DEMAND AND SUPPLY FACTORS IN THE EXPORT OF SOUTH AFRICAN FRESH ORANGES TO THE EUROPEAN UNION (EU) : 1976 - 1993

BY

PERCIVAL RAMAPULANA SELAI KHUELE
B.Sc. (Agric.) (University of Fort Hare)

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I hereby certify that, unless specifically indicated to the contrary in the text, this dissertation is the result of my own original work.

P.R.S. KHUELE

ABSTRACT

This is the first empirical study of the factors affecting the demand for and supply of South African (SA) fresh orange exports into the five main European Union (EU) markets: the United Kingdom (UK), France, Germany, the Netherlands and Belgium. Simultaneous-equation models of SA fresh orange export demand and supply were specified for each market and estimated by Two-Stage Least Squares using annual data for the period 1976-1993.

Export demand was negatively related to the price of SA fresh oranges relative to the price of fresh oranges from Israel in the UK, Germany, Netherlands and Belgium. In France, however, export demand was negatively related to the SA export price relative to the price of fresh oranges from Morocco. Israel appears to be the major fresh orange competitor for SA in the UK, Germany, Netherlands and Belgium, while the main competitor in France is Morocco. Export demand was also positively related with lagged SA fresh orange exports in all export demand functions. This implies that consumers in the EU markets do not adjust fresh orange consumption immediately following a relative price change, probably due to habit formation. Estimated short-run relative price elasticities of export demand were inelastic in each EU market.

Export supply in all markets varied directly with lagged net export realisation price relative to the SA domestic fresh orange price. Export supply in the UK also depended on the UK price of SA oranges relative to the French price. Conversely, export supply to the other four markets was positively related to the SA orange price in each market relative to the price in the major UK market. In addition, lagged exports (showing export orientation), and supply shocks (weather) positively influenced export supply to all markets. Export supply was price inelastic in both the short-term and long-term, supporting *a priori* expectations that supply reacts sluggishly to changes in the relative price of fresh orange exports.

The low relative price elasticities of export demand imply that Capespan International and future orange exporters may consider alternative markets to the traditional EU markets to increase real revenue. Lower import tariffs if citrus is included in a Free Trade Agreement (FTA) with the

EU would make SA fresh orange exports more competitive with exports from Israel and Morocco. Fresh orange exports from SA to the EU under this scenario are unlikely to increase markedly as long-run supply is price inelastic.

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My late father, my mother and family, who taught me to appreciate education and always gave me the love and, financial and emotional support, to accomplish my academic achievements.

I wish to dedicate this dissertation to my late father Napo Khuele, who I am sure would have been proud of his son, Selai.

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INTRODUCTION

The South African citrus industry is export oriented with 46 percent (354 731 metric tons) of the total 755 831 metric ton fresh orange crop in 1993 being exported. Citrus exports, mostly fresh oranges, are a major foreign exchange earner (worth R1,5 billion in 1993) (Directorate Agricultural Economic Trends, 1995). Some 82% of fresh orange exports from South Africa (SA) went to the European Union (EU) in 1993, with the United Kingdom (UK) and France being the major markets (Outspan International, 1994). Germany, the Netherlands and Belgium are the next three major income markets for SA fresh orange exports (Els, 1996). The SA share of annual fresh orange imports in the UK, France, Germany, the Netherlands and Belgium ranged from 13-23%, 4-9%, 3-6%, 1-6% and 6-13% respectively, over the period 1976-1993. However, SA has a major import share during its marketing season (May-November) when, relative to other Southern Hemisphere countries, her share ranged between 43-96%, 60-93%, 77-96%, 9-58% and 55-99% respectively in these markets, during 1976 to 1993 (Eurostat, 1995). The Navel orange accounts for over 50% of total EU consumption, followed by Valencia and Jaffa Late with 25% (International Trade Centre, ITC, 1989).

Research on factors which affect the demand for and supply of SA fresh orange exports is needed for two reasons. Firstly, SA and the EU are currently negotiating a Free Trade Agreement (FTA) and, although citrus is presently excluded from the products offered by the EU for a FTA, the implications of including citrus (reduction in import tariffs) need to be analyzed. Secondly, the information can help Capespan International and other future exporters to develop appropriate strategies for marketing fresh oranges to the EU and other markets.

Given the lack of SA orange export studies and a potential FTA between SA and the EU, this study examines the competitive relationship between SA and other fresh orange exporting countries in the EU which is the major export destination for SA fresh oranges. The UK, France, Germany, the Netherlands and Belgium are assumed to represent the major EU markets. This study also reports the first estimates of the relative price elasticity of export demand and supply of SA fresh orange exports in the five key EU markets. The size of the

relative price elasticity of export demand determines how shifts in export supply will affect export revenues, while the export supply function shows the relative influence of relevant price and non-price factors on export supply. The effect of trade restrictions (if any) in these markets on SA's fresh orange market shares also needs to be assessed. Restrictions include non-tariff barriers which signatories to the General Agreement on Tariffs and Trade (GATT) agreed to remove (e.g. quotas).

A review of literature indicates that no published research on these aspects of fresh orange export trade has been done in SA. The main research hypotheses are that (1) SA would increase its fresh orange exports to the EU as demand for fresh oranges in the EU expands; (2) SA fresh oranges in the EU are substitutes for fresh oranges from Israel, Morocco and Spain (as the relative price of fresh oranges into the EU from these suppliers rises, demand for South African fresh oranges would increase). Annual data for the 1976-1993 period will be used to estimate simultaneous-equations models of export demand and supply for SA fresh orange exports into the five EU markets.

The study is organised as follows: Chapter 1 identifies SA's main fresh orange export competitors in the five EU markets. A literature review of past international and local research on agricultural export demand and supply is given in Chapter 2. Recent developments in world trade and EU agricultural policy on fruit are outlined in Chapter 3. Empirical models of SA fresh orange export demand and supply are specified in Chapter 4. Model results estimated by Two-Stage Least Squares (2SLS) and Principal Component Regression follow in Chapter 5. The concluding section discusses the results and summarises their policy implications.

CHAPTER 1 SOUTH AFRICA'S MAJOR FRESH ORANGE EXPORT MARKETS AND COMPETITORS

In South Africa (SA), Outspan International Limited is currently the sole export marketing agency for the Southern African citrus export industry. Outspan is only involved with exports and operates in terms of the statutory Citrus Scheme which is currently supervised by the Citrus Board (Outspan International, 1994).

Canada, the EU, Singapore, Hong Kong and Japan accounted for 70% of the total value of world orange imports in 1970 and 67% in 1987 (Sparks, 1991). The same markets except for Japan, accounted for 92% of SA fresh orange exports in 1965 **(see figure 1)**,

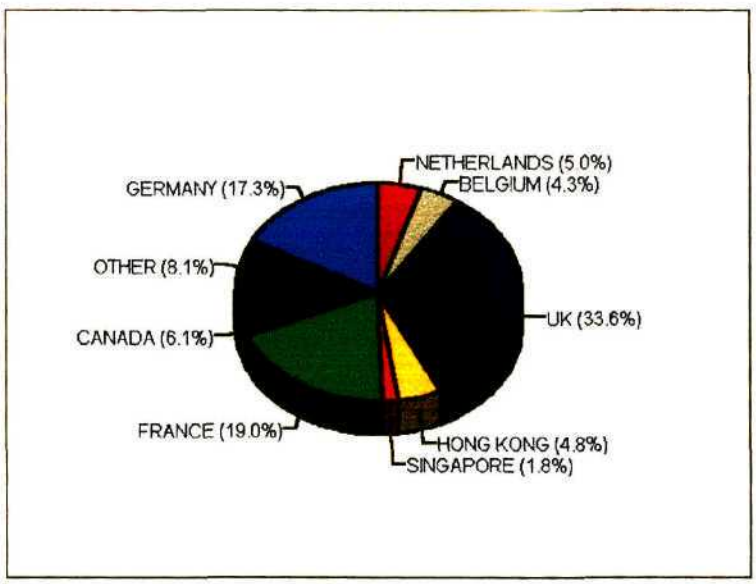

Figure 1 Major Export Destinations of South African Fresh Oranges, 1965. Source: Outspan International (1994).

where 79.2% of SA exports went to EU[1], 6.1% to Canada, 1.8% to Singapore, 4.8% to Hong Kong and 8.1% to other countries.

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[1] The EU was defined as the following markets (with share of total SA fresh orange exports in brackets): United Kingdom (33.6%), France (19.0%), Germany (17.3%), Netherlands (5.0%) and Belgium (4.3%).

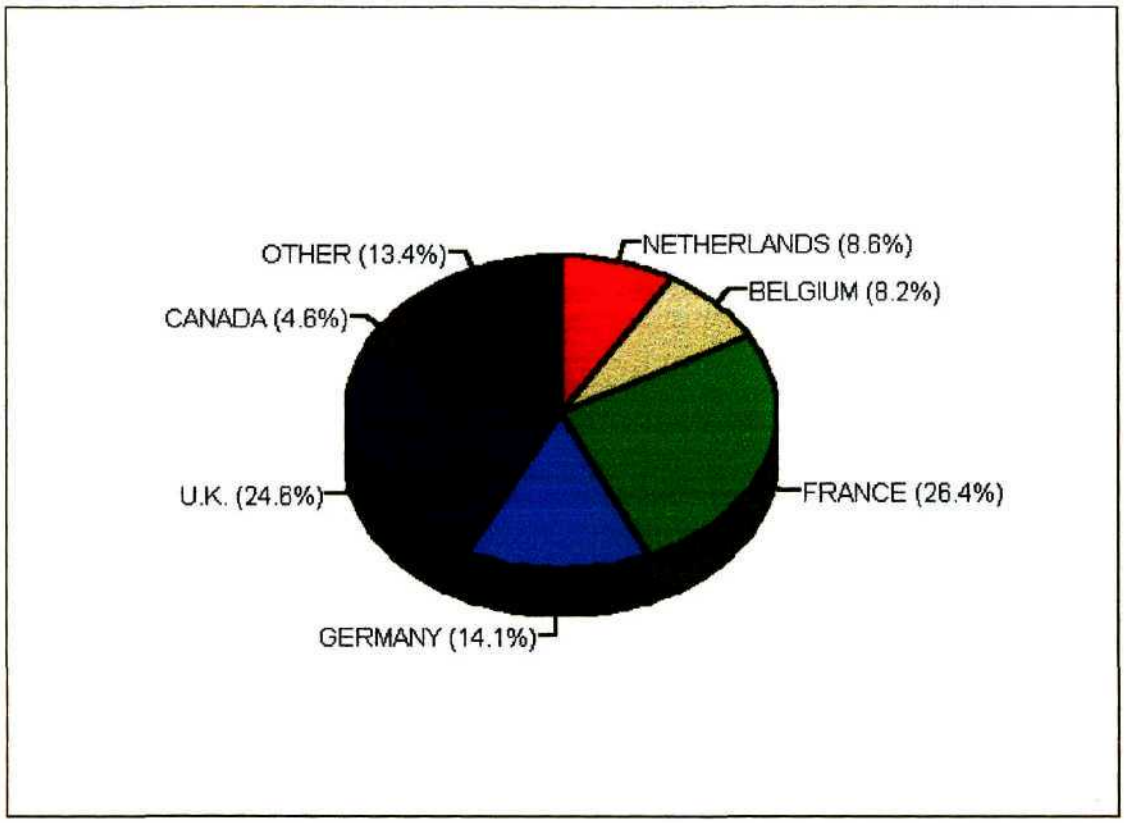

Figure 2 **Major Export Destinations of South African Fresh Oranges, 1993. Source: Outspan International (1994).**

In 1993 **(see figure 2)**, 81.9% of SA fresh orange exports went to the EU[2], 4.6% to Canada and no oranges were exported to Singapore, Hong Kong and Japan. The relative importance of suppliers to the EU, Canada, Singapore and Hong Kong has fluctuated since 1965. The observed changes reflect the competitive position among alternative suppliers, including SA, and also reflect trade restrictions that alter trade flows and prices. Restrictions include measures such as tariffs, phytosanitary requirements and trade sanctions. Because the study focuses on major import demand for SA fresh oranges, only the five main EU markets are analyzed.

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[2] United Kingdom (24.6%), France (26.4%), Germany (14.1%), Netherlands (8.6%) and Belgium (8.2%).

In order of export volumes **(see footnote 1 and 2)** these EU markets are the UK, France, Germany, Netherlands and Belgium. South Africa competes with Israel, Spain, the Rest of the World Northern Hemisphere (ROWNH) and the Rest of the World Southern Hemisphere (ROWSH) in the UK; in France there are the same suppliers as for the UK, but also Morocco; in Germany the same suppliers as for the UK compete; Israel, Spain, Brazil, ROWNH and ROWSH compete with SA in the Netherlands and for Belgium the same suppliers as for France are competitors. The EU Common Agricultural Policy (CAP) operates the reference or import price system (renamed the entry price) and common customs tariffs (CCT) which are imposed on SA's fresh orange imports into each EU market. All fresh orange exports must be accompanied by a phytosanitary certificate to the EU issued by the Directorate of Plant and Quality Control in SA. The certification specifies that fresh orange exports have been inspected according to appropriate procedures and are considered to be free from quarantine pests and practically free from other injurious pests and they are considered to conform to the current phytosanitary regulations of the importing country. Cold sterilisation treatment is not required for SA fresh orange exports to the EU, but is applicable for Japan and Taiwan export markets (Moore, 1996). The marketing season of SA fresh orange exports starts in May and ends in November **(see Table 1).** The non EU countries which compete with SA at this time are Chile, Argentina, Brazil and Uruguay in the EU import markets. The supply times of fresh oranges from Israel, Morocco, Spain, and Turkey overlap with SA exports into the EU in May, June, October and November (Maraga, 1996).

Table 1 Marketing Seasons of Fresh Oranges for South African Exports and EU Production.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SA export season					XX	XX	XX	XX	XX	XX	XX	
EU production season	YY	YY	YY	YY	YY	Y				Y	YY	YY

Source: Outspan International (1994).

1.1 European Union Markets

1.1.1 United Kingdom

Overall the UK had a moderate upward trend in fresh orange imports from 352 068 to 371 906 metric tons between 1976 and 1992, with a pronounced peak between 1990 and 1991 **(figure 3)**. Most of SA's fresh orange exports are destined for the UK, where SA had an import share of 13% to 23% over the period 1976-1993 (Eurostat, 1995).

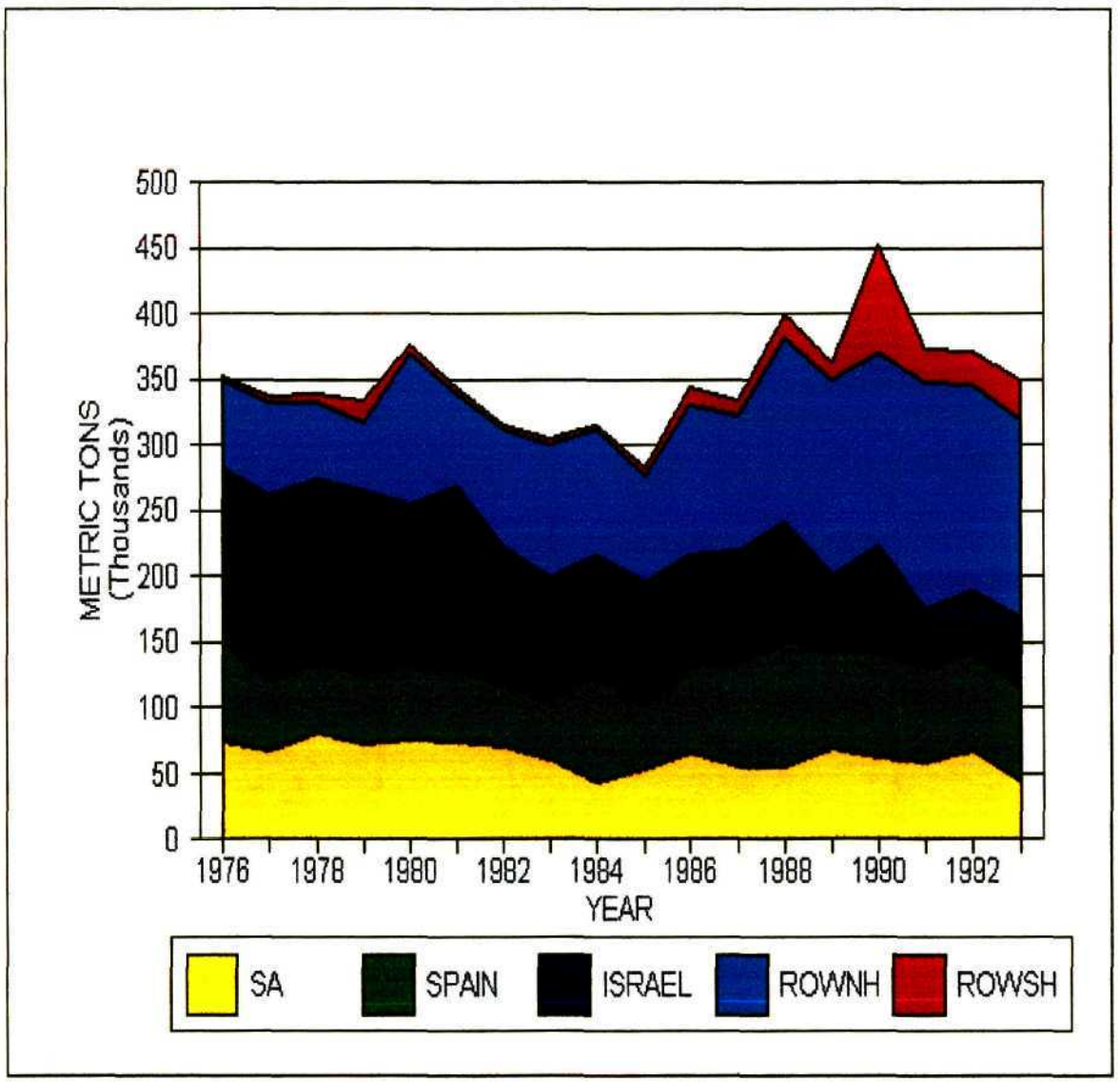

Figure 3 **United Kingdom Fresh Orange Imports, 1976 - 1993.**
Source: Eurostat (1995).

1.1.2 France

Orange production in France is negligible and consumption depends on imports. The main fresh orange exporters are Israel, Morocco, Spain and SA (International Trade Centre, ITC, 1989).

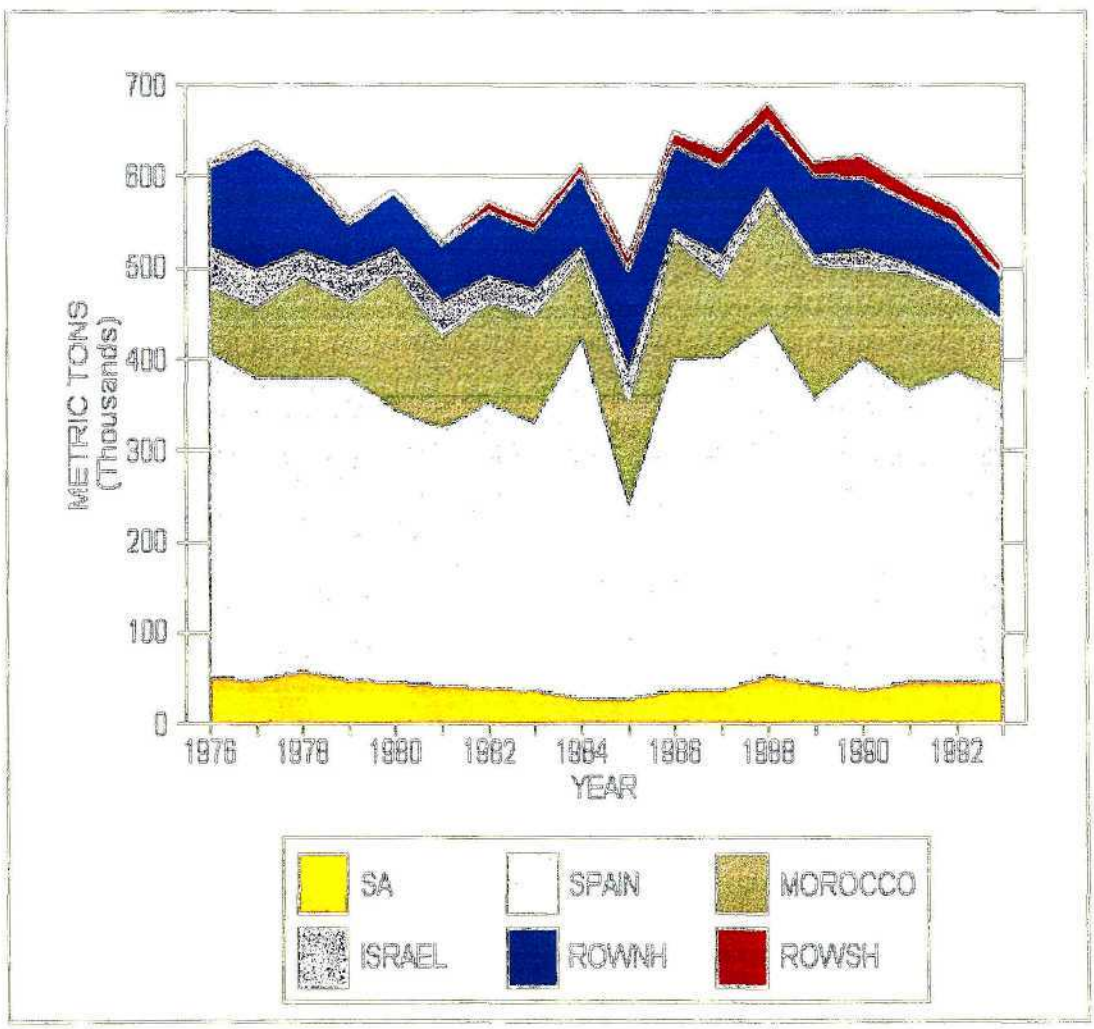

Figure 4 France Fresh Orange Imports, 1976 - 1993.
Source: Eurostat (1995).

Overall, France had a downward trend in fresh orange imports from 618 222 metric tons in 1976 to 505 418 metric tons in 1993 (figure 4). South Africa's fresh orange import share in France fluctuated between 4% and 9% over the period 1976-1993, with the lowest import share of 4% in 1984 (Eurostat, 1995).

1.1.3 Germany

The potential of Germany **(figure 5)** as a market is due to its large population, the strength of its currency and its high per capita income. There is no orange production and all requirements are imported. Main sources of fresh oranges are Israel, Spain and SA (ITC, 1989).

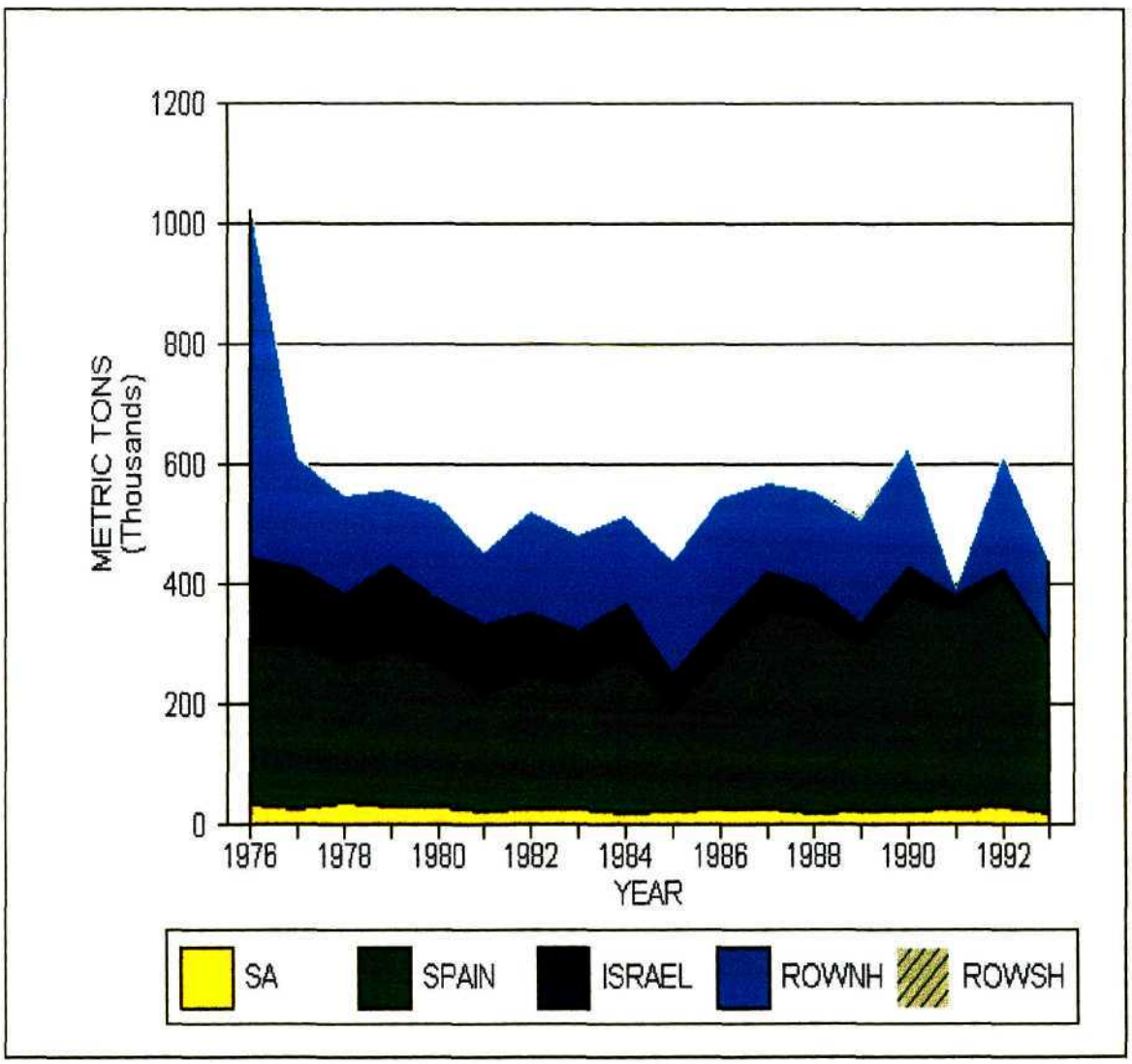

Figure 5 **Germany Fresh Orange Imports, 1976 - 1993.**
Source: Eurostat (1995).

The SA fresh orange import share ranged between 3% to 6% over the period 1976-1993 (Eurostat, 1995).

1.1.4 Netherlands

There is no orange production in the Netherlands and fresh oranges are among the most important fruits imported from developing countries into this market (ITC, 1989).

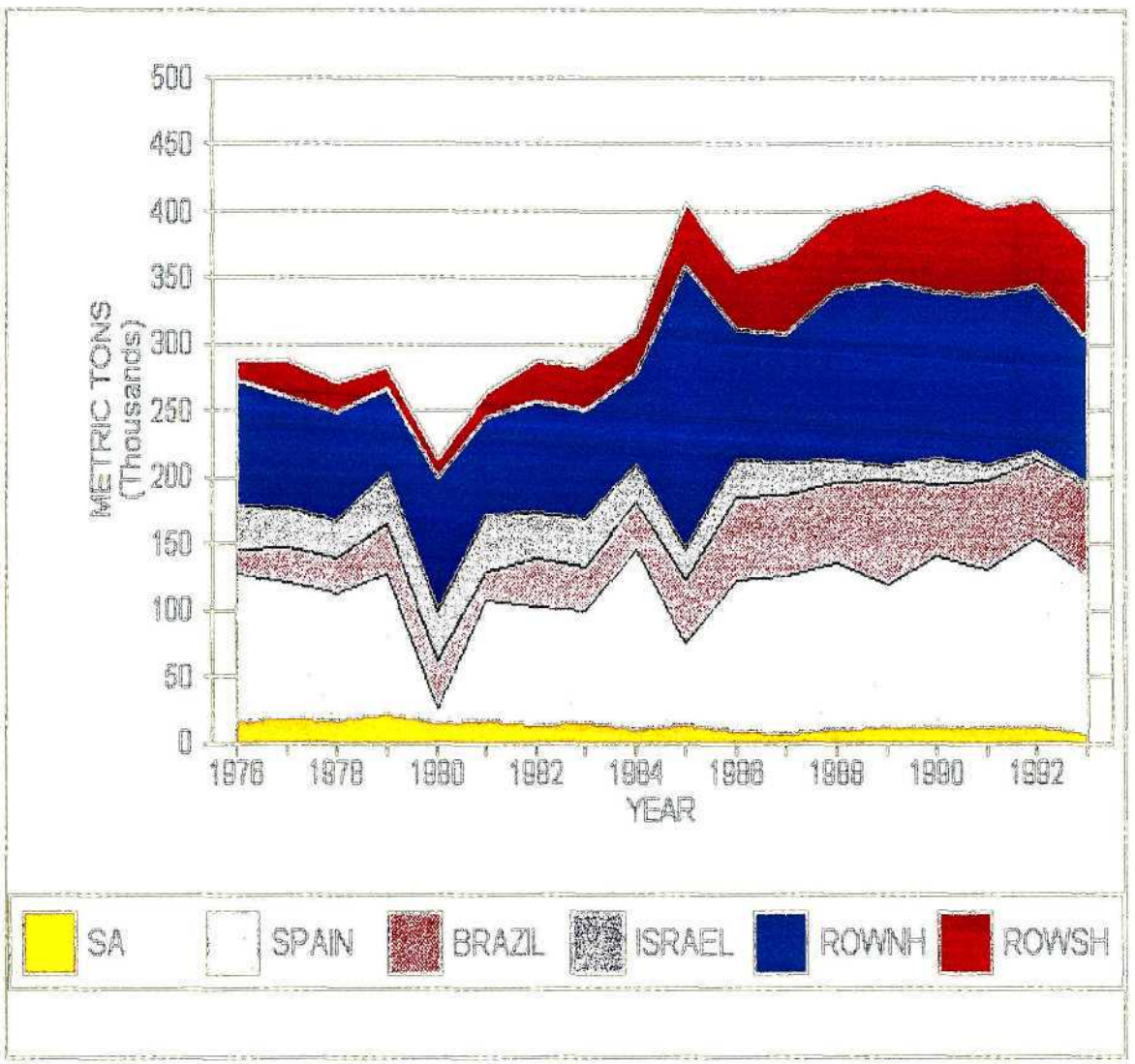

Figure 6 Netherlands Fresh Orange Imports, 1976 - 1993.
Source: Eurostat (1995).

The Netherlands had an upward trend in fresh orange imports, from 288 427 metric tons to 375 217 metric tons between 1976-1993 (figure 6). The SA fresh orange import share over the period 1976-1993 was between 2% and 6% (Eurostat, 1995).

1.1.5 Belgium

The fresh orange import market share of SA in Belgium ranged between 6% and 13% over the period 1976-1993. Belgium had a downward trend in fresh orange imports, from 155 601 metric tons in 1976 to 140 361 metric tons in 1993 (figure 7) (Eurostat, 1995).

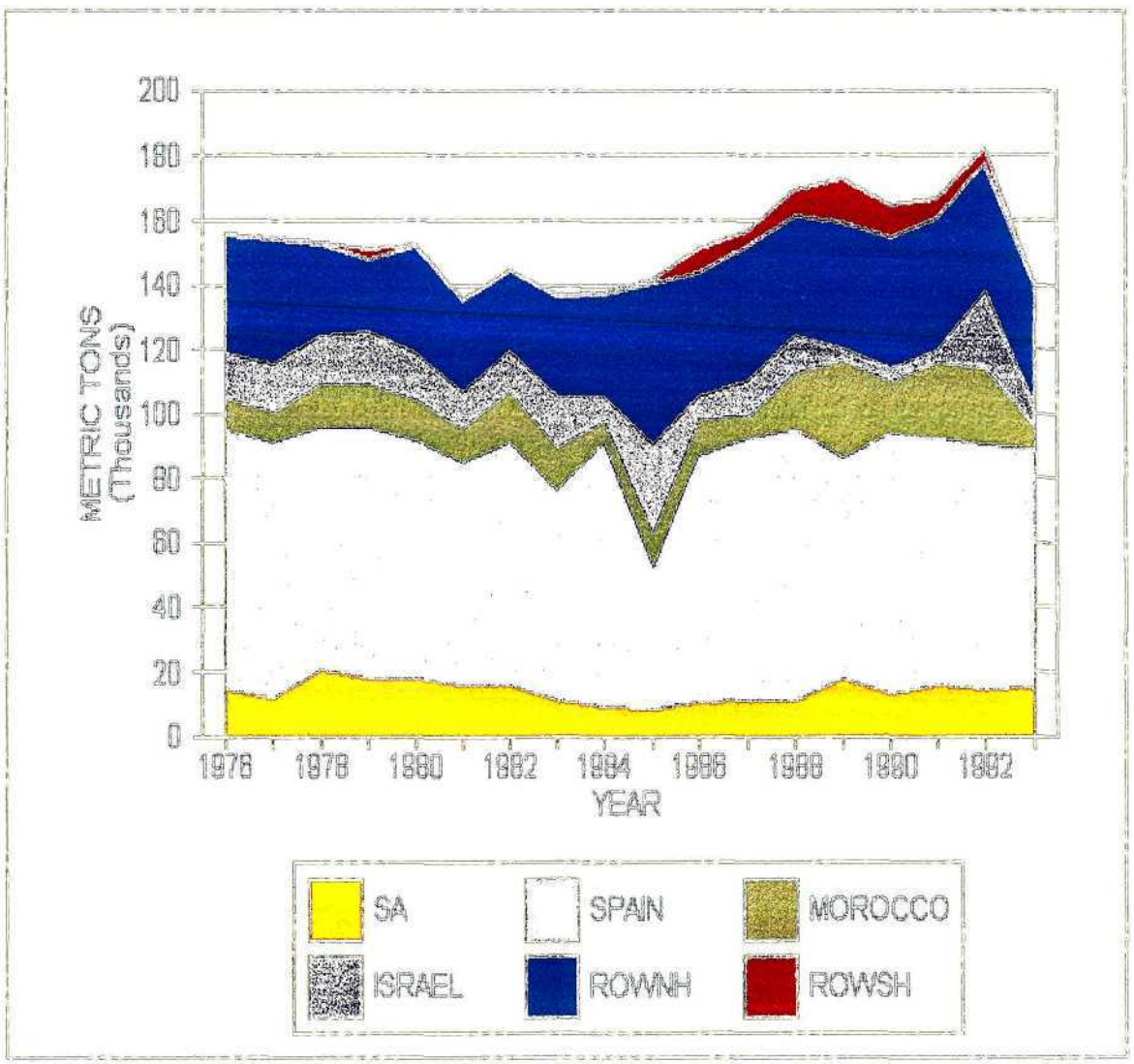

Figure 7 Belgium Fresh Orange Imports, 1976 - 1993.
Source: Eurostat (1995).

1.2 General Export Incentive Scheme (GEIS)

Export assistance granted to the Citrus Industry was facilitated through the General Export Incentive Scheme (GEIS) which dates back to April 1990. GEIS provided a tax-free financial subsidy to exporters based on the value of exports, the degree of processing and the local content of the exported product. Under GEIS, exports fell into one of four categories: primary products (e.g. fresh oranges, logs or mineral products), beneficiated primary products i.e., products with some degree of processing (e.g. billets), material intensive products (e.g. sheet metal), and manufactured products (e.g. furniture). The export subsidy increased with the level of beneficiation (processing), the level of local content, and with the value of the rand against a basket of currencies (Belli ***et al.,*** 1993). The Department of Trade and Industry (DTI) announced in September, 1994 that GEIS would be phased out over the next three years and terminated on 31st December, 1997. Given established SA shares of fresh orange markets in the EU by the early 1990's, GEIS helped Outspan International meet the costs of developing new markets, particularly in the Far East. It was also announced that subsidies on all fresh produce would be lowered from 1st October and would be withdrawn from 1st April, 1995 (Outspan International, 1994).

The above review of EU markets and the GEIS system shows that Israel, Spain and Morocco are important competitors in the first two and last two months of SA's marketing season to the EU, and that SA had established EU fresh orange markets by the early 1990's. The next chapter reviews past research on agricultural export demand and supply to identify gaps in local research, possible determinants of export demand and supply and how past studies can help formulate appropriate models for SA fresh orange export performance.

CHAPTER 2 LITERATURE REVIEW

This chapter reviews international and local literature on factors influencing agricultural commodity export demand and supply. This can help to identify appropriate variables to include in the SA citrus export demand and supply models.

2.1 International Research

International research, mostly in the United States (US), has focused on export demand for a commodity (e.g. fresh apples or oranges) by source.

Sirhan and Johnson (1971) used a market-share model to measure the short-run and long-run price elasticities of the US cotton share in UK and West German import markets from 1953-1954 to 1966-1967. The results showed that a 1% increase in the relative price of US cotton to that of its competitors would reduce US share of the UK cotton market by 2.9% in the short-run and by 11.1% in the long-run. Estimates of short-run and long-run elasticities of US cotton share in the West German import market ranged from 7.62% to 9.39% and 11.04% to 10.67% (all negative) respectively. Relative prices could hence be a key export demand factor to consider.

Roberts and Cuthbertson (1972) analyzed the demand for and supply of fresh apples in the UK during the period 1959-1969 and assessed the position of Australia as a supplier of fresh apples to the UK. The price elasticity of demand for fresh apples in UK was less than unity in absolute value (-0.72) which means that, as prices decline (e.g. because of a rapid build up in supplies), consumption would increase less than proportionately with the price fall and suppliers (collectively) would suffer a decline in total revenue. The low income elasticity of demand for fresh apples suggested that a 1% increase in UK consumers' incomes would increase apple consumption by 0.30%. The inferences drawn about the future levels of production and exports from countries which are potential competitors with Australia on the UK market suggested that apple production in SA, France and New Zealand would continue to expand, while Italian production was not expected to grow. The prospects for exporting fresh apples to the UK would be affected by: greater rate of increase in supplies available

for marketing compared with the expected rise in demand; the removal of quotas and the change in tariffs applying to imports as a consequence of Britain joining the then European Economic Community (EEC); and higher freight rates which would erode Australia's position as an exporter of fresh apples to the UK.

Atkin and Blandford (1982) analyzed changes in the composition of UK apple imports during the period 1963-79 using a first-order Markov model applied to the market share data of major supplying countries. Australia and SA were the two leading suppliers to the UK in 1963-4, collectively accounting for over 50% of all imports. By 1970-1, France, which had been insignificant in 1963-4, accounted for roughly 25% of total imports, matching the shares held by Australia and SA. With Britain's entry into the EEC in 1973, the quota on Community imports was replaced by a diminishing series of levies which was phased out by the beginning of 1978. Commonwealth suppliers lost their preferential status, and all third countries faced the Community's common external tariff ranging from 8 - 14% depending on the time of year, plus minimum import price enforced through a system of countervailing levies. The Markov model showed an increasing gain by the French over the transition period 1973-1978 and an increasing loss by Australia and SA.

Ward (1982), in light of the enlargement of the EEC to include Spain, Portugal and Greece, developed an orange demand model for the EEC. The EEC's demand for sweet oranges was quantified using both traditional Ordinary Least Squares regression procedures (OLS) and stochastic time varying parameter estimates. The empirical results showed the EEC's demand for oranges as a whole was price inelastic over a wide range of wholesale prices.

Islam and Subramanian (1989) estimated income and price elasticities of demand and supply of agricultural exports (coffee, cocoa, tea, bananas and plantains) from developing countries using a consistent and fully specified demand and supply model. The demand for a developing country's exports depended on incomes, and the relative prices of those exports, in the markets of importing countries. The supply of exports from developing countries was considered to be a function of two sets of variables; first, export price and long-term trend factors including changes in technology and infrastructure; second, short-term factors such as pressure of variation in domestic demand and changes in domestic production affecting

short-term variations in the availability of export supplies from year to year. The relative price term captures the relative profitability of producing the agricultural commodity for export rather than for local consumption. Results show a low income elasticity of demand for developing country exports (income growth in developed countries will have a proportionally small influence on export performance) and the relatively insignificant role of relative prices as opposed to non-price factors in explaining export supply.

Lee ***et al.*** (1990) investigated Japan's import demand for citrus, particularly for fresh citrus products (vs other fresh fruits) and for citrus juices from different export suppliers, using the Rotterdam model over the period 1973-1987. Results showed (a) if Japan is going to import more fresh fruit, the growth would come from the increased imports of oranges, lemons and limes, and pineapples; (b) for citrus juice import growth , the US will play a less important role than Brazil; (c) bananas and pineapples are substitutes for fresh grapefruit and *vice versa,* and (d) citrus juice imported from Israel is a substitute for that imported from Argentina and Brazil.

Seale ***et al.*** (1992) used the Rotterdam import allocation model to fit import data for fresh apples in four key markets for US apple exporters, namely Canada, Hong Kong, Singapore and the UK over the period 1962-1987. Expenditure elasticities in the Canadian market suggest that demand for fresh apple imports is unitary elastic, while demand for SA fresh apples was price elastic in Canada. The Hong Kong market had expenditure elastic demand for US fresh apples, but inelastic demand for apples from other sources (Australia, Rest of the World (ROW) and China). Expenditure elasticity estimates for US apples in Singapore were also elastic, as were those for Australian apples, while those for China and ROW were inelastic. The US, France and New Zealand face expenditure elastic import demand in the UK for their apples, while Australia and the ROW face expenditure inelastic import demand. All apple suppliers to Canada, Hong Kong, Singapore and the UK (except Australia in the UK market) would increase apple exports if expenditure for imported fresh apples in these markets increased.

Sparks (1992) examined the relationship among the US and other exporting countries in four major import markets for fresh oranges (Canada, the EC, Hong Kong and Singapore) over

the period 1962-1987 using the Rotterdam model. Cournot cross-price elasticities in the Canadian market indicated that US oranges were complements to those from the Mediterranean region. Spain and Morocco would increase their shares in the EC as the market grows, while SA would increase its exports to the EC but its market share would decline as the market expands. The US had a very elastic Cournot own-price elasticity in the EC, showing that a small change in the price would lead to a large change in the quantity demanded for US oranges. Cournot cross-price elasticities indicated that US oranges were substitutes for oranges from Morocco and SA. The conditional income elasticities for the Hong Kong import market indicated that the Rest of the World (ROW) would lose market share to Taiwan and the US as the Hong Kong market for oranges grows, while exports of US fresh oranges are complements for SA oranges. The US is the strongest competitor in the Singapore market where Australia and the ROW would also increase their import shares as this market grows. Fresh oranges from the US were complements to Israel and the ROW oranges, and substitutes for Australian oranges, in Singapore.

Jong-Ying Lee (1994) analyzed the household demand for fresh fruits in Japan, utilizing the Rotterdam model for the period 1973-1990. The cross-price parameter estimates indicated that bananas, strawberries, and lemons are complements; strawberries, bananas and lemons are substitutes for mandarin oranges and apples; and bananas and strawberries are substitutes for grapes. Own-price elasticity estimates indicated that demand for apples, grapes, and strawberries became less price responsive, and the demands for mandarin oranges, bananas and lemons became more price responsive. The price of mandarin oranges had tripled and increased at a faster rate than increases in prices of other fresh fruits over the study period, so the consumption of mandarin oranges decreased by almost 70%. If imported oranges have similar flavour and characteristics as mandarin oranges (such as US tangerines and tangelos) and favourable prices, there may be a chance to increase mandarin orange consumption in Japan, which may benefit US citrus exporters. The substitution effect relationships among mandarin oranges, grapes, bananas and lemons suggested that the promotion of table grapes could increase US grape exports at the expense of US grapefruit and orange exports to Japan and *vice versa*.

Gunawardana ***et al.*** (1995) estimated a model of export supply response for the Australian

citrus industry using cointegration and error correction techniques and quarterly data for the period 1983 to 1993. The estimates suggest that, even in the long-run, the supply of citrus exports is inelastic (0.73) with respect to relative price (Australian dollar price of exports relative to domestic wholesale price). The results also show that the adjustment of export supply to changes in relative prices is not instantaneous and that domestic production capacity has a significant positive impact on export supply.

2.2 Local Research

Cleasby ***et al.*** (1991) studied factors affecting the demand for and supply of South African deciduous fruit exports. Simultaneous-equation models of deciduous fruit export demand were specified and estimated by Two-Stage Least Squares (2SLS) using annual data for the 1960-1990 period. The relatively large price elasticity of export demand (-28.07) indicated that South African deciduous fruit exporters, in aggregate, were price takers on world markets. Increased export supply by local producers would have little impact on export price but would markedly raise export revenues. The income elasticity of export demand for deciduous fruit was greater than unity (1.41) - real income growth in importing countries would markedly influence deciduous fruit export performance. Export supply was highly price inelastic in the short-run as expected, as producers cannot increase fruit supply in the short-run due to time lag between planting and fruit production (perennial crops). Deciduous fruit export supply seemed to respond more to price factors than non-price factors like supply shocks (weather).

Cleasby ***et al.*** (1993) estimated SA yellow maize export demand and supply functions by 2SLS using annual data for the period 1960-1990. The demand for South African yellow maize exports was price elastic (-37.90), implying that South African producers are price takers on world markets. Income elasticity of export demand for yellow maize was greater than unity (real income growth in importing countries would markedly influence export performance). Export demand for yellow maize did not adjust immediately to world price or income changes, probably due to foreign consumers' preference for the superior quality of South African yellow maize. Export supply of yellow maize was price inelastic in the short-run due to time lag between planting and harvesting. Yellow maize export supply was driven

more by supply shocks caused mainly by variable weather conditions than real producer price, showing that South Africa was a "residual" exporter on world markets (annual export supply varied directly with weather conditions in any year). These results are similar to those results reported by Gunawardana ***et al.*** (1995) for Australian citrus export supply determinants.

Hayward-Butt and Ortmann (1994) studied factors influencing the demand for oranges sold on the SA domestic market. The OLS technique was used over a 34 year period (1959-1992) to estimate the orange demand function. The price elasticity of demand was elastic (-1.55), showing that oranges had close substitutes such as apples and naartjies. The estimated income elasticity of demand was inelastic (0.41) indicating a normal good (as consumer's real disposable income rises so does the demand for oranges).

Past international and local studies identify price, consumer preference (lagged exports) and income determinants of export demand and relative price, production capacity and weather determinants of export supply. These results suggest possible variables to include in the economic models of SA fresh orange export demand and supply which will be specified in Chapter 4. Local research on these aspects of SA citrus marketing is lacking compared to international studies. The next chapter outlines recent developments in world trade and EU agricultural policy on fruit as background to assessing policy implications of the models specified in Chapter 4.

CHAPTER 3 RECENT DEVELOPMENTS IN WORLD TRADE AND EUROPEAN UNION AGRICULTURAL POLICY

This chapter reviews recent developments in world trade in agricultural commodities following conclusion of the Uruguay Round (UR) of GATT. It also considers the principles underlying a Free Trade Agreement (FTA) to put the EU-SA negotiations in perspective. A final section describes EU policy on fresh fruits to identify current regulations affecting SA fresh orange exports.

3.1 The GATT and the Agricultural Commodities

The General Agreement on Tariffs and Trade (GATT) was a multilateral agreement among countries that governed the conduct of all international trade between those countries. The institution was first established in Geneva in 1947 (23 countries took part including SA). Membership by 1990 had grown to 117, representing roughly 90% of world trade. The GATT outlined the principles and rules of conduct underlying the trade policies agreed upon by participating countries. These principles included (l) limiting trade barriers, (2) non-discriminatory application of trade barriers to all member countries and reciprocity, (3) the binding of tariff levels negotiated among members and compensating trading partners for their elimination of trade, and (4) settling trade disputes through negotiations using codes of conduct as guidelines (Buckley, 1990).

After 7 years of negotiations, the Uruguay Round (UR) of the GATT, was formally concluded on December 15, 1993, to open the way to substantial increases in trade flows across the 117 participant countries in fifteen different sectors. The agreement came into effect on July 1 1995, will last until June 30 2001 and be administered by the World Trade Organization (WTO) which was also established by the UR (ABSA Bank Special Report, 1995 and Chadee and Johnson, 1994). The outcome of the UR marks a significant break with the past because domestic and border policies for agricultural products have been brought back within the disciplines of the GATT and constraints have been placed on the freedom of governments to pursue issues of national and sectoral interest without proper regard to the detrimental international consequences (MacLaren, 1995). The GATT now incorporates the

agreement on agriculture (Marrakech agreement) and the agreement on sanitary and phytosanitary measures (SPS agreement). The UR involved much more than these agreements, including agreements governing trade in services (GATS) and on trade related intellectual property rights (TRIPS), both of which SA signed (Tanner, 1996).

Although SA is a founder member of GATT, the principles were not adhered to during the 1970's and 1980's sanctions era, but with the lifting of sanctions and an internationally acceptable government and constitution, all this will change. Submissions by SA to GATT were clarified with the NEF (National Economic Forum) meaning that they were accepted by the African National Congress (ANC) and other extra-parliamentary groups and will be implemented by the new government (ABSA Bank Special Report, 1995). Given that this study focuses specifically on fresh orange exports, only the agreement on agriculture and SPS will be considered below.

3.2 GATT Agreement on Agriculture

This agreement has implications for market access, domestic support, export subsidies and sanitary and phytosanitary measures, anti-dumping and formation of the WTO.

3.2.1 Market Access

3.2.1.1 Tariffication

Non-tariff border measures are replaced by tariffs that provide substantially the same level of protection. Tariffs on agricultural products are to be reduced by an average of 36% by developed countries and 24% by developing countries, with a minimum 15% reduction for each tariff line being required. Reductions are to be undertaken over 6 years in the case of developed countries and over 10 years in the case of developing countries. Least-developed countries are not required to reduce their tariffs (Burrell, 1995; Chadee and Johnson, 1994). Note that SA is classified as a developed country while most other African countries are either least-developed or developing countries (ABSA Bank Special Report, 1995).

3.2.1.2 Minimum Access

The agreement provides for the maintenance of current access opportunities and the establishment of minimum access tariff quotas (at reduced tariff rates), where current access is less than 3% of domestic consumption. These tariff quotas are to be expanded to 5% by the year 2000 (Chadee and Johnson, 1994).

3.2.2 Domestic Support

Chadee and Johnson (1994) quote an OECD report which states that reform involves individual countries examining their internal assistance programmes as they are essentially domestic policies. It has been proposed that countries consider direct income payments to farmers (decoupling) as a substitute for price support and border measures that provide incentives to increase production . What is needed is a reduction in the level of assistance, and direct income support measures not linked to production, to facilitate reform by reducing distortions in production, consumption and trade.

Reductions in domestic support are measured on an aggregate basis, thereby allowing politically sensitive sectors to experience no reductions in support (MacLaren, 1995). Arrangements for binding domestic support will mean that there is no effective capping of that support. Internal support is measured globally by the Aggregate Measure of Support (AMS) based on 1986-1988, with credit given for reductions in support since 1986. The AMS is to be reduced by 20% (13.3% for developing countries with no reduction for least-developed countries) compared with the base period (Burrell, 1995; Chadee and Johnson, 1994; News of the Uruguay Round of Multilateral Trade Negotiations (MTN), 1993). The AMS figure is the average difference in the base period between the internal administered price and a world reference price, multiplied by the volume of production in the reference period (Chadee and Johnson, 1994).

Domestic support measures that have, at most, a minimal impact on trade ("green box" policies) are excluded from reduction commitments. Such policies include general government services, for example in the areas of research, disease control, infrastructure and

food security (News of the Uruguay Round of MTN, 1993).

3.2.3 Export Subsidies

Export subsidies are bound by volume and value, and no new subsidies can be introduced. Products which were not subject to export subsidies in the 1988-90 base period are ineligible to receive subsidies after 1 July 1995 (MacLaren, 1995). Members must reduce the value of mainly direct export subsidies to a level 36% below the 1986-90 base period level over the 6 year implementation period and the quantity of subsidized exports by 21% over the same period. The reductions are two-thirds of those of developed countries over a 10 year period (with no reductions applying to the least-developed countries) and subject to certain conditions. Where subsidised exports have increased since the 1986-90 base period, 1991-92 may be used, in certain circumstances, as the beginning point of reductions although the end point remains the 1986-90 base period level (News of the Uruguay Round MTN, 1993).

3.2.4 Agreement on Sanitary and Phytosanitary Measures

Sanitary measures are domestic regulatory actions taken to safeguard human and animal health, and phytosanitary measures are similar actions in regard to plant health. The sanitary and phytosanitary measures (SPS) could act as important non-tariff barriers to international trade. They can provide protection to domestic producers at the expense of consumers and overall economic welfare. The GATT draft on SPS encourages the development and adoption of uniform international food safety standards on as wide a basis as possible to reduce barriers to international trade. There would be increased reliance on the international standards associations. The goals will be achieved by greater transparency, openness and clarity, by promotion of greater international harmonisation of standards, rules and procedures and by promotion of an improved consultation and dispute settlement framework (Petrey and Johnson, 1993).

Countries would have the right to adopt measures more stringent than those provided for by the international standards but these cannot be established without reasonable scientific justification. The "onus of proof" would clearly fall on the country seeking the higher level

of protection. Countries unable to accept a product which met international standards would also need to justify their actions. Clearer rules would assist in the resolution of disputes. The agreement should clarify the so-called "onus of proof" between exporting and importing countries (Petrey and Johnson, 1993).

The GATT recognised three principal steps in sanitary and phytosanitary risk management that may give rise to restrictions on trade, inadvertent or otherwise. First, risk assessment involves an evaluation of the likelihood of a pest or disease becoming established or its potential consequences, or in the case of additives, contaminants and toxins, the potential adverse effects on human or animal health. Second, it involves determining the acceptable level of risk. That is, meeting societal preferences through acceptable "tolerance" levels for contaminants. Thirdly, it involves the selection and application of health and sanitary risk management measures by Governments. A clause should be included to allow an importing country to take into account only the bio-economic impact of the introduction of a pest or disease. Such a clause would identify that it was the risk of disease that was the problem and not an economic threat to a particular industry. It is suggested that exporting countries should not have to undergo more rigorous control, testing and approval procedures than those applying to domestic producers. It is also suggested that there should be time limits on information processes and consideration of applications for new protocols. Some countries would like to have the right to apply national approval processes in all circumstances as opposed to international processes. Access to a market should be based on the relevant international standard until such time as the importing country makes a national determination. Provisions were attempted to find a reasonable balance between the desire to avoid distortions to competition and the desire to allow each country sovereignty over measures affecting the health and safety of its residents, their herds and crops (Petrey and Johnson, 1993).

3.2.5 Agreement on Implementation of Anti-Dumping Measures

The GATT provided for the right of contracting parties to apply anti- dumping measures, i.e. measures against imports of a product at an export price below its "normal value" (usually the price of the product in the domestic market of the exporting country) if such dumped

imports cause injury to a domestic industry. The importing country must establish a clear causal relationship between dumped imports and injury to the domestic industry (News of the Uruguay Round MTN, 1993).

3.2.6 Agreement Establishing the World Trade Organisation (WTO)

The outcome of the Agreement on Agriculture is a new set of binding and enforceable rules rather than a substantial liberalisation of agricultural trade (MacLaren, 1995). This agreement envisages a single institutional framework encompassing the GATT, as modified by the UR, all agreements and arrangements concluded under its auspices and the complete results of the UR. The UR agreement is a complex package incorporating not just the Agreement on Agriculture but also a number of significant changes to the 1947 GATT and the establishment of a WTO. The WTO is an umbrella organization responsible for overseeing the 1994 GATT, the General Agreement on Trade and Services (GATS) and the General Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). The 1994 GATT was ratified by all the major participants and on 1 January 1995, the new WTO came into operation. The WTO framework will ensure a "single undertaking approach " to the results of the UR - membership in the WTO will entail accepting all the results of the UR without exception. Furthermore, it is envisaged that the WTO will eventually have the same status as the International Monetary Fund (IMF) and the World Bank in shaping global trade (News of the Uruguay Round of MTN, 1993; Tanner, 1996).

The WTO is a body with statutory powers to enforce its findings and rulings according to international law. Any country that is a member of the WTO has agreed to abide by the laws of this body, which means that domestic laws have to comply with WTO rules and regulations. If not, punitive measures, for example compensation or trade sanctions, may be taken. This is especially important for South Africa, as article six of the constitution states that any international agreement signed by the country becomes legally binding, which means it is incorporated into the domestic legal framework (Otto, 1997).

3.3 Free Trade Agreement (FTA)

3.3.1 Definition of FTA

According to Lindert (1991), a FTA involves the removal of all barriers to trade amongst members, while member countries keep their separate national barriers against trade with nonmember countries. In such cases, customs officers still have to police the borders between members in order to tax or prohibit trade that might otherwise avoid some members' higher barriers by entering (or leaving) the area through countries with lower barriers. Article XXIV (8b) of the GATT agreement defines FTA as a group of two or more customs territories (e.g. EU and SA) in which duties and other restrictive regulations of commerce are eliminated on substantially all the trade between the constituent territories in products originating in such territories (Otto, 1996).

Article I of the GATT lays down the fundamental principle that members of the WTO must extend to all other members unconditionally any advantage, favour, privilege or immunity affecting customs duties, charges, rules and procedures that they give to products originating from or destined to any other country. This is described as the 'most-favoured-nation' (MFN) principle and on joining the WTO, members assume 'multilateral GATT obligations' in terms of the MFN principle. This ensures that commitments made in the course of GATT negotiating rounds are applied uniformly by every member to every other member. Article XXIV of the GATT which deals with regional arrangements is perhaps the most important exception to the MFN principle. It recognises that regional arrangements can 'increase the freedom of trade' through 'closer integration between the economies' of the members to a regional arrangement. But the framers also recognised that there was a danger of a region raising barriers to the trade of other WTO members (Kumar, 1995).

Three types of regional arrangements are envisaged by Article XXIV of the GATT, namely, a custom union, a FTA and a 'interim agreement' leading to the formation of either a customs union or a FTA. The interim agreements are dealt with under Article XXIV:5 of GATT. It provides 'an interim agreement leading to the formation' of either a custom union or a free-trade area is eligible for a MFN exception if certain conditions are met. The

provision of an interim period is logical since sudden removal of trade barriers between two or more countries could greatly disturb the economies involved and that gradual and substantial readjustment would always be needed (Kumar, 1995). Article XXIV:5c provides that any 'interim agreement...(submitted to the WTO) shall include a plan and a schedule for the formation of such a customs union or a free-trade area within a reasonable length of time'. In a nutshell, Article XXIV:5c requires (1) a 'plan and a schedule', that (2) will lead to the defined arrangement within a 'reasonable' time.

The definition of an FTA and customs union defined in article XXIV is somewhat ambiguous in the sense that it does not provide any guidance as to what is meant by substantially all trade. This requirement can be interpreted in both qualitative and quantitative terms (it is, however, generally accepted that at least 90 percent of the current trade has to be included in the FTA, and no industry may be excluded). In qualitative terms, this means that trade must be freed in each sector of the economy by at least 90 percent. In quantitative terms, this requires total trade to be freed by at least 90 percent. That is, some sectors of the economy may be excluded as long as, on average, 90 percent of all trade is freed (Kumar, 1995).

3.3.2 Issues Affecting FTA between SA and the EU

At the time of writing, the EU had rejected SA's application to be included in the trade chapter of the Lome' convention and proposed instead a fully reciprocal FTA covering 90 percent of each party's trade, implemented over a course of a ten (or twelve) year period. The EU proposal does include an element of asymmetry in timing, in that SA would be given slightly longer to implement its obligation than the EU. The EU proposal excludes 38 percent of currently most competitive SA agricultural exports, including citrus, to the EU from a FTA. Only 55 percent of SA agricultural exports to the EU would be included in the FTA and many of these only towards the end of a twelve year phase-in period. The schedule also proposed that SA be required to receive 88 percent of EU industrial imports duty free, while being allowed to export 97 percent of its manufactured products duty free. In order for SA to reach the required overall 90 percent coverage, the schedule proposed that SA be required to accept 95 percent of EU agricultural imports duty free. Not only would these come in duty free, they would also be subsidised under the CAP. Any proposed FTA between EU and SA

must be submitted to the WTO for approval. Tariff changes resulting from a FTA with the EU would automatically apply to the whole of the Southern African Customs Union (SACU). Producers (both agricultural and industrial) in Botswana, Lesotho, Namibia and Swaziland (BLNS), whether producing for their own domestic markets or for the wider SACU market, would be subject to full competition from EU imports. A reduction of tariffs to zero on a substantial range of imports from a major trading partner would significantly reduce revenue collections from customs duties - SACU common revenue pool, and a major source of government revenue for the BLNS countries (Parliament of the RSA, 1996).

If SA accepted the EU proposal on a FTA, this would subject her agricultural industry to unfair competition from highly subsidized agricultural imports under the EU CAP. If SA is granted better trade agreements for its agricultural commodities including citrus to the EU, the implications are possibly an increase in the quantity of SA fresh orange exports to the EU and increased competition for EU orange producers. The extent of these changes can only be assessed once empirical models of export demand and supply are estimated (see Chapter 4).

Given above new trade developments, EU agricultural policy changes, particularly with regard to fruit, are considered in the next section.

3.4 EU Common Agricultural Policy (CAP) for Fresh Fruits

The main objectives of the Common Agricultural Policy (CAP) as set out in Article 39 of the Treaty of Rome, 1957 were to increase agricultural productivity through technical progress and optimum utilization of labour; ensure a fair standard of living of the agricultural population by increasing earnings of persons in agriculture and stabilize markets, guarantee regular supplies and ensure reasonable prices to consumers. Within these broad goals, the CAP operates under three principles: a unified market, Community preferences and common financial responsibility. The CAP is the most important departure from the largely market-oriented economic and trade policies of the EU. For many observers, agricultural protectionism and the CAP are synonymous. Although CAP market interventions differ by type of product, the principal tool is price policy. To enforce policy determined prices,

variable levies on imports and subsidies - restitutions - on exports are used to insulate domestic markets from international price fluctuations to protect EU farmers from foreign competition. The price guarantee is accompanied by a marketing guarantee, with EU or national intervention agencies buying up any quantity that cannot be marketed at domestic (intervention) prices. Variable levies are set to increase import prices above prevailing domestic prices and are highly effective trade barriers. The variable levy system does not apply to some fruits and vegetables (Pohl and Sorsa, 1992). The CAP regulations affecting fresh orange imports by the EU consist of Common Customs Tariffs (CCT's) and a reference price system (renamed entry price system in 1994) which operated since July 1962 (Fernandez-Cavada, 1979).

3.4.1 Previous Reference or Import Price System (1962-1994)

The reference price system covered most imported fruit and vegetable products which compete with EU production and thus protected EU producers during their main marketing periods from low priced imports from third countries. The reference price is distinct to the operation of the Common Customs Tariff (CCT). It is effectively a minimum import price system whereby, when prices of a particular product from a particular country representing a significant proportion of imports on a representative Community market fall below the reference price plus the full rate of CCT for 2 days, countervailing charges are applied to make up the difference. The countervailing charges refer only to a particular country and have a cumulative effect as long as produce continues to come in below reference price levels. The charges are not removed until prices are above reference price levels for two consecutive market days or when no prices are recorded for six consecutive market days. The countervailing charge was a tax equal to the difference between the wholesale price recorded net of all import charges, and the reference prices. In effect the reference price plus CCT defined a minimum wholesale price below which it should not have been possible to market imported produce. It could, in practice, prove quite difficult for an importing country to respect the reference price once countervailing charges have triggered. This was because, after countervailing charges had been incurred, the minimum price which suppliers from the offending country had to respect now included the countervailing charge (Hinton, 1991; Pohl and Sorsa, 1992).

For sweet oranges, the reference price system applied from 1 December-31 May. When references prices were fixed for the first time they were based on the arithmetic mean of producer prices in the Member States, plus an allowance for transport costs from production areas to the consumption centres, with an adjustment if necessary for any changes in production costs in the fruit and vegetable sector. A lower bound was set such that reference prices could not fall in european currency unit (ecu) terms from one year to the next. This resulted in some reference prices being held constant in ecu terms for several years (Hinton, 1991 and Swinbank and Ritson, 1995).

The system differs from most other CAP regimes in that it discourages imports below the minimum import price, rather than bringing imports up to institutional levels by the addition of levies. The reference price is superficially like any other minimum import price of the CAP. Even for those countries which have imposed preferential rates on the CCT on their exports to the Community, the calculation to determine whether the reference price is being respected involves the full rate of the CCT. All exporting countries for any particular product face the same minimum import price, below which produce should not be able to enter the EU. Under this system a tariff concession granted by the EU does not necessarily lead to a price advantage with respect to foreign supplies in the EU market. The reference price system might lead to non-price competition, more stringent grading, better packaging and promotion - all with the aim of raising quality - and is more likely to act as a trade barrier to those third countries who compete on price rather than quality (Hinton, 1991).

Hinton (1991) stated that for citrus fruit, lemons, mandarins, oranges and clementines, the reference price provided little or no impediment to third country imports but that reference prices will become more active in future. Swinbank and Ritson (1995) note that the citrus reference prices had been inactive for many years because they had been frozen at their 1975 levels, with Italian exports to other Member States aided by 'penetration premiums'. Any increased protection to citrus producers had been reflected in increases in the penetration premium since that date. In May 1982, with the prospect of Spanish accession, it was decided to phase out penetration premiums and correspondingly increase reference prices. For sweet oranges the period of transition was 1990/91-1993/94 (Swinbank and Ritson, 1995). However, the predicted increase in reference prices for oranges did not occur because

of the freeze on such developments during the GATT negotiations.

The reference price system was distinctive in that it differentiated between alternative sources of supply. Countervailing charges when introduced, were only brought into force against a country which supplied significant quantities of low-priced produce (as compared, for example, to the cereals import levy policy, where the levy to be paid on all supplies was determined by the lowest price consignment) (Swinbank and Ritson, 1995). There was a strong incentive for individual supplying nations to arrange their exports so as to avoid incurring countervailing charges by ensuring that most supplies did indeed respect the reference prices. This was done by having an export marketing board or company which had control over prices and quantities supplied to European markets (Swinbank and Ritson, 1995). For example, all citrus and deciduous fruit exports from South Africa are channelled through the Capespan International. South African fresh oranges can thus be marketed in the European markets except from the 1 December-31 May when the reference price system is in operation and countervailing charges can be imposed if the reference or import price system is not respected. If marketing boards exercised marketing discipline, then the absence or small size of countervailing charges was not in itself proof that reference prices did not raise EU market prices. It could have been that third country suppliers operated a conscious marketing strategy to minimise the application of countervailing charges. The reference or import price system is not in operation for fresh oranges during the EU off-season (1 June - 31 November) (Swinbank and Ritson, 1995).

The GATT Agreement and the process of tariffication put the EU in a quandary when it came to reference price products. The process of tariffication entitled the EU to convert into import duties the protective effect of minimum import prices; but to have increased the import duty on these products, to reflect the average protective effect of reference prices, would have meant that suppliers, most times, would have been faced with increased import charges. Rather than increase import duties, or abandon the protective effect of the reference price system, the EU decided to retain minimum import prices (renamed entry prices), and despite the apparent conflict with the tariffication provisions of the new GATT Agreement, it seems that the EU's trading partners accepted this outcome as the lesser of two evils (Swinbank and Ritson, 1995).

3.4.2 New Entry Price System (post 1994)

The new entry price system is to apply to all products previously subject to reference prices. Entry prices, which will act as minimum import prices, have been derived from the reference prices that applied in 1986/88.

Table 2 EU Entry Price System on Fresh Orange Imports.

Start of EU Marketing Season	Entry price period	Duty periods	% Normal Rate	Entry price (ecu/ton)	Maximum Tariff Equivalent (ecu/ton)
01.10	01.12-31.05	01.01-31.03	18.7	36.60	8.30
		01.04-30.04	12.1	36.60	8.30
		01.05-14.05	5.6	36.60	8.30
		15.05-31.05	3.7	36.60	8.30
		01.06-30.09	3.7	-	-
		01.10-15.10	3.6	-	-
		16.10-30.11	18.0	-	-
		01.12-31.12	18.0	36.30	8.00

Source: Outspan International (1997).

For most products, the calender of application of the new entry prices reflects the calendar previously in place for reference prices. Unlike the old reference price system, under which

wholesale market prices were monitored to police the mechanisms, in principle the new system is to work on a consignment basis at the time of import. If the actual entry price/value of a particular consignment is below the minimum entry price specified, then a countervailing charge will be levied. The maximum countervailing charge is specified in the tariff schedules as a maximum tariff equivalent (MTE) (Swinbank and Ritson, 1995) **(refer table 2 for 1997 EU duties on fresh orange imports)**.

If the shortfall is small, the countervailing charge will be set equal to the shortfall. If the actual entry price falls below 92 percent of the specified minimum entry price then the countervailing charge will be set equal to the full MTE. For example, if SA fresh orange export price/ton is 33.67 ecu/ton to the EU, i.e. below 92% of the entry price (36.60 ecu/ton), then a MTE of 8.30 ecu/ton and import tariff of 18.7% of 33.67 ecu/ton would be imposed on SA fresh orange imports into the EU. The maximum countervailing charge is to be reduced over the six-year transition and the minimum entry price will itself be reduced by the amount of ecu that the MTE is reduced.

The uncertainty flowing from the decision to apply the mechanism on a consignment basis relates to the impact on countries which enjoy tariff preferences. The old reference price system did not allow the tariff preference to be expressed in lower wholesale prices in EU markets. This is because the ex-post monitoring of wholesale prices to see if reference prices had been respected treated all origins as if the full rate of the customs tariff had been paid. Under the new system if the consignment respects a minimum entry price at the border of 36.9 ecu/ton of fresh oranges, and there is no import duty to pay, the full impact of the tariff concession can presumably be reflected in market prices without fear of countervailing charges being levied. This could be an important additional concession for preferred suppliers, if in lowering prices they can expand market share. Most maximum countervailing charges, like tariffs, are to be reduced by 20% over the six-year transition, though for a few items, tariffs and MTE's will see a larger reduction (Swinbank and Ritson, 1995).

3.4.3 Trade Policy Instruments

Instruments for trade policy range from tariffs and quantitative restrictions to voluntary

restraints and more subtle barriers, such as product standards.

3.4.3.1 Tariffs

Table 3 EU Import and Concessionary Tariffs on Fresh Oranges, 1997.

Period of applicability	01.04 - 30.04	01.05 - 14.05	15.05 - 31.05	01.06 - 30.09	01.10 - 15.10	16.10 - 31.03
EU external tariff (SA)	12.1%	5.6%	3.7%	3.7%	3.6%	18%-18.7%
GSP[3] States	0% and over, depending on the agreement with the particular GSP State.					
ACP[4] States	2.6%	1.2%	0%	0%	0.8%	4%
Egypt	5.2% TQ[5]:0	2.4% TQ:0	2.4% TQ:0	1.6% TQ:0	1.6% TQ:0	8% TQ:0
Israel	5.2% TQ:0	2.4% TQ:0	2.4% TQ:0	1.6% TQ:0	1.6% TQ:0	8% TQ:0
Lebanon	5.2%	2.4%	2.4%	1.6%	1.6%	8%
Morocco	2.6% TQ:0	1.2% TQ:0	1.2% TQ:0	0.8% TQ:0	0.8% TQ:0	4% TQ:0
Tunisia	2.6% TQ:0	1.2% TQ:0	1.2% TQ:0	0.8% TQ:0	0.8% TQ:0	4% TQ:0

Source: Outspan International (1997).

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[3] Some GSP states receive further import tariffs reductions. Although SA has been accorded GSP status, her agricultural products including fresh oranges are excluded from GSP status benefits as of 1 January 1997.

[4] ACP stands for African, Caribbean and Pacific Countries.

[5] 0% import tariff where tariff quota (TQ) apply.

The EU operates in the form of a custom union where member countries (UK, France, Germany, Netherlands and Belgium) removed all tariffs and other trade restrictions with respect to each other and set the Common Customs Tariff (CCT) against outsiders. The CCT applies to the full range of fruit and vegetables whether they are subject to intervention or reference prices or not. There are some concessionary rates for third countries through Lome', Generalised System of Preference (GSP) and Mediterranean third country agreements, but these are normally limited by tariff quota and often by calendar period (Hinton, 1991) **(refer Table 3)**.

Table 4 shows the estimated reduction in EU fresh orange import tariffs over a six-year implementation period using 1994 as base period which includes GATT, Entry price and GSP. In the year 2000, SA fresh orange exports between June and October will face a 3.2% import tariff compared with the current 3.6% import tariff. It is expected that SA can increase its market share as EU reduces import tariffs in compliance with the GATT.

Table 4 EU Estimated Reduction in Fresh Orange Import Duties[6], 1994-2000.

Entry price period	Duty period	1994	1995	1996	1997	1998	1999	2000
01.12-31.05	16.10-31.03	20%	19.3%	18.7%	18%	17.3%	16.7%	16%
	01.04-30.04	13%	12.6%	12.1%	11.7%	11.3%	10.8%	10.4%
	01.05-15.05	6%	5.8%	5.6%	5.4%	5.2%	5%	4.8%
	16.05-15.10	4%	3.9%	3.7%	3.6%	3.5%	3.3%	3.2%

Source: Outspan International (1996).

[6] Estimated trend from 1994 base, including GATT, Entry Price and GSP reductions.

3.4.3.2 System of Preferences

Preferential agreements between the EU and developing countries can be divided into three types: the Lome', Mediterranean Agreements and the Generalised System of Preferences (GSP) (Pohl and Sorsa, 1992). The successive Lome' Agreements were negotiated to maintain and develop the traditional economic and commercial relations between EU member countries and now seventy-one developing countries in Africa, Caribbean and Pacific (ACP) countries benefit from reductions in duties on a number of agricultural products, sometimes combined with quantitative limits on preferential access (tariff quotas). For some fruits in which many developing countries have a natural comparative advantage, ACP countries are exempt- without seasonal restrictions -from tariffs that range up to 20 percent in the EU (Pohl and Sorsa, 1992).

With each southern enlargement of the EU adding Greece (1980), Portugal and Spain (1986), the Mediterranean Agreements have been updated to maintain preferential access and traditional trade flows. Tariff reductions have also been granted for certain agricultural products. In agriculture the system of preferences is complex, with country and product-specific preferences limited to off-season periods, subject to seasonal tariffs and EU reference prices during summer. Following the southern enlargement of the EU, these duties are being phased out for traditional quantities of exports to the EU. In addition to these EU-wide restraints, some member countries apply quantitative restrictions. The southern Mediterranean countries- Algeria, Egypt, Jordan, Lebanon, Morocco, Syria and Tunisia - have no reciprocal obligations (Pohl and Sorsa, 1992).

The GSP was introduced in 1971 in response to demands by developing countries for preferential access to help diversify their exports. Renewed annually, it extends preferential trade treatment to some 146 developing countries and territories. As the ACP and Mediterranean countries have more favourable access under their special agreements, the effective beneficiaries of the GSP system now are sixty-six developing countries in Asia and Latin America. Benefits under the GSP scheme are temporary and nonbinding. The GSP scheme applies to agricultural products but benefits are more limited (Pohl and Sorsa, 1992).

South Africa has been made a standard beneficiary of the new GSP which is fixed for a three-year period, ending on 30 June 1999, thereafter it will be either extended or re-evaluated and amended. The citrus fruits (fresh oranges) have not been included in the new GSP. This indicates EU sensitivity towards SA's agricultural exports to their markets (Otto, 1996).

The demand for SA fresh orange exports to the EU should benefit if fresh orange import tariffs are lowered by a FTA or as the EU reduces fresh orange import tariffs as set out in the UR (lower relative export price). South Africa should compete favourably with her competitor's if she is granted GSP status for agricultural products including fresh oranges in the EU markets. The EU preferential trade agreements with SA's main competitors (Israel, Morocco and Spain) could divert trade in fresh orange imports from third countries (including SA) to these competitors.

CHAPTER 4 RESEARCH METHODOLOGY

Numerous studies of export demand and supply appear in the literature (Goldstein and Kahn, 1978; Bond, 1985; Islam and Subramanian, 1989; Cleasby ***et al.***, 1991; Cleasby ***et al.***, 1993, and Gunawardana ***et al.***, 1995). All studies specify simultaneous-equations models of export demand and supply, in order to differentiate the demand response of exports from the supply response. This approach is followed in the simultaneous-equation models of SA fresh orange exports by specifying separate export demand and supply functions in each of the five EU markets over the period 1976-1993. The simultaneous equation technique is discussed first as background to estimation of SA fresh orange export demand and supply equations.

4.1 Simultaneous-Equation Techniques

The Ordinary Least Squares (OLS) estimation procedure allows for unidirectional cause-and-effect relationships between the endogenous and exogenous variables. However, multi-directional relationships exist in the specified export models with quantity traded and commodity price being jointly dependant variables. For instance, income growth in importing countries may cause an increase in export demand, leading to changes in quantity traded and commodity price, *ceteris paribus*. Therefore, a regression of quantity on price would violate the OLS assumption of no correlation between the exogenous variable (s) and the error term. This leads to parameter estimates that are biased and inconsistent (do not converge to their true (population) values as sample size increases indefinitely). Simultaneous-equation methods are designed to overcome these problems (Gujarati, 1995). Such models also differentiate the demand response of exports from the supply response. Separate estimation of export demand and supply equations outside the simultaneous-equation framework would give "biased" relative price elasticity of export demand and supply estimates which are weighted averages of the "true" elasticities (Orcutt, cited by Haniotis ***et al.***, 1988).

Single-equation simultaneous-equation methods like Two-Stage Least Squares (2SLS) estimate each equation in the system individually, taking into account the restrictions (such as exclusion of some variables) on that equation (Dhrymes, 1974, and Gujarati, 1995).

4.1.1 Two-Stage Least Squares

Two-Stage Least Squares (2SLS) is a method of estimating consistent structural parameters for exactly and over-identified equations in a simultaneous-equation system. The aim of 2SLS is to replace the endogenous explanatory variables (correlated with the error term) with a "proxy" explanatory variable which resembles them but is uncorrelated with the error terms. This technique is a special case of the instrumental variables technique in which the "best" instrumental variables are used (Kennedy, 1979). A good instrumental variable is highly correlated with the regressor for which it is acting. The reduced form equations and coefficients are derived from the structural equations. A reduced form equation expresses the endogenous variable solely in terms of the predetermined variables and the stochastic disturbances.

2SLS involves the application of OLS in two stages; firstly, each endogenous variable is regressed on all the exogenous variables of the system by OLS in order to get rid of the likely correlation between the endogenous variable and the error term. This generates the reduced-form regression with the exogenous (predetermined) variables on the right hand side (Gujarati, 1995). Actual values of the exogenous variables are substituted into the reduced-form equations to obtain the estimated (proxy) values of the endogenous variables; secondly, the endogenous variables in the original structural equations are replaced by their "proxy" (reduced form) values and OLS is applied to each equation.

2SLS produces consistent parameter estimates because the "proxy" variables are uncorrelated with the error terms. Monte Carlo studies have shown it to have small-sample properties superior on most criteria to all other estimators. 2SLS is insensitive (robust) to the presence of other estimating problems such as multicollinearity and specification error (Kennedy, 1979).

Advantages of 2SLS are:

* it has unique and consistent structural coefficient estimates in both exactly and overidentified equations,

* the procedure estimates the standard errors of the structural coefficients estimates directly,
* most identified models are overidentified and 2SLS is ideally suited for simultaneous equation models, and
* the researcher can apply the technique to individual equations without taking into account other equations in the system (ibid).

4.2 Simultaneous-Equation Models

4.2.1 SA Fresh Orange Export Demand Equations

The export demand equations adapt the specifications outlined by Goldstein and Kahn (1978). Export demand for SA fresh oranges in each EU market is specified as a function of the price of SA fresh orange exports in the *ith* country (UK, France, Germany, Netherlands or Belgium) relative to the price of fresh oranges from SA's major competitor in the *ith* country, lagged exports and real annual disposable income per capita in the *ith* country. Relative price and export demand should be negatively related - as the SA fresh orange price rises relative to the prices of fresh oranges from the major competitor in the *ith* country, less SA fresh orange exports will be demanded. Lagged exports should be positively related to export demand, as foreign buyers are unlikely to adjust their consumption habits immediately to the desired level following a price change. This could be due to a preference for the premium quality of SA fresh orange exports and their May-November specific availability. Therefore, following a price increase, consumption habits would not change immediately as this may cause some disutility (Gujarati, 1995). Assuming fresh oranges are a normal good in the *ith* country, real disposable income per capita would be positively related to export demand. As consumers' real disposable income rises, so does the demand for fresh oranges. Equation (1) gives the export demand equation which applies to each EU market:

$$OREX_{it} = f([PSA_i/PCO_i]_t;\ OREX_{it-1};\ [Y_i/POP_i]_t;\ e_t) \qquad (1)$$

where:

	$OREX_{it}$	=	SA annual fresh orange exports (tons) to *ith* market,
	PSA_{it}	=	Price of SA fresh orange exports in *ith* market (UK, France, Germany, Netherlands or Belgium) (ecu/ton),
	PCO_{it}	=	Price of fresh oranges of SA's major competitor in the *ith* market (ecu/ton),
	$OREX_{it-1}$	=	SA fresh orange exports (tons) lagged one period,
	Y_{it}	=	Annual national disposable income in *ith* market (ecu's),
	POP_{it}	=	Population in the *ith* market (millions), and
	e_t	=	Error term (t=1,...,18 years).

During the sanctions era, the Outspan brand was used on SA fresh orange exports to the EU including also fresh orange exports from Swaziland, Mozambique and Zimbabwe. The Goldland brand was also used for a small proportion of SA fresh orange exports. Sanctions had no significant impact on SA fresh orange exports to major EU markets, especially in the UK, but there was some impact on the Netherlands market (Moore, 1996). Dummy variables for sanctions years in the study period (= 1 for sanctions year, 0 = for non-sanctions year) were included in the estimated demand equations.

4.2.2 SA Fresh Orange Export Supply Equations

Export supply of SA fresh oranges is specified as a function of lagged relative export price (ratio of net export realisation price to domestic market price), SA fresh orange price in the *ith* market relative to SA fresh orange price in the most profitable alternative *(nth)* export market to the *ith* market, lagged exports and random shocks in total SA fresh orange supply. Equation (2) gives the export supply equation which applies to each EU market:

$$OREX_{it} = f\left(\left[\frac{RNERP}{RDP}\right]_{t-m};\ \left[\frac{PSA_i}{PSA_n}\right]_t;\ OREX_{it-1};\ \left[S-\bar{S}\right]_t;\ e_t\right) \qquad (2)$$

where:

$OREX_{it}$	=	SA annual fresh orange exports (tons) to *ith* market,
$RNERP_{t-m}$	=	Real net export realisation price lagged *m* periods (R/ton),
RDP_{t-m}	=	Real domestic fresh orange price lagged *m* periods (R/ton),
PSA_{it}	=	Price of SA fresh orange exports in the *ith* market (ecu/ton),
PSA_{nt}	=	Price of SA fresh orange exports in the most profitable alternative *(nth)* export market to the *ith* market (ecu/ton),
$OREX_{it-1}$	=	SA fresh orange exports lagged one period (tons),
$[S-\bar{S}]_t$	=	Supply shock (deviation of actual production from trend), and
e_t	=	Error term (t=1,...,18 years).

Influences on domestic producer decisions to export fresh oranges are reflected in the export supply function by the lagged relative price term $[RNERP/RDP]_{t-m}$ which captures the higher relative profitability of producing for export. Desired long-run export supply in period *t* is a function of *expected* relative price. In the short-run, however, export supply cannot adjust completely to the desired level, due to the lag between planting and harvesting. The empirical model will show what length of lag best estimates export supply. The short-term relative price $[PSA_i/PSA_n]_t$ captures the profitability of the *ith* market relative to the *nth* market or next most profitable market. Once exports arrive in the *ith* market, agents can allocate fresh oranges amongst the *ith* and *nth* markets according to relative profitability. A positive relationship between export supply and lagged relative prices is expected. Relatively higher net export price would induce a lagged increase in exports while a relatively higher *ith* price in the short-term would increase quantity supplied to that market relative to the *nth* market. The UK usually fetches the highest price and largest quantity of SA fresh orange exports with France usually the next major profitable market (Els, 1996).

Lagged export supply reflects export orientation as it represents partial adjustment of

producers to desired export levels. Fresh oranges are perennial crops and, therefore, supply is very inflexible in the short-run. Over the long-run, output of fresh oranges can vary through shifts in production capacity resulting from changes in the number of orange-bearing trees. Actual export supply in period t is thus a function of expected relative price and the level of exports in the previous period. The random shock variable captures how supply shocks caused by variable weather conditions impact on exports and is estimated as the residuals from a regression of total SA annual orange production on time. The random shock variable should be positively correlated with exports (Gunawardana ***et al.***, 1995).

The number of orange bearing fruit trees rose by 73%, from 6.98 million trees to 9.57 million trees, during 1976-1993. This indirectly shows that plantings increased despite the threat of sanctions in established export markets (Directorate of Agricultural Statistics, 1996). The recent increase in the supply of fresh oranges would be destined for non-EU markets like the Far East and Eastern Europe which were closed to SA fresh oranges during the sanctions era (Moore, 1996).

4.3 Data Sources

Data on fresh orange exports (tons and ecu/ton) by country to each of the five EU markets (1976-1993) were sourced from Eurostat (1995). South African export tons and R/ton price for fresh oranges (1965-1993) were provided by Outspan International (1994) in South Africa. The annual fresh orange net export realisation price (R/ton) and domestic price (R/ton) for the export supply equations were obtained from the Directorate Agricultural Economic Trends (1995). National disposable income and population estimates for the EU markets were obtained from Europa World Yearbook (various years) and International Financial Statistics (various years) respectively. The volume of South African fresh orange exports at any given point in time is determined by export demand and supply conditions. Exports of all fresh oranges by country into the five EU markets are expressed in metric tons. All EU member country prices are expressed in European Currency Unit (ecu/ton) and deflated by the Consumer Price Index (1987=100).

The results in Chapter 5 show how parameters of the SA fresh orange export demand and

supply equations specified above were estimated by 2SLS for each EU market. They also highlight the use of principal component analysis to remedy multicollinearity in some of the functions.

CHAPTER 5 RESULTS

This chapter presents correlation matrices for export demand and supply variables and estimated simultaneous-equation models for each of the five EU markets.

5.1 Correlation Matrices for Export Demand Equations

5.1.1 Correlation Coefficients Between Export Demand Variables in the United Kingdom

Table 5 shows that export demand for SA fresh oranges ($OREX_{UKt}$) was negatively related to the price of SA fresh oranges relative to the price of fresh oranges from Israel in the UK $[PSA_{UK}/PIS_{UK}]_t$ (15% significance level) - as SA fresh orange price rises relative to the Israel fresh orange price, less SA fresh orange exports will be demanded. $OREX_{UKt}$ was positively correlated (5% significance level) with $OREX_{UKt-1}$ (lagged export demand of SA fresh oranges) - showing that foreign buyers are unlikely to adjust their consumption habits immediately following a price change. $OREX_{UKt}$ was negatively correlated (5% significance level) with YPC_t (real income per capita), but one would expect a positive correlation if SA fresh oranges are a normal good.

Table 5 Correlation Coefficients Between Export Demand Variables in the United Kingdom.

	$OREX_{UKt}$	$[PSA_{UK}/PIS_{UK}]_t$	$OREX_{UKt-1}$	YPC_t
$OREX_{UKt}$	1.0000	-0.3710*	0.5185**	-0.5553**
$[PSA_{UK}/PIS_{UK}]_t$	-0.3710*	1.0000	0.3843*	-0.5776**
$OREX_{UKt-1}$	0.5185**	0.3843*	1.0000	-0.4780**
YPC_t	-0.5553**	-0.5776**	-0.4780**	1.0000

Note: **, * and ns indicate significance at the 5% and 15% levels, and no statistical significance, respectively.

5.1.2 Correlation Coefficients Between Export Demand Variables in France

Export demand for SA fresh oranges ($OREX_{FRt}$) was negatively correlated with $[PSA_{FR}/PMO_{FR}]_t$ (relative price of SA to Morocco fresh oranges fetched in France) (-0.2528) and YPC_t (real income per capita) (-0.1997), but the coefficients were not statistically significant. The high positive correlation of $OREX_{FRt}$ with $OREX_{FRt-1}$ (0.6853) (1% significance level) was as expected. No other correlation coefficients were statistically significant.

5.1.3 Correlation Coefficients Between Export Demand Variables in Germany

For Germany, $OREX_{GERt}$ was negatively correlated with $[PSA_{GER}/PIS_{GER}]_t$ (price of SA fresh oranges relative to the price of fresh oranges from Israel in Germany) (-0.3223), but the coefficient was not statistically significant. The correlation coefficient between $OREX_{GERt}$ and $OREX_{GERt-1}$ was positive and significant at the 10% level. The income per capita variable, YPC_t, was negatively correlated (5% level of significance) with $OREX_{GERt}$, contrary to expectations. YPC_t was negatively correlated with $[PSA_{GER}/PIS_{GER}]_t$ (no statistical significance), and positively correlated with $OREX_{GERt-1}$ (0.3595) at the 15% significance level.

5.1.4 Correlation Coefficients Between Export Demand Variables in Netherlands

In the Netherlands market, $OREX_{NETHt}$ was highly positively correlated with $OREX_{NETHt-1}$ (0.6662) and highly negatively correlated with YPC_t (-0.6812) at the 1% level of significance. The negative relationship between $OREX_{NETHt}$ and $[PSA_{NETH}/PIS_{NETH}]_t$ (price of SA fresh oranges to Israel fresh oranges in the Netherlands) was significant at the 10% level. $[PSA_{NETH}/PIS_{NETH}]_t$ was highly correlated with $OREX_{NETHt-1}$ (0.8880) and YPC_t (0.8365) at the 1% significance level.

5.1.5 Correlation Coefficients Between Export Demand Variables in Belgium

Results for Belgium show that $OREX_{BELt}$ was negatively correlated with $[PSA_{BEL}/PIS_{BEL}]_t$

(price of SA fresh oranges to Israel fresh oranges in Belgium) (-0.4213) at the 10% level of significance and YPC_t (-0.1303) (no statistical significance). The $OREX_{BELt}$ and $OREX_{BELt-1}$ variables were positively correlated (0.7347) at the 1% level of significance. No other correlation coefficients were statistically significant.

5.2 Correlation Matrices for Export Supply Equations

5.2.1 Correlation Coefficients Between Export Supply Variables in the United Kingdom

In Table 6, export supply of SA fresh oranges, $OREX_{UKt}$, was positively correlated at the 10% level of significance with the relative export price lagged three periods $[RNERP/RDP]_{t-3}$ - a relatively higher net export price would induce an increase in SA fresh orange export supply. The correlation between $OREX_{UKt}$ and $[PSA_{UK}/PSA_{FR}]_t$ (price of SA fresh oranges in the UK relative to France) was positive as expected but was not statistically significant. A higher relative UK price would increase quantity supplied to that market compared to France. The positive correlation (5% level of significance) of $OREX_{UKt}$ with $OREX_{UKt-1}$ represents partial adjustment of producers to desired export levels: the export supply of fresh oranges in period *t* is a function of the level of fresh orange exports in the previous period. The random shock variable, $[S-\bar{S}]_t$, was positively correlated (20% level of significance) with $OREX_{UKt}$, as expected: it captures how supply shocks caused by weather conditions impact on export supply. Multicollinearity may be present as the supply shock proxy $[S-\bar{S}]_t$ was significantly related to $[RNERP/RDP]_{t-3}$ and $OREX_{UKt-1}$ at the 5% level.

Table 6 Correlation Coefficients Between Export Supply Variables in the United Kingdom.

	$OREX_{UKt}$	$[RNERP/RDP]_{t-3}$	$[PSA_{UK}/PSA_{FR}]_t$	$OREX_{UKt-1}$	$[S-\bar{S}]_t$
$OREX_{UKt}$	1.0000	0.4829**	0.1766^{ns}	0.5185***	0.3370*
$[RNERP/RDP]_{t-3}$	0.4829**	1.0000	-0.3754*	0.3684*	0.5995***
$[PSA_{UK}/PSA_{FR}]_t$	0.1766^{ns}	-0.3754*	1.0000	-0.1420^{ns}	O-0.3754*
$OREX_{UKt-1}$	0.5185***	0.3684*	-0.1420^{ns}	1.0000	0.5907***
$[S-\bar{S}]_t$	0.3370*	0.5995***	-0.3754*	0.5907***	1.0000

Note: ***, **, * and ns indicate significance at the 5%, 10% and 20% levels, and no statistical significance, respectively.

5.2.2 Correlation Coefficients Between Export Supply Variables in France

In the French market, $OREX_{FRt}$ was positively correlated with $[RNERP/RDP]_{t-3}$ (0.5152), $[PSA_{FR}/PSA_{UK}]_t$ (price of SA fresh oranges in France relative to price of SA fresh oranges in UK) (0.5387), and $[S-\bar{S}]_t$ (0.4982) at the 5% level of significance, and with $OREX_{FRt-1}$ (0.6853) at the 1% level. Multicollinearity may be a problem as $OREX_{FRt-1}$ and $[S-\bar{S}]_t$ were highly positively correlated (0.7203) (1% significance level). The relative export price $[RNERP/RDP]_{t-3}$ was positively correlated with $OREX_{FRt-1}$ (0.5631) and $[S-\bar{S}]_t$ (0.5995) at the 5% level of significance.

5.2.3 Correlation Coefficients Between Export Supply Variables in Germany

For Germany, $OREX_{GERt}$ and $[RNERP/RDP]_{t-3}$ (0.0553) and $[PSA_{GER}/PSA_{UK}]_t$ (SA fresh orange price in Germany relative to SA fresh orange price in the UK) (0.0374) were positively correlated (no statistical significance). The expected positive relationships between $OREX_{GERt}$ and $OREX_{GERt-1}$ (0.4083) (10% significance level); and $[S-\bar{S}]_t$ (0.3150) (20% level of significance) were reported. Also, $[S-\bar{S}]_t$ was positively correlated with $[RNERP/RDP]_{t-3}$

(0.5995) (5% level of significance), and $OREX_{GER_{t-1}}$ (0.3786) (15% level of significance).

5.2.4 Correlation Coefficients Between Export Supply Variables in Netherlands

Netherlands results show that $OREX_{NETH_t}$ was positively correlated with $[RNERP/RDP]_{t-3}$ (0.6062), $OREX_{NETH_{t-1}}$ (0.6662), and $[S-\bar{S}]_t$ (0.4977), as expected, all at the 5% level of significance. In addition, $OREX_{NETH_t}$ was positively correlated with $[PSA_{NETH}/PSA_{UK}]_t$ (price of SA fresh oranges in Netherlands relative to price of SA fresh oranges in the UK) (0.2904), but the coefficient was not statistically significant. Multicollinearity may be present as $[S-\bar{S}]_t$ was positively correlated with $[RNERP/RDP]_{t-3}$ (0.5995) (5% significance level); and $OREX_{NETH_{t-1}}$ (0.3997) (15% significance level).

5.2.5 Correlation Coefficients Between Export Supply Variables in Belgium

Export supply, $OREX_{BEL_t}$, was positively correlated with $[RNERP/RDP]_{t-3}$ (0.6076) at the 5% level of significance, and $[PSA_{BEL}/PSA_{UK}]_t$ (price of SA fresh oranges in Belgium relative to price of SA fresh oranges in UK) (0.3112 - not statistically significant). The high positive correlation (1% level of significance) of $OREX_{BEL_t}$ with $OREX_{BEL_{t-1}}$ (0.7347), and $[S-\bar{S}]_t$ (0.7326) was as expected. Relative export price $[RNERP/RDP]_{t-3}$ was positively correlated with $OREX_{BEL_{t-1}}$ (0.5238), and $[S-\bar{S}]_t$ (0.5995) at the 5% level of significance. Finally, $OREX_{BEL_{t-1}}$ and $[S-\bar{S}]_t$ (0.8267) were highly correlated at the 1% level of significance.

The above results imply that multicollinearity may be a problem in the estimation of export supply equations. Principal components extracted to remedy this problem are described in the next section.

5.3 Model Estimation

Two-Stage Least Squares (2SLS) was used to estimate the parameters of the export demand and supply equations in the system using SPSS (1995). The estimated export demand equations for the five EU markets are compared below.

5.3.1 EU Export Demand Models

The export demand models for the UK (3), France (4), Germany (5), Netherlands (6) and Belgium (7) were free of multicollinearity and all signs agreed with *a priori* expectations. The explanatory power of the functions (adjusted R^2) ranged from 20 percent (Germany) to 59 percent (Belgium). All *t*-values are shown in parentheses, and **, * and ns indicate significance at the 1% and 10% levels, and no statistical significance, respectively. Export demand was negatively related to the price of SA fresh oranges relative to the price of fresh oranges from Israel in the UK $[PSA_{UK}/PIS_{UK}]_t$, Germany $[PSA_{GER}/PIS_{GER}]_t$, Netherlands $[PSA_{NETH}/PIS_{NETH}]_t$ and Belgium $[PSA_{BEL}/PIS_{BEL}]_t$. In France, however, export demand was negatively related to the SA export price relative to the price of fresh oranges from Morocco $[PSA_{FR}/PMO_{FR}]_t$. Israel appears to be the major fresh orange competitor for SA in the UK, Germany, Netherlands and Belgium. The significant $OREX_{it-1}$ coefficient in all export demand functions probably shows that consumers in these markets adjust consumption habits slowly following a price change, due to their preference for the premium quality of SA fresh orange exports.

The United Kingdom export demand equation **(3)** explained only 35% of the total variation in $OREX_{UKt}$.

$$OREX_{UKt} = \underset{}{27651.8289} \underset{(-2.02)^{*}}{-9102.8931} \left[\frac{PSA_{UK}}{PIS_{UK}}\right]_t \underset{(3.16)^{**}}{+0.7457} OREX_{UKt-1} \qquad (3)$$

adjusted $R^2 = 35\%$, $d = 1.63$

All variables have the expected signs and the $[PSA_{UK}/PIS_{UK}]_t$ and $OREX_{UKt-1}$ coefficients are statistically significant at the 10% and 1% levels respectively. As equation (3) is an autoregressive model, serial correlation cannot be detected using the conventional Durbin-Watson *d* statistic. In such cases the Durbin *h* statistic should rather be used to detect first-order autocorrelation (Gujarati, 1995:605). For this export demand model, the Durbin *h* is not applicable as the formula for estimating *h* included the square root of a negative number. To overcome this problem, Pindyck and Rubinfeld (1991:147) suggest a technique which uses

the estimated residual variable and the lagged estimated residual variable from equation (3). The residual variable is regressed on the lagged residual and the two explanatory variables shown in equation (3). A *t* test of the null hypothesis that the estimated coefficient for the lagged residual is not statistically different from zero is then conducted. In this case, the coefficient of the lagged residual variable was 0.0809 with a non-significant *t*-value, implying that serial correlation is not present.

For the French export demand, equation **(4)**, all coefficients are significant and have the expected signs, $[PSA_{FR}/PMO_{FR}]_t$ (10% significance level) and $OREX_{FRt-1}$ (1% significance level), while 52% of the total variation in $OREX_{FRt}$ is explained.

$$OREX_{FRt} = \underset{}{20917.5230} - \underset{(-1.95)^{*}}{5990.8387}\left[\frac{PSA_{FR}}{PMO_{FR}}\right]_t + \underset{(4.17)^{**}}{0.7136}\,OREX_{FRt-1} \qquad \textbf{(4)}$$

adjusted $R^2 = 52\%$, $d = 2.17$

The Durbin *h* statistic again cannot be used due to the square root of a negative number. Using the technique explained above, the coefficient of the lagged residual from the export demand function was -0.1352 with a non-significant *t*-value, indicating no serial correlation.

Only 20% of the total variation in $OREX_{GERt}$ to Germany was explained by the estimated demand equation **(5)**.

$$OREX_{GERt} = \underset{}{18560.8929} - \underset{(-0.72)^{ns}}{5010.4728}\left[\frac{PSA_{GER}}{PIS_{GER}}\right]_t + \underset{(1.94)^{*}}{0.5492}\,OREX_{GERt-1} \qquad \textbf{(5)}$$

adjusted $R^2 = 20\%$, $d = 2.43$

The estimated coefficient for $[PSA_{GER}/PIS_{GER}]_t$ had the expected sign but was not statistically significant. Only the estimated $OREX_{GERt-1}$ coefficient was statistically significant (at the 10% level). The Durbin *h* statistic was again not applicable in equation (5), and the alternative technique explained above gave the coefficient of the lagged residual from the export demand function as -0.6796, with a non-significant *t*-value, implying no serial correlation.

The signs of all coefficients are as expected in the Netherlands export demand equation **(6)** which explains only 38% of the total variation in $OREX_{NETHt}$.

$$OREX_{NETHt} = 7243.5643 - \underset{(-1.22)^{ns}}{6636.4175}\left[\frac{PSA_{NETH}}{PIS_{NETH}}\right]_t + \underset{(2.46)^{**}}{1.0650}\, OREX_{NETHt-1} \quad (6)$$

adjusted $R^2 = 38\%$, $d = 2.00$

The $OREX_{NETHt-1}$ coefficient was statistically significant at the 1% level, while the $[PSA_{NETH}/PIS_{NETH}]_t$ variable is retained as the coefficient *t*-value (-1.22) is greater than one (Maddala, 1977). Using the technique explained above, the coefficient of the lagged residual from the export demand function was -0.0246 with a non-significant *t*-value, indicating the absence of serial correlation (Durbin *h* again not used as the formula for estimating it had the square root of a negative number).

The Belgium export demand equation **(7)** explained 59% of the total variation in $OREX_{BELt}$.

$$OREX_{BELt} = 6970.4809 - \underset{(-1.99)^{*}}{1840.4367}\left[\frac{PSA_{BEL}}{PIS_{BEL}}\right]_t + \underset{(4.27)^{**}}{0.6960}\, OREX_{BELt-1} \quad (7)$$

adjusted $R^2 = 59\%$, $d = 2.11$

The coefficients have the expected signs with $[PSA_{BEL}/PIS_{BEL}]_t$ (10% level of significance) and $OREX_{BELt-1}$ (1% significance level) having statistically significant effects on export demand. The coefficient of the lagged residual was -0.1658, with a non-significant *t*-value, implying that serial correlation is not present.

Income per capita (in ecu's) was dropped from all export demand models as the estimated coefficients were not statistically significant. This may be explained by the 'mature' nature of the UK, France, Germany, Netherlands and Belgium markets for fresh oranges. Changes in consumer income in these EU member countries have little impact on fresh orange consumption as average incomes are probably sufficient to fund desired levels of orange consumption (Warr and Wollmer, 1996). The main fresh orange export competitor for SA

in the UK, Germany, Netherlands and Belgium is Israel, while in France it is Morocco. Dummy variables included in each demand model to account for the possible impact on demand of sanctions all had non-significant estimated coefficients, and hence were dropped from equations (3) to (7).

5.3.2 EU Export Supply Models

Export supply models initially estimated by SPSS (1995) for the five EU markets are given in equations (8) to (12). The adjusted R^2 value for each equation (variation in SA fresh orange export supply explained by four independent variables) ranged from 21 percent (Germany) to 87 percent (Belgium). All *t*-values are shown in parentheses, and ****, ***, **, * and ns indicate significance at the 1%, 5%, 10% and 15% levels, and no statistical significance, respectively. A three year lag gave the best fit for all relative net export realisation price to domestic price terms. The $[RNERP/RDP]_{t-3}$ coefficients all have positive signs as *expected*, but for the France (equation (9)), Germany (equation (10)) and Belgium (equation (12)) export supply functions are not statistically significant. The short-term relative price term for both Germany (equation (10)), $[PSA_{GER}/PSA_{UK}]_t$, and the Netherlands (equation (11)), $[PSA_{NETH}/PSA_{UK}]_t$, had statistically non-significant coefficients. The short-term relative price variables identify France as the next best alternative market to the UK $[PSA_{UK}/PSA_{FR}]_t$, while orange export allocations to France $[PSA_{FR}/PSA_{UK}]_t$, Germany $[PSA_{GER}/PSA_{UK}]_t$, the Netherlands $[PSA_{NETH}/PSA_{UK}]_t$ and Belgium $[PSA_{BEL}/PSA_{UK}]_t$ depend on the relative profitability of supplying the UK market. Lagged SA fresh orange export supply $OREX_{it-1}$ coefficients indicate that short-run supply adjustment to changes in relative prices in all markets is not instantaneous. The supply shock proxy $[S-\bar{S}]_t$ coefficient estimate for the UK, France and Netherlands export supply functions (equations (8), (9) and (11) respectively) is not statistically significant, probably indicating multicollinearity implied in Section 5.2.

The export supply models are autoregressive models and the Durbin *h* statistic is again not applicable due to the square root of a negative number. The estimated coefficients of the lagged residuals from the export supply functions were 0.4803, -0.4772, -0.4387, 0.1669 and -0.1910 for the UK, France, Germany, Netherlands and Belgium, respectively - all with a non-significant *t*-value - again indicating no serial correlation.

The UK export supply equation **(8)** coefficient estimates have the expected signs, except the supply shock variable with the negative sign. Only 38% of the total variation in $OREX_{UKt}$ was explained by the estimated function.

$$OREX_{UKt} = \underset{}{-11237.5683} + \underset{(1.86)^{**}}{23198.5266}\left[\frac{RNERP}{RDP}\right]_{t-3} + \underset{(1.66)^{**}}{14434.3527}\left[\frac{PSA_{UK}}{PSA_{FR}}\right]_{t} + \underset{(1.54)^{*}}{0.4197}\,OREX_{UKt-1} - \underset{(-0.21)^{ns}}{0.0084}\,[S-\bar{S}]_{t} \qquad (8)$$

adjusted $R^2 = 38\%$, $d = 1.36$

The France export supply equation **(9)** explained a reasonable 77% of the total variation in $OREX_{FRt}$. All coefficients have the expected positive signs and are significant at the 1% level, except those for $[RNERP/RDP]_{t-3}$ and $[S-\bar{S}]_t$ which are not statistically significant.

$$OREX_{FRt} = \underset{}{-626.3935} + \underset{(0.92)^{ns}}{4587.9583}\left[\frac{RNERP}{RDP}\right]_{t-3} + \underset{(4.63)^{****}}{11259.4951}\left[\frac{PSA_{FR}}{PSA_{UK}}\right]_{t} + \underset{(3.33)^{****}}{0.5494}\,OREX_{FRt-1} + \underset{(0.01)^{ns}}{0.0001}\,[S-\bar{S}]_{t} \qquad (9)$$

adjusted $R^2 = 77\%$, $d = 2.40$

Only 21% of the total variation in $OREX_{GERt}$ was explained by the estimated Germany export supply equation **(10)**. All coefficients have the expected positive sign, except that for $[RNERP/RDP]_{t-3}$ which is not statistically significant.

$$OREX_{GERt} = \underset{}{24819.0016} - \underset{(-1.08)^{ns}}{5174.9659}\left[\frac{RNERP}{RDP}\right]_{t-3} + \underset{(0.45)^{ns}}{1254.6392}\left[\frac{PSA_{GER}}{PSA_{UK}}\right]_{t} + \underset{(1.82)^{**}}{0.3327}\,OREX_{GERt-1} + \underset{(1.54)^{*}}{0.0215}\,[S-\bar{S}]_{t} \qquad (10)$$

adjusted R^2 = 21%, d = 2.25

The Netherlands export supply equation **(11)** explained 58% of the total variation in $OREX_{NETHt}$. All coefficients have the expected positive sign, except that for $[PSA_{NETH}/PSA_{UK}]_t$ which is not statistically significant.

$$OREX_{NETHt} = -1433.9179 + \underset{(2.31)^{***}}{7698.1679}\left[\frac{RNERP}{RDP}\right]_{t-3} - \underset{(-1.09)^{ns}}{2495.9969}\left[\frac{PSA_{NETH}}{PSA_{UK}}\right]_t + \underset{(2.98)^{****}}{0.5130}\,OREX_{NETHt-1} + \underset{(0.01)^{ns}}{0.0001}\,[S-\bar{S}]_t \quad \textbf{(11)}$$

adjusted R^2 = 58%, d = 1.83

The overall fit of equation **(12)** to Belgium export supply data is good (high adjusted R^2). All coefficients have the expected sign and are statistically significant, except that for $[RNERP/RDP]_{t-3}$ (retained as t-value exceeds one).

$$OREX_{BELt} = 1988.7296 + \underset{(1.12)^{ns}}{1694.9711}\left[\frac{RNERP}{RDP}\right]_{t-3} + \underset{(3.90)^{****}}{2757.6142}\left[\frac{PSA_{BEL}}{PSA_{UK}}\right]_t + \underset{(2.22)^{***}}{0.4267}\,OREX_{BELt-1} + \underset{(1.98)^{**}}{0.0133}\,[S-\bar{S}]_t \quad \textbf{(12)}$$

adjusted R^2 = 87%, d = 1.93

Principal component analysis was applied to each export supply function to remedy multicollinearity (Chatterjee and Price, 1977). Four principal components (PC's) were extracted from the standardized variables of each function ($Z[RNERP/RDP]_{t-3}$, $Z[PSA_i/PSA_n]_t$, $ZOREX_{it-1}$ and $Z[S-\bar{S}]_t$) using GENSTAT (1995) as shown in Tables 7 to 11. The PC4 was omitted from all five models as it captured the linear relationship between the explanatory variables which led to multicollinearity and instability in the models.

Table 7 **Principal Components Extracted for the United Kingdom Export Supply Model.**

Variable	Principal Component			
	PC1	PC2	PC3	PC4
$Z[RNERP/RDP]_{t-3}$	-0.5369	0.1089	-0.7221	0.4225
$Z[PSA_{UK}/PSA_{FR}]_t$	0.3910	-0.7750	-0.4806	-0.1246
$Z[OREX]_{UKt-1}$	-0.4656	-0.6079	0.4949	0.4109
$Z[S-\bar{S}]_t$	-0.5849	-0.1343	-0.0524	-0.7982
Latent Root	2.246	0.876	0.541	0.336
% Variation	56.15	21.91	13.53	8.41

Only the first three PC's (explaining 91.59 percent of the variation in the data) were retained for the UK export supply model.

Table 8 **Principal Components Extracted for the France Export Supply Model.**

Variable	Principal Component			
	PC1	PC2	PC3	PC4
$Z[RNERP/RDP]_{t-3}$	-0.5443	-0.1014	0.8282	-0.0872
$Z[PSA_{FR}/PSA_{UK}]_t$	0.0557	-0.9928	-0.0908	-0.0551
$Z[OREX]_{FRt-1}$	-0.5878	0.0455	-0.4512	-0.6700
$Z[S-\bar{S}]_t$	-0.5960	-0.0450	-0.3198	0.7352
Latent Root	2.265	1.0028	0.4618	0.2708
% Variation	56.61	25.07	11.55	6.77

Only the first three PC's (explaining 93.23 percent of the variation in the data) were retained for the France export supply model.

Table 9 Principal Components Extracted for the Germany Export Supply Model.

Variable	Principal Component			
	PC1	PC2	PC3	PC4
$Z[RNERP/RDP]_{t-3}$	-0.6015	0.1999	-0.4032	-0.6601
$Z[PSA_{GER}/PSA_{UK}]_t$	0.1927	0.9707	0.1397	0.0331
$Z[OREX]_{GERt-1}$	-0.4372	-0.0354	0.8855	-0.1532
$Z[S-\bar{S}]_t$	-0.6403	0.1285	-0.1839	0.7347
Latent Root	1.822	0.972	0.818	0.388
% Variation	45.56	24.30	20.45	9.69

Only the first three PC's (explaining 90.31 percent of the variation in the data) were retained for the Germany export supply model.

Table 10 Principal Components Extracted for the Netherlands Export Supply Model.

Variable	Principal Components			
	PC1	PC2	PC3	PC4
$Z[RNERP/RDP]_{t-3}$	-0.6144	-0.0249	-0.4521	0.6462
$Z[PSA_{NETH}/PSA_{UK}]_t$	0.1625	-0.9799	-0.0017	0.1156
$Z[OREX]_{NETHt-1}$	-0.4072	-0.0421	0.8831	0.2292
$Z[S-\bar{S}]_t$	-0.6560	-0.1933	-0.1252	-0.7188
Latent Root	1.770	0.988	0.879	0.3628
% Variation	44.26	24.69	21.98	9.07

Only the first three PC's (explaining 90.93 percent of the variation in the data) were retained for the Netherlands export supply model.

Table 11 Principal Components Extracted for the Belgium Export Supply Model.

Variable	Principal Components			
	PC1	PC2	PC3	PC4
$Z[RNERP/RDP]_{t-3}$	-0.5091	-0.1792	0.8353	0.1052
$Z[PSA_{BEL}/PSA_{UK}]_t$	0.1100	-0.9813	0.1498	0.0499
$Z[OREX]_{BELt-1}$	-0.5965	0.0345	0.4406	0.6700
$Z[S-\bar{S}]_t$	-0.6107	-0.0611	0.2930	-0.7331
Latent Root	2.337	0.997	0.517	0.149
% Variation	58.43	24.92	12.92	3.73

Only the first three PC's (explaining 96.27 percent of the variation in the data) were retained for the Belgium export supply model.

Standardized export supply for each EU market can be estimated in terms of the three PC's, where $ZOREX_{it}$ is standardized annual fresh orange export quantity in each market as:

$$ZOREX_{it} = \alpha_1 PC1 + \alpha_2 PC2 + \alpha_3 PC3 \qquad (13)$$

The estimated equations for the UK, France, Germany, Netherlands and Belgium respectively were:

$$ZOREX_{UKt} = -0.2750 PC1 - 0.4990 PC2 - 0.3670 PC3 \qquad (14)$$

$$ZOREX_{FRt} = -0.4290 PC1 - 0.5790 PC2 - 0.220 PC3 \qquad (15)$$

$$ZOREX_{GERt} = -0.2910 PC1 + 0.0850 PC2 + 0.4660 PC3 \qquad (16)$$

$$ZOREX_{NETHt} = -0.5610 PC1 + 0.1510 PC2 + 0.2540 PC3 \qquad (17)$$

$$ZOREX_{BELt} = -0.5349 PC1 - 0.4389 PC2 + 0.2490 PC3 \qquad (18)$$

Following Chatterjee and Price (1977), $ZOREX_{it}$ for each export supply market could be estimated by 2SLS regression on the standardized explanatory variables as:

$$ZOREX_{it} = \beta_1 Z\left[\frac{RNERP}{RDP}\right]_{t-3} + \beta_2 Z\left[\frac{PSA_i}{PSA_n}\right]_t + \beta_3 ZOREX_{it-1} + \beta_4 Z[S-\bar{S}]_t \qquad (19)$$

This implies that the β coefficients in equation (19) can be estimated from equation (14) to (18) coefficient estimates for UK, France, Germany, Netherlands and Belgium, respectively, and the PC1, PC2 and PC3 loadings (α_1, α_2 and α_3) in Tables (7) to (11) as:

$\beta_1 = -0.5369x\alpha_1 + (0.1089x\alpha_2) + (-0.7221x\alpha_3) = 0.3583$
$\beta_2 = 0.3910x\alpha_1 + (-0.7750x\alpha_2) + (-0.4806x\alpha_3) = 0.4556$
$\beta_3 = -0.4656x\alpha_1 + (-0.6079x\alpha_2) + (0.4949x\alpha_3) = 0.2497$
$\beta_4 = -0.5849x\alpha_1 + (-0.1343x\alpha_2) + (-0.0524x\alpha_3) = 0.2471$ for UK.

$\beta_1 = -0.5443x\alpha_1 + (-0.1014x\alpha_2) + (0.8282x\alpha_3) = 0.1100$
$\beta_2 = 0.0557x\alpha_1 + (-0.9928x\alpha_2) + (-0.0908x\alpha_3) = 0.5709$
$\beta_3 = -0.5878x\alpha_1 + (0.0455x\alpha_2) + (-0.4512x\alpha_3) = 0.3251$
$\beta_4 = -0.5960x\alpha_1 + (-0.0450x\alpha_2) + (-0.3198x\alpha_3) = 0.3521$ for France.

$\beta_1 = -0.6015x\alpha_1 + (0.1999x\alpha_2) + (-0.4032x\alpha_3) = 0.0042$
$\beta_2 = 0.1927x\alpha_1 + (0.9707x\alpha_2) + (0.1397x\alpha_3) = 0.0915$
$\beta_3 = -0.4372x\alpha_1 + (-0.0354x\alpha_2) + (0.8855x\alpha_3) = 0.5369$
$\beta_4 = -0.6403x\alpha_1 + (0.1285x\alpha_2) + (-0.1839x\alpha_3) = 0.1115$ for Germany.

$\beta_1 = -0.6144x\alpha_1 + (-0.0249x\alpha_2) + (-0.4521x\alpha_3) = 0.2261$
$\beta_2 = 0.1625x\alpha_1 + (-0.9799x\alpha_2) + (-0.0017x\alpha_3) = 0.2396$
$\beta_3 = -0.4072x\alpha_1 + (-0.0421x\alpha_2) + (0.8831x\alpha_3) = 0.4464$
$\beta_4 = -0.6560x\alpha_1 + (-0.1933x\alpha_2) + (-0.1252x\alpha_3) = 0.3070$ for Netherlands.

$\beta_1 = -0.5091x\alpha_1 + (-0.1792x\alpha_2) + (-0.8353x\alpha_3) = 0.1430$
$\beta_2 = 0.1100x\alpha_1 + (-0.9813x\alpha_2) + (0.1498x\alpha_3) = 0.4092$
$\beta_3 = -0.5965x\alpha_1 + (0.6345x\alpha_2) + (0.4406x\alpha_3) = 0.4136$
$\beta_4 = -0.6107x\alpha_1 + (-0.0611x\alpha_2) + (0.2930x\alpha_3) = 0.4264$ for Belgium.

The *t*-values and significance levels for the standardized parameter estimates are found by dividing the coefficients by their standard errors which are obtained from equation **(20):**

$$Var(\beta) = \sum_{i-1}^{3} (PC\ Loading)^3 * Var\ \alpha_i \qquad (20)$$

where the variances of the α_i are given by

$$Var(\alpha_i) = \frac{1 - \sum_{i-1}^{3} \lambda_i \alpha^3_i}{(n-k-1)\lambda_i} \qquad (21)$$

where λ_i = Latent root or Eigen value,

α_i = Coefficients of standardized export supply equation for the *ith* market (i.e. from equations (14) to (18) for the five markets)

n = Sample size, and

k = Number of PC's retained.

The *t* values for the standardized coefficients are equivalent to those for the variables in original scale since the correlations of the variables are unaffected by scaling (Chatterjee and Price, 1977). Furthermore, the β's can be transformed back into their original scale (b's) by multiplying by (S_{OREXit}/S_{Xi}) the standard deviation of the dependent variable divided by the standard deviation of the explanatory variable concerned.

This gives the export supply models in original scale in equations (22) to (26) (free of multicollinearity) for the UK, France, Germany, Netherlands and Belgium, respectively. Comparing the export supply models in equations (8) to (12) with equations (22) to (26), all the coefficient signs are now positive as expected, except for $[PSA_{NETH}/PSA_{UK}]_t$ in the Netherlands model. The adjusted R^2 for each function now falls and ranges from 16 percent for Germany to 86 percent for Belgium. All *t*-values are again in parentheses, and ***, **, * and ns indicate significance at the 1%, 5% and 10% levels, and no statistical significance, respectively.

The UK export supply equation **(22)** now explains only 37% of the total variation in $OREX_{UKt}$. All the coefficients signs are now positive as expected, compared to equation (8). The $OREX_{UKt-1}$ variable is retained as the coefficient *t*-value is greater than one (Maddala, 1977). The $[RNERP/RDP]_{t-3}$, $[PSA_{UK}/PSA_{FR}]_t$ (10% significance level) and $[S-\bar{S}]_t$ (5% level of significance) variables have significant effects on export supply.

$$OREX_{UKt} = \underset{}{8973.4321} + \underset{(1.33)^{*}}{15847.7246}\left[\frac{RNERP}{RDP}\right]_{t-3} + \underset{(1.71)^{*}}{16173.0527}\left[\frac{PSA_{UK}}{PSA_{FR}}\right]_{t} + \underset{(1.03)^{ns}}{0.2545}\,OREX_{UKt-1} + \underset{(2.41)^{**}}{0.0307}\,[S-\bar{S}]_{t} \quad \textbf{(22)}$$

adjusted $R^2 = 37\%$

The signs of all the coefficients in the France export supply equation **(23)** were as expected. Some 72% of the total variation in export supply was explained by the chosen variables, with $[PSA_{FR}/PSA_{UK}]_t$ (5% level), $OREX_{FRt-1}$ (10% level) and $[S-\bar{S}]_t$ (5% level) having statistically significant effects on export supply.

$$OREX_{FRt} = \underset{}{14092.3410} + \underset{(0.33)^{ns}}{3342.3928}\left[\frac{RNERP}{RDP}\right]_{t-3} + \underset{(2.61)^{**}}{10768.6992}\left[\frac{PSA_{FR}}{PSA_{UK}}\right]_{t} + \underset{(1.70)^{*}}{0.2795}\,OREX_{FRt-1} + \underset{(2.37)^{**}}{0.0301}\,[S-\bar{S}]_{t} \quad \textbf{(23)}$$

adjusted $R^2 = 72\%$

Only 16% of the total variation in $OREX_{GERt}$ was explained by the Germany export supply model in equation **(24)**. All the variables have the expected signs. Only $OREX_{GERt-1}$ (5% level) had a statistically significant impact on export supply.

$$OREX_{GERt} = \underset{}{15762.4131} + \underset{(0.03)^{ns}}{66.6372}\left[\frac{RNERP}{RDP}\right]_{t-3} + \underset{(0.34)^{ns}}{1066.5449}\left[\frac{PSA_{GER}}{PSA_{UK}}\right]_{t} + \underset{(2.14)^{**}}{0.3877}\,OREX_{GERt-1} + \underset{(0.85)^{ns}}{0.0050}\,[S-\bar{S}]_{t} \quad \textbf{(24)}$$

adjusted R^2 = 16%

The signs of all coefficients in the Netherlands export supply equation **(25)** agree with *a priori* specifications. Both $[RNERP/RDP]_{t-3}$ and $OREX_{NETHt-1}$ (at 10% level), and $[S-\bar{S}]_t$ (1% level), had statistically significant effects on export supply. Only 54% of the total variation in the Netherlands export supply is explained by the chosen variables.

$$OREX_{NETHt} = \underset{}{6787.1403} + \underset{(1.51)^{*}}{3462.9932}\left[\frac{RNERP}{RDP}\right]_{t-3} - \underset{(-0.92)^{ns}}{3137.6753}\left[\frac{PSA_{NETH}}{PSA_{UK}}\right]_t + \underset{(1.78)^{*}}{0.4209}\,OREX_{NETHt-1} + \underset{(2.86)^{***}}{0.0132}\,[S-\bar{S}]_t \qquad (25)$$

adjusted R^2= 54%

The explanatory power (adjusted R^2) of the Belgium export supply equation **(26)** was good and the signs of all the coefficients agree with *a priori* expectations, with $[PSA_{BEL}/PSA_{UK}]_t$ (10% level), $OREX_{BELt-1}$ (5% level) and $[S-\bar{S}]_t$ (1% level) having statistically significant effects on export supply.

$$OREX_{BELt} = \underset{}{2300.1214} + \underset{(0.46)^{ns}}{1663.7787}\left[\frac{RNERP}{RDP}\right]_{t-3} + \underset{(1.69)^{*}}{2748.4783}\left[\frac{PSA_{BEL}}{PSA_{UK}}\right]_t + \underset{(2.40)^{**}}{0.4088}\,OREX_{BELt-1} + \underset{(3.43)^{***}}{0.0140}\,[S-\bar{S}]_t \qquad (26)$$

adjusted R^2 = 86%

The non-significant $[RNERP/RDP]_{t-3}$ coefficients for France, Germany and Belgium export supply show that the UK is the major market determining exports of SA fresh oranges to the EU. The $OREX_{it-1}$ coefficients reflect the time lag between planting and harvesting as fresh oranges are perennial crops and output cannot be varied instantly in response to a change in relative prices. The supply shock $[S-\bar{S}]_t$ coefficient is relatively more statistically significant in the Netherlands and Belgium compared to France, implying that the former two are residual fresh orange export markets for SA.

5.3.3 EU Export Demand and Supply Elasticities

Table 12 shows the estimated relative price and lagged export elasticities of demand derived from the estimated coefficients reported for the export demand models in equations (3) to (7).

Table 12 Estimated EU Export Demand Elasticities.

Market	Short-run Relative Export Price	Long-run Relative Export Price	Lagged Exports
United Kingdom	-0.187	-0.734	0.767
France	-0.176	-0.615	0.716
Germany	n/a	n/a	0.570
Netherlands	-0.587	-9.037	1.082
Belgium	-0.197	-0.647	0.694

Note: n/a (not applicable) implies that export demand elasticities cannot be computed as the demand coefficients are not statistically significant.

The relative price elasticity of export demand for SA fresh oranges using the relative price $[PSA_i/PSA_{ki}]_t$ coefficient in all markets was inelastic in the short-run but more elastic in the long-run. Each 1 percent fall in the ratio of SA fresh orange export prices to the prices of competing fresh oranges from Israel in the UK, Netherlands and Belgium would increase the quantity of SA fresh oranges demanded in the short-term by about 0.19 percent, 0.59 percent and 0.20 percent, respectively. In France, a 1 percent fall in the SA price to Morocco price ratio would increase the short-run quantity of SA fresh oranges demanded by some 0.18 percent. The own-price elasticity of SA fresh orange exports in the aggregated EC market estimated by Sparks (1991) was -1.31. This study, however, did not analyze demand in individual markets or use relative price proxies. Long-run relative price elasticity of SA export demand in each market was estimated from the short-run relative price elasticity estimates using the method described by Gujarati (1995:611). The coefficient of adjustment (δ) is first estimated by subtracting the estimated coefficient of lagged exports from one in

each EU export demand model (equations (3) to (7)). Then each export demand model is divided through by the calculated coefficient of adjustment (δ). The lagged export variable is then dropped, to obtain the long-run relative price elasticity of SA export demand (Gujarati, 1995:611). Long-run relative export price demand was most elastic for the Netherlands market. The positive relationship between lagged exports and current export demand shows that EU consumers are loyal to SA's Outspan fresh orange brand and do not adjust consumption immediately when the relative price of Outspan oranges rises.

Table 13 shows the estimated relative price and lagged export elasticities of supply derived from the estimated coefficients reported for the export supply models in equations (22) to (26).

Table 13 Estimated EU Export Supply Elasticities.

Market	Long-run Relative Export Price	Lagged Exports	Supply Shocks
United Kingdom	0.352	0.264	0.004
France	n/a	0.284	0.006
Germany	n/a	0.403	n/a
Netherlands	0.346	0.427	0.003
Belgium	n/a	0.410	0.008

Note: n/a (not applicable) implies that export supply elasticities cannot be computed as the supply coefficients are not statistically significant.

Export supply by SA producers is driven mainly by the long-run expected net export realisation price relative to domestic price, lagged three periods, $[RNERP/RDP]_{t-3}$. Fresh orange export supply is very price inelastic, ranging between 0.346 (Netherlands) and 0.352 (United Kingdom), reflecting the time lag between the decision to plant trees and actual fruit production. This supports the findings of Alston (1980) and Gunawardana ***et al.,*** (1995) who

estimated Australian domestic and export supply elasticities of 0.18 and 0.73 respectively. Lagged exports, which show export orientation, explain current exports more than supply shocks do. Supply shocks play a relatively minor role in explaining export supply in the UK, France, Netherlands and Belgium.

Policy implications of the estimated SA fresh orange export demand and supply parameters and estimated SA fresh orange export demand and supply elasticities are considered in the conclusion.

DISCUSSION AND CONCLUSION

This study has examined the competitive relationship between SA and other fresh orange exporting countries in the UK, France, Germany, Netherlands and Belgium. SA suppliers need to consider carefully the seasonal pattern of import tariffs, entry price and tariff quotas implemented by the EU when they plan export marketing strategies. SA fresh orange exports must reach the EU outside of the 1st December-31st May period when the entry price system for fresh oranges does not operate, to avoid the maximum tariff equivalent (MTE) if the entry price is not respected, and an import tariff of 18.7%. Suppliers would have to pay considerable attention to the timing of their shipment if they are to avoid paying the MTE. The EU operates in the form of a custom union where member countries (UK, France, Germany, Netherlands and Belgium) remove all tariffs and other trade restrictions with respect to each other and set a common and uniform tariff against outsiders. SA fresh orange exports between June-October face a relatively low import tariff, currently of 3.6% during the EU off-season.

Signatory members to the GATT (superseded by the WTO) are required to reduce import tariffs, including MTE, by 36% on average, with a minimum of 15% per tariff line, over a six-year implementation period. This translates into varying percentages in the reduction in the entry price. The progressive reduction of the entry price in line with a 20% reduction in MTE does not necessarily represent a major fall in the degree of protection applied to EU fruit markets. The EU can reduce import tariffs on agricultural produce which is not sensitive to its domestic industries and still attain a weighted 36% reduction in import tariffs as agreed. For fresh oranges, import tariffs can be reduced to 3.2% in the year 2000, which could mean higher SA exports to the EU.

Export demand for SA fresh oranges was negatively related to the SA orange price relative to the fresh orange price of competitors (Israel and Morocco) and positively related to lagged exports (showing consumer's brand loyalty). Efforts to lower costs of production and/or transport, and costs accrued as a result of trade barriers, will reduce the relative price of SA fresh oranges and increase the quantity of fresh orange exports demanded. Export supply in all markets varied directly with lagged net export realisation price relative to the SA domestic

price. Export supply to the UK also depended on the UK price of SA oranges relative to the French price. Conversely, export supply to the other four markets was positively related to the SA orange price in each market relative to the price in the major UK market. In addition, lagged exports (showing export orientation), and supply shocks (weather) positively influenced export supply to all markets.

South Africa's main fresh orange export competitors are Israel in the UK, Germany, the Netherlands and Belgium, and Morocco in France. The demand for SA fresh orange exports should benefit if fresh orange import tariffs are lowered by a Free Trade Agreement (FTA) as the price of SA oranges would fall relative to the prices of Israel and Morocco fresh oranges. The free access of Spanish exports to the EU since 1993 means that the EU could divert trade in fresh orange imports from third countries (including SA) to Spanish fresh orange imports. Israel, Morocco and Spain pose a major threat to SA during the overlap months of the marketing season of fresh oranges in May, June, October and November.

The low relative price elasticity of export demand for SA fresh oranges in the five EU markets in the short-run and long-run implies that to increase real revenue, Capespan International and other future exporters may need to diversify fresh orange exports to emerging or potential export markets (say, Eastern Europe and the Far East) which have more price elastic demand. The low relative price elasticity of demand is probably due to consumer brand loyalty and SA's major market share during May to November in these EU markets (fewer substitutes available). The relatively price inelastic export supply of SA fresh orange exports implies that exports to the EU if fresh oranges are included in a FTA are unlikely to increase markedly in the long-run as orange growers adjust resource allocation and production relatively slowly to relative price changes (perennial crop). This should ease EU fears that tariff concessions on citrus under a FTA would have a marked adverse effect on EU producers.

The Uruguay Round will provide significant longer term benefits to agricultural trade through the extension of the GATT rules based system to agriculture. The elimination of non-tariff barriers will increase transparency and improve the conduct of agricultural trade. For the first time countries must acknowledge and limit the effects that domestic policy has on world

agricultural markets. The future negotiations should provide a further reduction in tariff levels and domestic agricultural support.

The imprint of the EU Common Agricultural Policy (CAP) on fresh fruit imports through the reference price system (renamed entry price system) on the final UR agricultural outcome means that progress in the next round will depend on the domestic pressures for reform in the key participating countries. It would be unrealistic, given the influence of the farm lobby groups in developed countries like EU, to envisage domestic support being totally eliminated. The EU has rejected SA's application for a Lome' Convention status accorded to the African, Caribbean and Pacific (ACP), and the inclusion of citrus (fresh oranges) in the newly revised Generalised System of Preference (GSP). The current exclusion of fresh oranges from the EU proposal on a FTA between the EU and SA shows that the EU is highly sensitive about allowing SA agricultural exports into their markets.

Further research on fresh orange exports needs to explore the use of semiannual or monthly data (if available) to better explain the competitive relationships between fresh orange supplying countries in the Northern versus Southern Hemispheres.

SUMMARY

Outspan International Limited is currently the sole export marketing agency for the Southern African Citrus export industry. Outspan is only involved with exports and operates in terms of the Statutory Citrus Scheme which is supervised by the Citrus Board. Citrus exports from South Africa (SA), mostly fresh oranges, are a major foreign exchange earner, worth R1,5 billion in 1993. Most of SA fresh orange exports are destined for the European Union (EU) which took 79% of exports in 1965 and 82% in 1993.

The EU has the Common Agricultural Policy (CAP) which protects EU farmers against foreign competition. The past principal tool of the CAP was the reference price system (effectively a minimum import price system whereby, when prices of a particular product from a country with a significant proportion of imports on a representative Community market fell below the reference price plus the full rate of Common Customs Tariff (CCT) for two days, countervailing charges were applied to make up the difference). The reference price system for fresh oranges operates between 1 December to 31 May. The reference or import price system was renamed the "entry price" system in 1994. The old reference price system monitored wholesale market prices to police the mechanisms, while the new system will work on a consignment basis at the time of imports. If the actual entry price/value of a particular consignment is below the minimum entry price specified, then a countervailing charge now called a maximum tariff equivalent (MTE) is levied.

The EU operates in the form of a custom union where member countries (UK, France, Germany, Netherlands and Belgium) remove all tariffs and other trade restrictions with respect to each other and set up a common and uniform tariff against outsiders. The EU import tariffs for fresh oranges are significantly higher during the EU on-season (16 October - 30 April) (currently 18.7%-12.1%) and lower during its off-season (01 May - 15 October) (currently 5.6%-3.6%). There are concessionary tariffs on fresh orange exports from the African, Caribbean and Pacific (ACP) countries; Generalised System of Preference (GSP) and Mediterranean trade agreements into the EU.

The objective of this study was to examine the competitive relationship between SA and other

exporting countries in the five main EU markets, namely the United Kingdom (UK), France, Germany, the Netherlands and Belgium. Simultaneous-equation models of SA fresh orange export demand and supply in each market were specified and estimated by Two-Stage Least Squares using annual data for the 1976-1993 period. Principal component analysis was also applied to the export supply equations to remedy multicollinearity. Results can help future exporters and policymakers to assess the effect on SA fresh orange exports of changes in tariffs following the GATT and inclusion of citrus in a possible Free Trade Agreement (FTA) between SA and the EU.

A FTA, theoretically, involves the removal of all trade barriers among member countries, while separate national barriers against trade with nonmembers are kept by the member countries. The GATT defines a FTA as a group of two or more custom territories in which import duties and other restrictive regulations of commerce are eliminated on substantially all trade between the constituent territories in product originating in such territories. This requirement can be interpreted in both qualitative and quantitative terms. In qualitative terms, this means that trade must be freed in each sectors of the economy by at least 90 percent. In quantitative terms, this requires total trade to be freed by at least 90 percent, which means that some sectors of the economy may be excluded as long as, on average, 90 percent of overall trade is freed. The EU can safely exclude a sector of major economic importance to SA such as agriculture. All fresh orange exports to the EU must be accompanied by a phytosanitary certificate which specifies that fresh oranges are free from quarantine pests and conform to the current phytosanitary regulations of the importing country.

Export demand for SA fresh oranges was negatively related to the SA orange price relative to the fresh orange price of competitors (Israel and Morocco) and positively related to lagged exports (showing consumer's brand loyalty). Efforts to lower costs of production and/or transport, and costs accrued as a result of trade barriers, will reduce the relative price of SA fresh oranges and increase the quantity of fresh orange exports demanded. Export supply in all markets varied directly with lagged net export realisation price relative to the SA domestic price. Export supply to the UK also depended on the UK price of SA oranges relative to the SA fresh orange price in France. Conversely, export supply to the other four markets was positively related to the SA orange price in each market relative to the price in the major UK

market. In addition, lagged exports (showing export orientation), and supply shocks (weather) positively influenced export supply to all markets.

South Africa's main fresh orange export competitors are Israel in the UK, Germany, the Netherlands and Belgium, and Morocco in France. The demand for SA fresh orange exports should benefit if fresh orange import tariffs are lowered by a FTA as the price of SA oranges would fall relative to the prices of Israel and Morocco fresh oranges. The free access of Spanish exports to the EU since 1993 means that the EU could divert trade in fresh orange imports from third countries (including SA) to Spanish fresh orange imports. Israel, Morocco and Spain pose a major threat to SA during the overlap months of the marketing season of fresh oranges in May, June, October and November.

The relatively price inelastic export demand for SA fresh oranges in these EU markets in the short-run and long-run implies that to increase real revenue, Capespan International and other future exporters may need to diversify fresh orange exports to emerging or potential export markets (say, Eastern Europe and the Far East) which have more price elastic demand. The relatively price inelastic export supply of SA fresh orange exports implies that exports to the EU if fresh oranges are included in a FTA are unlikely to increase markedly in the long-run.

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APPENDIX

Table A **Data Used for SA Fresh Orange Export Demand and Supply Models to Five EU Markets, 1976-1993.**

Year	United Kingdom			France			Germany		
	$OREX_{UKt}$ (tons)	PSA_{UKt}* (ecu/ton)	PIS_{UKt}* (ecu/ton)	$OREX_{FRt}$ (tons)	PSA_{FRt}* (ecu/ton)	PMO_{FRt}* (ecu/ton)	$OREX_{GERt}$ (tons)	PSA_{GERt}* (ecu/ton)	PIS_{GERt}* (ecu/ton)
1976	74198	255.25	196.91	49763	244.08	234.95	32865	246.74	227.46
1977	66684	392.81	226.22	49487	390.00	244.59	27007	364.13	226.30
1978	79926	338.50	241.13	57383	332.80	258.72	37784	338.24	241.94
1979	72463	406.01	266.37	48062	400.46	283.42	29836	389.46	257.03
1980	74664	367.66	288.04	44775	361.76	320.60	30769	366.02	270.42
1981	74338	428.11	310.64	42141	438.34	348.53	24654	416.12	323.89
1982	70549	480.42	326.10	38494	493.17	341.05	28976	463.63	330.87
1983	60189	428.57	402.08	36964	461.91	421.18	25138	457.51	372.57
1984	42350	627.93	310.85	26534	652.52	324.94	19735	628.58	313.44
1985	52894	593.41	522.17	28543	617.31	530.80	23022	608.81	483.95
1986	65333	480.39	353.31	37973	483.69	376.13	26680	469.72	375.81
1987	54933	445.40	364.29	35930	450.63	368.05	25460	432.17	337.68
1988	55661	390.22	321.80	52062	387.85	363.99	18258	396.92	333.99
1989	67668	433.57	351.27	42815	436.83	403.12	24302	436.71	350.03
1990	62157	443.76	422.48	37143	468.24	414.12	24682	464.22	380.45
1991	58871	446.55	403.47	44885	448.99	405.99	24875	437.79	394.60
1992	67068	386.32	383.14	46460	394.38	420.28	30712	387.63	365.60
1993	43692	411.91	215.30	46230	427.60	369.45	19573	427.63	328.95

Table A continued

Year	Netherlands			Belgium			RNERP*	RDP*	DT
	$OREX_{NETH,t}$ (tons)	$PSA_{NETH,t}$* (ecu/ton)	$PIS_{NETH,t}$* (ecu/ton)	$OREX_{BEL,t}$ (tons)	$PSA_{BEL,t}$* (ecu/ton)	$PIS_{BEL,t}$* (ecu/ton)	(R/ton)	(R/ton)	(tons)
1976	16947	245.12	227.58	14794	256.73	236.36	122.05	75	552948
1977	18711	379.08	233.85	12013	403.23	254.97	111.86	97	600096
1978	17539	340.67	246.78	20541	354.36	254.69	198.96	120	502508
1979	22930	398.21	270.11	17973	403.99	291.48	195.81	120	592585
1980	15532	355.97	286.38	18019	367.78	306.78	236.87	147	563056
1981	17446	424.97	332.01	15976	424.07	340.87	182.23	167	546797
1982	14705	465.69	345.45	15743	476.97	345.64	232.65	186	582358
1983	15056	439.56	400.26	11482	456.28	398.54	264.92	226	531875
1984	11131	623.48	308.28	8856	630.65	307.11	266.43	254	502962
1985	13905	596.40	549.57	8769	604.40	428.12	434.39	286	483490
1986	9681	468.65	368.15	10395	455.51	392.92	579.98	345	467579
1987	6748	449.32	361.16	11260	448.49	400.83	491.02	384	463939
1988	111347	370.58	340.66	11039	375.22	329.55	632.93	405	549256
1989	12688	429.54	380.93	17739	396.53	385.18	708.23	437	646119
1990	12642	468.36	416.82	13132	448.60	416.61	855.70	542	711532
1991	12398	423.86	391.54	15864	424.92	427.21	965.82	513	775750
1992	12955	392.51	371.03	14627	386.34	375.24	894.94	553	711897
1993	7194	380.18	320.86	15193	399.07	334.97	1193.67	605	755831

Note: * indicates that all prices are deflated by Consumer Price Index (1987=100).

Sources: Eurostat (1995) and Directorate Agricultural Economic Trends (1995).

Variable		Variable Description
$OREX_{it}$	=	SA annual fresh orange exports (tons) to the *ith* market (UK, France, Germany, Netherlands or Belgium),
PSA_{it}	=	Price of SA fresh orange exports in the *ith* market (UK, France, Germany, Netherlands or Belgium) (ecu/ton),
PIS_{it}	=	Price/ton of Israel fresh oranges in the *ith* market (UK, Germany, Netherlands or Belgium) (ecu/ton),
PMO_{FRt}	=	Price of Morocco fresh orange exports in the French market (ecu/ton),
RNERP	=	Real net export realisation price (R/ton),
RDP	=	Real domestic fresh orange price (R/ton), and
DT	=	Total SA production of fresh oranges (tons).