than that for the developing countries'. This causes a negative effect on the balance of payments in the developing country (Thirlwall 1999), and dampens the growth opportunities. Senhadji and Montenegro (1999) estimated the income elasticity of the export demand function for the years 1960 to 1993 and found an income elasticity of 0.28 for total Chilean exports.

3.3 The Export Demand Model

With exports being an important component of demand, its growth will affect the growth of output in the long-run. In the export demand function Thirlwall (2002) states the factors that affect export growth. Export demand is a function of relative prices, measured in a common currency which reflects the competitiveness, and the income outside the exporting country:

$$X_t = A \left(\frac{P_{dt}}{P_{ft}} \right)^\eta Z_t^\varepsilon \quad (3.1)$$

Where X_t is the exports at time t , A is a constant, P_{dt} is the domestic price, P_{ft} is the foreign price measured in the same currency, Z_t is the foreign income level, η (<0) is the price elasticity of export demand, and ε (>0) is the income elasticity of demand for exports. The logarithms give the percentage change, expressed in lower-case letters, and the export demand becomes:

$$x_t = \eta(p_{dt} - p_{ft}) + \varepsilon(z_t) \quad (3.2)$$

Hence export growth depends on the price elasticity of export demand multiplied by the change in relative price, and changes in world income times the income elasticity of export demand (Thirlwall 2002).

Assuming that consumers are willing to pay a higher price for a good with higher quality, the relative prices will be an indicator of quality of the product, higher relative prices indicating the Chilean wines being more expensive than the average world prices of imported wines, and associated with higher quality. Inversely, a low relative price would indicate cheaper Chilean wines in relation to the world average price of wines, and hence lower quality. However, since prices affect consumer choice, increased relative price for a good is assumed to decrease demand for that good. The relative price in this study is calculated as the price of Chilean wine in the importing country j to the average price of imported wine in country j . This expresses the relative price of Chilean wine in relation to imported wine in general.

The income in the importing country, measured by GDP, will have large impact on the demand for foreign imports. Higher income level naturally allows for demand of imported goods to be higher. Assuming that wine is a commodity with income sensitive demand, the size of the importer's GDP should positively affect the demand for Chilean wine. Thus, higher GDP will yield higher demand for the Chilean wine.

Except for income and relative prices there are other factors likely to affect the export demand, the ones chosen for the study of the demand for Chilean wine are distance to trading partners and whether or not the importing country is a wine producer. Including these factors of friction in equation 3.1 gives:

$$X_t = A \left(\frac{P_{dt}}{P_{ft}} \right)^\eta Z_t^\epsilon F \quad (3.3)$$

Where F is:

$$F = e^{-(\lambda d + \delta D)} \quad (3.4)$$

The d indicates distance and D is a dummy variable for own production, $D=1$ indicates a wine producing country and $D=0$ indicates a non wine producer. If the importing country has its own wine production it can be of importance to its demand for foreign wine. One can assume that the demand will be lower for foreign wine in countries that have their own wine production. High quality wine on the other hand could be demanded to a higher extent regardless of the domestic production, if it represents a quality variety. Moreover, brand-added values, like psychological meaning, associations, and brand name awareness, are likely to affect demand in countries both with and without domestic production (Riezbos 1996). Preferences most likely differ from consumer to consumer, however, this thesis analyzes the aggregate demand for wine exports. Thus the assumption will be that domestic wine production will dampen the demand for foreign imported wine.

The argument that distance tends to decrease international trade makes sense since the cost of transportation increases with the distance, even though costs of transportation have been reduced along with better technology over the last centuries (Anderson and van Wincoop 2003, Berthelon and Freund 2004). Distance is one of the major determinants of the intensity of trade, according Strivastava and Green (1986) neighbouring countries are more likely to be trading partners than countries with larger geographical distance.

In the case of wine one can assume costs for importers to include travel expenses for quality control and tasting of the product, and thus be higher than for other products. Therefore a longer distance to the trading partner would, due to higher costs, decrease demand. One could expect a negative relation between exports and the distance between two trading countries.

3.4 Product Differentiation and Passion for Variety

Consumers' welfare is often determined by the level of consumption, high consumption implying higher welfare. Since peoples' tastes differ, a broader selection of goods will increase the well-being of consumers. Differentiation of products into many different varieties of goods from the same industry therefore increases the choices and possibilities for consumers to be satisfied. Taking the case of wines, tastes differ from person to person, and there is a large demand for varieties, red, white, rosé, sparkling and so on. Demand also

differ from person to person in willingness to pay, some demand a good wine from a particular year and vineyard for a high price while others demand cheap table wine. Individual demand of different varieties also differs at different points in time.

There are probably differences in demand due to cultural factors that affect demand both positively and negatively. For example the impact of consumers' values tied to different brands, country of origin and product groups is likely to affect preferences and demand. Culture, national and regional traditions in wine producing countries is likely to affect the demand towards the domestic products.

The passion for varieties could lead to intra-industry trade, as in the Chamberlinian approach of trade which assumes that firms entering a market have the possibility to differentiate their products from the existing firms when entering so that each firm will face a downward sloping demand curve and gain some monopoly power. The market consists of many small monopolists in the market, to the extent that the monopolist gains are crowded out. Demand is characterised by consumers being happier with a larger variety of goods to choose between, together with increasing returns to scale trade would occur even if the countries were perfectly similar in factor endowments. This result obtains since different varieties would be produced in the two countries in the model, and consumers demanding as large amount of varieties as possible. Scale economies thus lead to concentrated production (Krugman 1990).

According to Dixit and Stiglitz (1977) scale economies will lead to larger scale production since each unit of input added in production yields larger output. However, less varieties of goods will be provided and thus include some welfare loss for consumers. With monopolistic competition and the commodities produced being close substitutes, the contribution of any product to total surplus will imply small benefits for the monopolist producer and hence gains for the consumers Spence (1976) argues. That higher variety of goods in the market implies higher welfare for the consumers are in line with the assumptions in both Dixit and Stiglitz (1977) and Spence (1976).

High volume of trade between similar countries and increased volume of intra-industry trade could be explained by product differentiation. Differentiation leads to increased trade since there is a desire to consume both domestic and foreign varieties of goods. Based on the model of differentiated products in monopolistic competition (Helpman and Krugman 1985) one can make precise the effects from product differentiation and factor supply differences. The major assumption behind this model is that people prefer greater variety (Bowen, Hollander and Viaene 1998).

The literature suggests two types of consumers. The first is the "love of variety" consumer and the second is the "most preferred variety" consumer. The "love of variety" consumer demands as many varieties as possible, and would choose a basket of goods containing the largest number of varieties, given equal prices. In accordance with Dixit and Stiglitz (1977) and Spence (1976), the individual sub-utility of larger varieties in the market consists of the sum of the available varieties in the market consumed by an individual consumer. The sub-utility increases with increasing number of varieties in the market. The total individual consumption will be determined by the sum of varieties consumed by the individual consumer. The amount spent on a variety depends on its price relative to the price of all varieties (Bowen, Hollander and Viaene 1998).

As opposed to the "love of variety" approach, the "most preferred variety" view states that consumers' utility is maximized by consuming one ideal variety. Since consumers' tastes are

Theoretical Framework

different this will lead to demand for varieties at the market level and differentiation of production. This view was first stated by Lancaster (1979) who claimed that each specific product corresponded to a point in space, where the distance between points defines the disparity in the characteristics of products. Higher disparity implies lower likelihood for substitution.

Consumers will maximize their sub-utility by choosing the variety with the lowest effective price, something that do not depend on how much of the income that is spent on the differentiated good. If all varieties have the same price consumers will choose the variety closest to his or her ideal preferences (Bowen, Hollander and Viaene 1998).

4 Estimation of the Demand Model

The empirical test aims to analyse how importer's GDP, price of Chilean wine relative to the world price of wine, distance between Santiago de Chile and the capital of the importing country, and domestic production of wine affects the demanded export volume. The data, years of study, hypothesis and results are presented in this section.

4.1 Data Selection and Time Period

The 15 OECD countries chosen for this study are selected since they are high income countries and therefore assumed to demand imported wine, a full record of selected countries and their world rank by production of wine can be seen in Appendix 1.

The years of study are 1988 to 2002, the 15 years of study are chosen since it is an interesting period of the Chilean wine industry's development, including large investments in technology and recovery from the excess supply period and the start of the differentiation, quality improvement, and variety increase of the wines.

The trade volume and value data is collected from OECD (2005), data on GDP is from the World Bank (2004), distance from Indo (2005) and production from Wine Institute (2005), further explanation of the variables and units of measurement can be found in Appendix 2.

The data used in the regression analysis is a pooled cross section and time series data set of the 15 countries and the 15 years.

4.2 Model Formulation

Based on the export demand function (3.1), including the friction variables of export demand chosen in this study (3.4), the export demand function takes the form of;

$$EXP_{cj} = aGDP_j^{\beta_1} \left(\frac{P_{cj}}{P_{wj}} \right)^{\beta_2} e^{-(\beta_3 d_{cj} + \beta_4 D_j)} \quad (4.1)$$

Where;

EXP_{cj} is the export value of wine from Chile to country j.

a is the share of GDP_j spent on Chilean wine

GDP_j is the gross domestic product in country j.

P_{cj} is the export price of Chilean wine in country j.

P_{wj} is the average price of total imported wine from the world in country j.

P_{cj}/P_{wj} is country j's specific relative price.

d_{cj} is the distance between Santiago de Chile and the capital city of country j.

D_j is a dummy variable for wine production in country j, where $D_j=1$ implies production and $D_j=0$ indicates no production.

Logarithmising (4.1) yield a linear model with explicit elasticities. The model to be estimated in this study is thus;

$$\ln EXP_{cj} = \ln a + \beta_1 \ln GDP_j + \beta_2 \ln \left(\frac{P_{cj}}{P_{wj}} \right) + \beta_3 d_{cj} + \beta_4 D_j \quad (4.2)$$

where β_1 is the elasticity of GDP , β_2 is the elasticity of the relative price of wine, β_3 shows the sensitivity of geographical distance between the export and import country, and β_4 measures the importance of the existence of domestic wine production in the importing country.

Based on theory one can assume the parameter estimates to be positive for GDP since with a higher income demand for wine most likely increases. Negative estimates can be assumed for the relative price, since a higher price of Chilean wine in relation to other wine will decrease demand, distance, since it includes higher transport cost, and domestic production, since it is assumed to decrease demand for imported wine.

In a second regression model, three-year average values of wine exports will be used. In addition, dummy variables will be included in the model to clear out eventual time specific effects in the export demand. The model to be tested extends to;

$$\ln AvEXP_{cj} = \ln a + \beta_1 \ln GDP_j + \beta_2 \ln \left(\frac{P_{cj}}{P_{wj}} \right) + \beta_3 d_{cj} + \beta_4 D_j + \beta_5 D_2 + \beta_6 D_3 + \beta_7 D_4 + \beta_8 D_5 \quad (4.3)$$

where $AvEXP_{cj}$ is the three-year average value of Chilean wine exports, D_2 is the dummy for the time period 1991 to 1993, D_3 is the dummy for the 1994 to 1996, D_4 is the dummy for 1997 to 1999, and D_5 is the dummy for 2000 to 2002, the other variables are explained after (4.1) above.

Moreover, estimating the unstandardized residuals for the observations will show how countries deviate from the estimated regression lines. This will be linked to the variables in the analysis to see if there is some tendency of time effects and for wine producing countries to deviate negatively and the non producing countries positively, which could be expected.

4.3 Empirical Results

The regression results of (4.2) for the 15 countries studied are summarized in Table 4.1 below. The signs are as expected and show significant t-values for all variables. The coefficient of determination, R^2 , shows that 27.8 percent of the demand for Chilean wine in the 15 countries is determined by the factors GDP, relative price, distance, and production.

Table 4.1 The impact of GDP, relative prices, distance and foreign production of wine to the export demand of Chilean wine 1988 to 2002.

Variable	Estimated coefficient	t-stat	Sig.
Constant	-14.290 (2.856)	-5.004	0.000
ln GDP	0.966 (0.144)	8.455	0.000
ln (Pc/Pw)	-0.592 (0.166)	-3.571	0.000
Distance	-0.214 (6,910e-05)	-3.096	0.002
Production	-2.036 (0.342)	-5.957	0.000
R^2	0.278		df=224

Dependent variable: lnEXP. Standard deviations in brackets.

To increase the coefficient of determination and reduce the amount of information concealed in the residuals due to temporal effects the regression is run on average three year values of Chilean exports and extended to include dummy variables on every three year period (4.3). The coefficient of determination increases to 58.1 percent when running the regression on (4.3). All variables show signs in line with the predictions. The intercepts received from the time dummies are increasing over time. The estimates are shown in Table 4.2 below.

Table 4.2 The impact of GDP, relative prices, distance and foreign production of wine to the export demand of three-year average values of Chilean wine 1988 to 2002.

Variable	Estimated coefficient	t-stat	Sig.
Constant	-12.765 (2.050)	-6.227	0.000
lnGDP	0.834 (0.082)	10.149	0.000
ln (Pc/Pw)	-0.329 (0.120)	-2.734	0.007
Distance	-0.181 (4,948e-05)	-3.660	0.002
Production	-1.897 (0.245)	-7.738	0.000
D ₂	1.048 (0.279)	3.751	0.000
D ₃	1.927 (0.279)	6.899	0.000
D ₄	2.859 (0.280)	10.221	0.000
D ₅	2.860 (0.571)	10.121	0.000
R^2	0.581		Df=220

Dependent variable: lnEXP. Standard deviations in brackets.

Estimation of the Demand Model

The countries are grouped after deviation in the unstandardized residuals¹ from the predicted response line and pattern of change in the residuals for both regressions in Table 4.3 below. “High” indicates that the residuals deviates more than one positively and “Low” that the residuals deviate with more than one negatively. “OK” implies residuals between one 1 and -1. For each regression the pattern of the residuals are divided in two time periods, 1988 to 1994 and 1995 to 2002, the average value for these periods determines what category the country end up in. In most cases the deviation from the estimated regression line decrease when adding the time dummies. However for 9 countries there is a negative deviation (>1.5) the first three years, which may not always be shown in the averages. The plotted residuals are shown in Appendix 3.

Table 4.3 Distribution of the Residuals from regression on (4.2) and (4.3).

Country	Residuals regression (4.2)	Residuals regression (4.3)
USA	Ok	Ok
Italy, Spain, Australia	Low-Low	Low-Low
Canada, United Kingdom	High-High	High-High
Germany, Japan, Sweden, Norway	Low-High	Ok
Netherlands, France	Low-Ok	Ok
New Zealand, Denmark, Switzerland	Ok-High	Ok

The average price of Chilean wine (1988 to 2002) in the countries that showed lower than predicted import was between 2.04 and 2.83 US dollar per litre, which is high but not exceptionally high. Canada and United Kingdom that imported more than predicted faced a price of 1.2 and 2.4 US dollar per litre respectively. These prices can be compared with 2.29 US dollar per litre in the United States whose residuals were in line with the predictions. The other countries faced average prices between 1.55 and 2.48 US dollar per litre.

The price changes in percentage terms differs largely from country to country, the increase in Italy that deviated the most negatively from the predictions, was only 6.2 percent which could be compared with 62.1 and 56.7 percent in Australia and Spain. The average prices and percentage increase can be seen in Appendix 3.

¹ The unstandardized residuals are the difference between the actual response and the predicted response. This opposed to the standardized residuals where the unstandardized residuals are divided by the respective standard deviations.

5 Analysis

The Chilean wine exports are shown to be affected positively by the income in the importing country and negatively by the relative price, the distance to Chile and the own production of wine. According to the empirical tests in section four all predictions hold and are significant.

Estimating (4.2) gives significant estimates for all variables on the 95 percent level of significance as can be seen in Table 4.1. The coefficient of determination shows that the variables explain the changes in demand for the volume of Chilean wine to 27.8 percent.

The beta value for GDP shows that an increase in the income of the importing countries with one percent significantly increase exports of Chilean wine with 0.966 percent ($t=8.455$). The relative price affects the exports negatively as assumed in section three. With a beta coefficient of -0.592 , a one percent increase in the relative price significantly decreases the exports with 0.592 percent. These results were expected and in accordance with the discussion on the effect of relative price (Bowen, Hollander and Viaene 1998), and income and relative price (Thirlwall 2002) on demand in section 3.1, 3.4, and 3.3 respectively.

Looking at the friction variables added to the export demand function in this study one can see that exports decline with distance and if the importing country is a wine producer. Increasing distance between the trading countries with 1000 kilometres will decrease the export of wine with 19.3 percent². This is in line with the arguments of Berthelon and Freund (2004) and Anderson and van Wincoop (2003) presented in section 3.3.

Whether or not the importing country is a wine producer proved to have large impact on the export. The beta coefficient of -2.036 implies that the presence of wine production in the importing country decrease exports to that country with 86.9 percent³, ($t=-5.957$). The assumptions made in section 3.3 thus hold. Consumers probably prefer domestically produced wine to imported Chilean wine. Reasons for this could be tied to cultural and habitual factors affecting consumer preferences to be biased towards domestic wine (Riezebos 1996). The ideal variety is thus likely the domestic variety. The preferences in the wine producing countries are in line with the ideal variety approach rather than the love of varieties approach as stated by Bowen, Hollander and Viaene (1998) in section 3.4.

Three of the wine producing countries, Spain, Italy and Australia, have negative residuals for the entire period. These results could be explained by values tied to domestically produced products and large variety of domestic products in the market which affect the demand for imported wines negatively. Surprisingly, France which was the world's largest producer in 2001 (Wine Institute 2005^a), follows the estimated regression line.

United Kingdom departs positively from the mean in 1999 and 2000. United Kingdom is not a very large wine producer, ranked 59th in 2001 (Wine Institute 2005^a), and the demand for imported Chilean wine could therefore be higher in relation to the largest wine producing countries. The scale of production is not taken into account when studying the effects of domestic wine production on the demand for Chilean wine in this study, but it is likely

² Calculations on the importance of distance are based on the equation $(e^{\beta}-1)*100$ throughout the analysis.

³ Calculations on the importance of domestic production of wine are based on the equation $(e^{\beta}-1)*100$ throughout the analysis.

that differences in the size of domestic production have an effect on demand for foreign wine and available amount of varieties in the market.

The deviation in the residuals of (4.3) is reduced compared to the regression on (4.2), for most countries the residuals lies in the interval of (-1; 1) as can be seen in Table 4.3. The coefficient of determination almost doubles its value through this (58.1 percent). Hence, it is likely that temporal effects, such as price fluctuations caused by environmental circumstances, can influence the results of the regression on (4.2) to be lower. With the dummy variables included in the regression on (4.3) the long run trend of demand for Chilean wine is shown more reliable.

The estimated coefficients received from the regression on (4.3) show significant estimates on the 95 percent significance level and expected signs of all variables, see Table 4.2 for t-values. However, the estimates are lower than in (4.2) for all variables.

The income elasticity of demand for wine is still relatively high and significant ($t=10.149$). A one percent increase in GDP in the importing countries is estimated to increase the export of wine with 0.834 percent. This is lower than in the previous regression but GDP still has large effect on export demand. The significance of GDP shows high beta- and t-values for both regressions and is of large importance in demand for Chilean wine. The estimated income elasticity of wines is much higher than the income elasticity for total exports found by Senhadji and Montenegro (1999) which implies that wine is highly income sensitive in comparison to total exports.

The effect of relative prices decreases when the time effect dummies are added to the equation, but shows significant estimates. The results imply that the effect of a one percent increase of the relative price of Chilean wine to the world price of wine will decrease exports with 0.329 percent. This is in accordance with the arguments of Bowen, Hollander, and Vi-aene (1998) discussed in section 3.4.

The reducing effects on exports from increasing distance is also lower, increasing the distance with 1000 kilometres would decrease the export demand for wine with 16.6 percent. The dummies are smoothening out the temporal effects from weather and years of typical production volumes, which was included in the previous regression. This affects both the prices of grapes and wines and the cost of transportation of larger or smaller quantities. Domestic production in the importing country is still very important ($t=-7.738$) and not affected much by the revision of time effects. Countries with wine production demand less than countries without domestic wine production. Calculated from the beta value (-1.897) the demand in a wine producing country is 85.0 percent lower than in a non-producing country.

The intercepts calculated for the three-year periods are negative for all time periods, but increases over time, see table 4.2. For 1988 to 1990 the constant is -12.765, and for 2000 to 2002 the intercept is -9.905. The increased value of the intercept implies that a larger share of income is spent on Chilean wine, hence the demand has increased over time. As the constants increase the t-values also rises. A negative intercept can be expected since with all independent variables being zero the demand for Chilean wine would probably be negative.

Three of the wine producing countries have negative residuals both with and without dummy variables in the regression. Two countries deviate positively in both regressions. Five countries deviate negatively the first half of the period and positively in the latter half, for these countries the residuals tend towards zero since time effects are smoothed out when adding the dummy variables, see Table 4.3.

The countries that still show very low residuals after adjusting for time effects are Italy, Spain and Australia, all being large wine producers, see Appendix 1 for rank by production. Their demand is not affected even after adjustment for temporal effects. In the plot of residuals one can see that Italy deviate the most from the mean in both regressions, where the four points between the arrows in both diagrams are residuals for Italy, see Appendix 4 and 5. The average prices of Chilean wine in the wine-producing countries are higher than the prices in the non producing countries which probably dampens the demand as well. The countries that deviate most positively after adjusting for temporal effects are Canada and the United Kingdom. However, Canada is less affected by the inclusion of the dummy variables and still import more than average in the earlier years of the study as can be seen in Appendix 4 and 5. Dissimilarities between wine producing countries could be explained by the volume of production affecting the varieties available in the market.

The residuals received from the regressions tend to be closer to zero for the non wine producing countries than for the wine producers in both cases. However the export to both Norway and Sweden are low between 1988 and 1990, thereafter Norway follows the estimated regression line and Sweden tends to import more than the average after 1991. The pattern of Norway and Sweden is present both before and after adjusting for time period specific effects. This contradicts with the expectations of non wine producing countries demanding more imported wine. However the length of the periods of the dummy variables might not be as representative for Norway and Sweden as for the other countries for these years. Nine other countries in the sample also have lower than predicted imports of Chilean wine in this period, however after adjusting for seasonal effects this pattern disappears. A reason for this could be that during 1988 to 1990 the import value of Chilean wine was very low in the two countries and one can assume that the import of wine started off at a larger scale as the production increased due to the investments in the wine industry made after the regime shift in 1990 as discussed in section 2.1.

Looking at the trends in the residuals in table 4.3, most countries have lower than predicted imports of Chilean wine in the first period, but in the later period the demand for Chilean wine increases to follow the predictions or to be higher.

The elasticities for income and relative price in the original export demand function is said to have the largest effects on demand (Thirlwall 2002), accordingly the test show high beta values for both GDP and relative price. Nevertheless, the inclusion of the friction variables distance and production has proved to explain a great deal of the demand for wines.

Analysing the differences between wine producing countries and non wine producing countries, the consumers in countries with domestic wine production would, according to the empirical results in section four, fall into the category of those demanding the “ideal variety” whereas the consumers in non producing countries could rather belong to those demanding a large variety of goods. It is true that tastes and preferences vary among people regardless of nationality, nevertheless there is no doubt about that countries with old wine traditions add values to the domestic wines. The “love of variety” approach assumes equal preferences among consumers, something that is not likely in the real world. The results of this study clearly show the effect of domestic production. The residuals show that the largest wine producers are the ones demanding the least Chilean wine whereas the non producing countries and countries with relatively low production tend to demand more. It is likely that consumers’ make their consuming choices based on habits, value associated with the product, prices, and quality.

6 Conclusions and Suggestions for Further Research

The aim of this study was to analyse how export demand of Chilean wine was affected by consumers' income, the relative price of Chilean wine to the world price of wine, the distance between trading partners and whether or not the importer is a wine producer.

The results showed that the independent variables significantly had the expected effect on demand. The coefficient of determination increased from 27.8 to 58.1 percent when adjusting for time period specific effects in the export value of Chilean wine. An increase in GDP of the importer with one percent is estimated to increase demand for Chilean wine with 0.834 percent, an equal increase in the relative price decreases demand for Chilean wine with 0.329 percent. Increased distance between the trading countries with 1000 kilometres is estimated to decrease demand with 16.6 percent. Wine producing countries demand less Chilean wine in comparison to non producers, the effect of domestic production of wine is estimated to decrease demand for Chilean wine with about 85 percent. The inclusion of a time dummy shows that Chilean wines seem to have become more popular over time.

The high and significant results of the effect of domestic production of wine opened for the discussion of how consumer preferences, traditions and culture may influence the demand for wines. These factors are probably very important determinants of demand. The three largest wine producers in the world depart the most from the mean. For these countries (Italy, Spain and Australia) one can expect strongly biased preferences towards domestic wine being the reason. The width and importance of the wine culture and traditions in these countries could be an explanation of consumers considering the domestic wine as the ideal variety. Moreover, the volume of production in the importing countries probably affects the market supply of varieties which decrease the demand.

For the countries with no or low wine production the tendency follows the estimated line of the regression. Consumers in those countries tend to have a larger passion for varieties and demand a broader selection of wines to a variety of a specific origin, here again the varieties supplied on the home market are not monitored.

To include dummy variables to look at the effects of the volume of domestic production on export demand would be interesting since the largest wine producers in this sample imported less than the average in comparison to countries with low production were the countries deviating positively from the mean.

The question of values tied to domestic products and habitual consumption arose when analysing the results. The countries with a long tradition of wine production most likely value their products higher than foreign products. Examining the effects of culture and traditions to the demand for wine would therefore be interesting.

To conclude, income, relative price, distance and domestic production proved to determine the demand for Chilean wine in a significant way. However consumer preferences differ among people, some being the price hunters, while others are willing to pay more to enjoy a Château Latour from Bourdeaux...

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Appendix 1

Sample countries, World rank by production volume of wine, and Production Volume in 2001

Selected Countries	World Rank by Production Volume 2001	Production Volume 2001 (Hectolitres 000)
Australia	5	10.163
Canada	34	445
Switzerland	25	1.113
Germany	6	8.891
Denmark	-	-
Spain	2	30.500
France	1	53.389
United Kingdom	59	15
Italy	3	50.093
Japan	26	1.100
Netherlands	-	-
Norway	-	-
New Zealand	30	530
Sweden	-	-
United States of America	4	21.300
Chile	11	5.658

Source: Wine Institute, 2004^a

Appendix 2

Explanation of variables

Variable	Description
Value of exports	The value of total Chilean exports of wine to the importing country, measured in thousands of US dollar (OECD 2005).
GDP	Gross Domestic Product measured in constant 1995 US dollar (World Bank 2004).
Relative price	Value per quantity of the selected countries' imports of Chilean wine to the imports of world wine, measured in 1000 US dollars/ton (OECD 2005).
Distance	Measured in thousands of kilometres between the capital cities of the trading countries (Indo 2005).
Production	Existence of wine production in the importing country, P=1 indicating a wine producing country, and P=0 indicating a non wine producing country (Wine Institute 2005 ^a).

Appendix 3

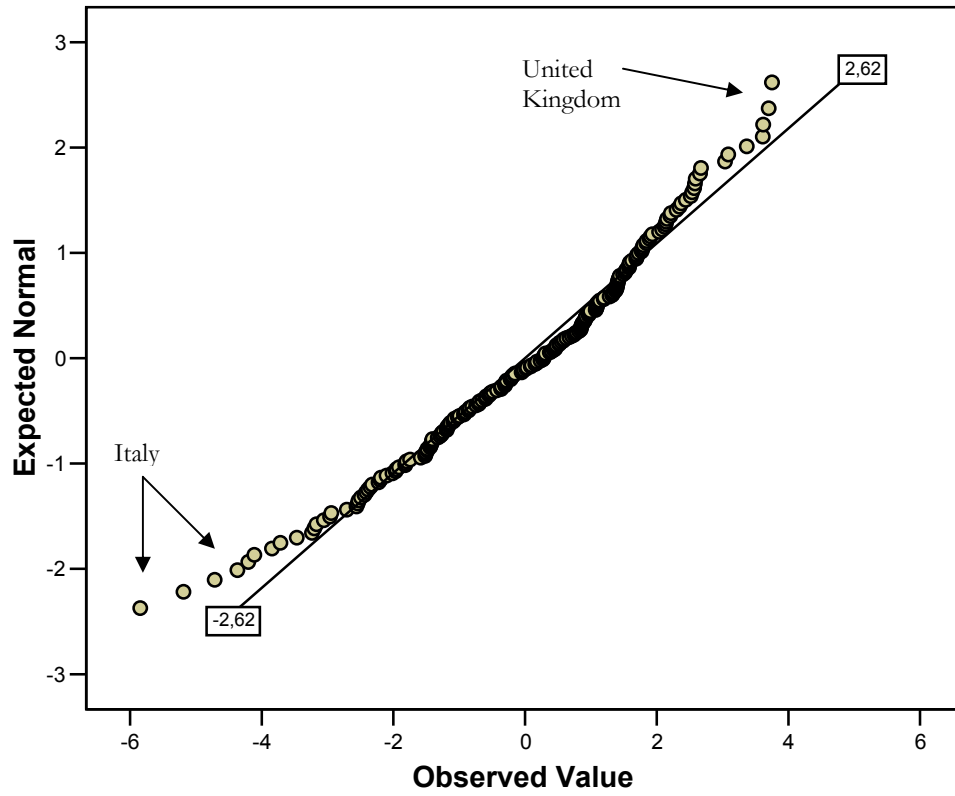
Percentage change in prices and average price per litre (US Dollar) 1988 to 2002.

Residual pattern	Country	Price change (%)	Average Price
Ok	USA	142	2.29
Low-Low	Australia	62.1	2.04
	Italy	6.2	2.60
	Spain	56.7	2.83
High-High	Canada	35.2	1.24
	United Kingdom	0.16	2.42
Low-High	Germany	-32.0	2.26
	Japan	199.1	1.86
	Norway	-48	1.98
	Sweden	-64.0	2.35
Low-Ok	France	-40.9	1.55
	Netherlands	7.0	2.39
Ok-High	New Zealand	-80.8	1.67
	Denmark	-27.0	1.79
	Switzerland	105.0	2.48

Appendix 4

Residual plot of regression 4.2

Normal Q-Q Plot of Unstandardized Residual



Appendix 5

Residual plot of regression 4.3

Normal Q-Q Plot of Unstandardized Residual

