

EUROPEAN MARKETS FOR NFC: SUPPLY AND DEMAND ISSUES

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ABSTRACT

The European market for not-from-concentrate citrus juices has experienced strong growth in recent years. The growth appears to be related to the high quality of not-from-concentrate juice, the ready-to-serve form of the product, and the increased affluence of consumers.

Key Words: Europe, orange juice, not-from-concentrate, demand.

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Introduction

This report examines the European market for not-from-concentrate (NFC) citrus juices. The first section of this report highlights the technical considerations in producing NFC juices. A basic understanding of these processes is necessary for developing economic assumptions and predictions regarding the European market for NFC. The second section of the report presents volume sales of NFC orange juice (OJ) and NFC grapefruit juice (GJ), juice suppliers and FOB prices. In recent years, consumption of NFC-OJ and NFC-GJ in Europe has been increasing. This growth appears to be related to NFC's high quality and fresh taste, the perception that NFC is more natural than other products made from concentrates, its convenient ready-to-serve form, and the increased affluence of consumers. Sales of NFC products have increased, despite their relatively high prices. NFC tends to cost more than other OJ and GJ products such as frozen concentrate or reconstituted product made from frozen concentrate, due to higher storage and transportation costs.

Technical Considerations

NFC History

NFC citrus juices have been produced and marketed by Florida juice processors since the industry began in the early 20th century. NFC juice was packaged in cans during the citrus processing season, then sold throughout the year, and was also stored in frozen form for later processing and packaging. NFC was, however, a very minor segment of the citrus industry between the 1930's and the mid-1980's. Most of the efforts in citrus processing technology focused on evaporator development and the production of quality frozen concentrated orange juice (FCOJ). FCOJ could be produced economically, was convenient to store and ship, and

could be sold to consumers in the form of 3+1 concentrate or reconstituted prior to packaging. Even today, several Florida and most Brazilian processors focus primarily on the production of bulk citrus concentrates for further use by industrial users.

However, the NFC juice category is one segment of the juice industry that is currently growing, and this recent growth has clearly been enabled by the development of aseptic processes and tanks that allow the large-scale storage of single-strength (i.e. not concentrate) juice over a long period of time. This time period is generally envisioned as one year (from processing season to processing season), although some individual juice processors have complex blending schemes that require more frequent juice additions/withdrawals to the tanks.

Aseptic technology itself is not new. In fact, Florida NFC-OJ was being marketed and sold in France in the 1940's. Juice was aseptically bottled during prime Valencia season, held in cold storage to protect quality, and then sold throughout the year. The food and beverage industry definition of "aseptic" technology is generally understood as introducing a commercially sterile food product into a sterile package; thus both the 1940's example and current aseptic tank technology fit this definition. What differs today is the enormous difference in the scale of the two "packages", with the corresponding differences in degree of economic risk in package failure, and required infrastructure.

Aseptic Bulk Storage

The aseptic tanks used in the citrus industry were adapted from those used in the tomato industry to store processed tomato products cheaply and effectively during the off-season. The early aseptic tanks were constructed of stainless steel, and were limited in capacity to about 250,000 gallons. Installations of the past few years have focused on lined carbon steel tanks holding 1 million gallons; several economic analyses have indicated this is the optimum size based on capital, risk and operating costs. Installation of these tanks involves careful site preparation and soil compaction, construction of a concrete foundation pad, assembly of the tanks in sections, and lining of the tanks with an inert epoxy resin. The tank farm is enclosed in a refrigerated room (0-2°C), although early aseptic tanks were individually insulated and

refrigerated. The capacity of aseptic citrus juice storage in Florida at the end of the 1997-98 processing season was approximately 100 million gallons. Still more installed capacity is expected due to the continued increase in NFC juice sales.

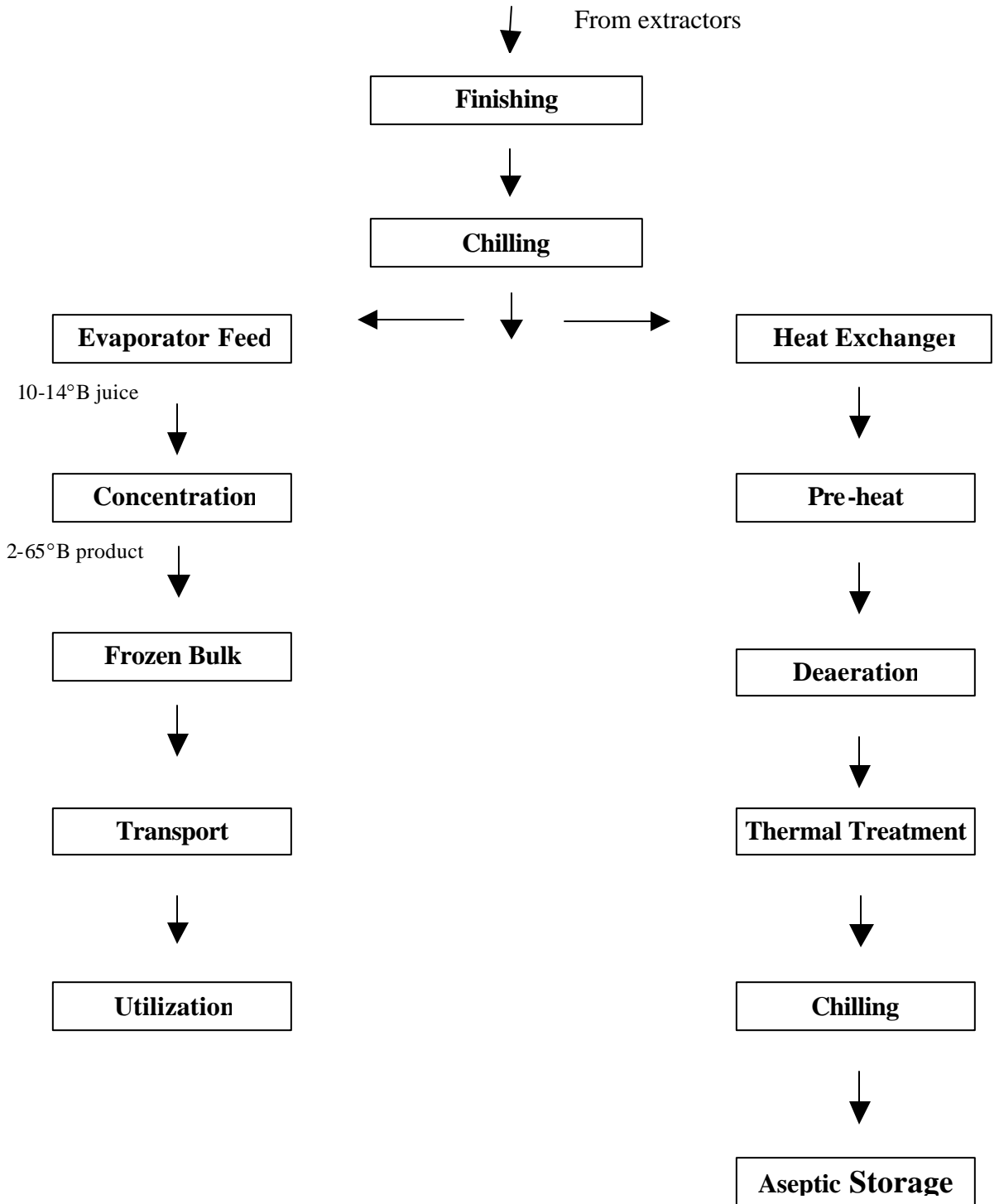
Juice is typically withdrawn from aseptic storage, blended to specification with other juices or ingredients if necessary, and transported to a packaging facility (on-site or remote) where it is unloaded, pasteurized and then filled into consumer packages. Some processors/packagers are experimenting with aseptic transfer from tank to packaging line, which avoids additional thermal treatments prior to filling. The ability to perform aseptic transfers successfully has both juice quality and process cost implications.

Production of NFC

The overall goal of NFC production is to produce a quality product in a cost-effective manner that can eventually be sold for a substantial premium over concentrated or reconstituted juice products. Figure 1 portrays a simplified flow diagram of the major steps in producing citrus juices, both NFC and FCOJ (FCGJ). Until the branch point immediately after finishing/chilling, the process is basically similar. Some NFC producers utilize different extraction/finishing conditions for their NFC product, or adhere to more rigorous fruit grading criteria, but the same unit operations are required up until this point.

The production of bulk citrus concentrate is summarized in the left portion of Figure 1. The chilled juice is routed to a surge tank, which acts as an evaporator feed tank. The juice is transformed into concentrate by the staged removal of water in the evaporator. The evaporator most often used in the citrus processing industry is termed a “TASTE” unit (meaning thermally accelerated short time evaporator and generally referred to as a TASTE evaporator). Concentration of juice offers several distinct benefits to the processor: it reduces storage space and shipping costs for the equivalent amount of soluble solids, it pasteurizes the juice, destroying most microorganisms and inactivating pectinesterase, it results in a product that is microbiologically more stable than single-strength juice due to its low water activity, and the

Figure 1. Flow diagram for the production of citrus products.



Bulk Citrus Concentrate

Aseptic Bulk NFC Juice

technology is well-defined. After the concentrate is produced, it is stored in refrigerated tanks according to its variety and/or biochemical specifications, until needed for shipment or use.

The other side of Figure 1 highlights the key steps in NFC juice production. The pulp-free, chilled juice is sent to the aseptic storage systems. For illustration, we will focus on juice that will be aseptically filled into storage tanks, although NFC juice can and is sent directly to packaging lines, or filled into smaller aseptic or ultra-clean bulk storage and transport containers such as 300 gallon bag-in-bins or juice tankers. Prior to filling the aseptic tanks, the sterilization systems are cleaned and sterilized. The juice is deaerated, thermally treated, and chilled, and then introduced into the aseptic tanks. The degree of thermal treatment is actually based upon the inactivation kinetics of the heat-stable form of the enzyme pectinesterase, which must be almost completely inactivated for the citrus juice to maintain the expected cloud stability. In reality, this thermal inactivation also results in a microbiologically stable juice, which is commercially sterile. A typical time-temperature regime for orange juice is 195-205°F for 5-15 seconds; however each processor adheres to individual corporate specifications. Juice in the tanks is used on an as-needed basis, with aseptic additions and withdrawals occurring one or several times throughout the season. Tank sterility can be maintained for several years (3-5) with proper processing and handling procedures.

To many consumers, NFC juice is perceived as a generally higher value product than the equivalent amount of reconstituted single-strength juice with a premium quality that may be perceived or real. It is important to understand that maintaining aseptic juice quality is absolutely critical, and involves controlling the chemical (by deaeration and low temperatures, for example) and physical (by agitation) stability of the product, as well as maintaining the microbiological integrity of the juice. All of the unit operations involved in the processing of aseptic NFC juice are designed with these objectives, and must be considered in the overall economic analysis of NFC citrus juice world movement and markets.

Market Supply and Demand

European Consumption of NFC and Other Juices and Nectars

From 1993 to 1998, European NFC-OJ and NFC-GJ gallons sales grew at relatively fast rates, compared to growth in the broader market for juices and nectars. NFC-OJ sales in retail outlets grew from 53 million gallons in 1993 to 89 million gallons in 1998, or 11.1% per year on average (Table 1). Similarly, over this period, NFC-GJ sales grew from 11 to 19 million gallons, or 11.5% per year on average. In comparison, the (total) OJ and GJ markets in Europe grew at more moderate rates, with OJ gallon sales increasing by 3.3% per year on average and GJ gallon sales increasing by 2.8% per year. In 1998, European OJ and GJ sales were at 852 and 46 million gallons, respectively. The broader juice and nectar market in Europe grew from 2,021 million gallons in 1993 to 2,309 million gallons in 1998, or 2.7% per year on average. Juice gallon sales, which account for roughly 70% of this market, grew by 3.7% per year while nectar sales were roughly flat.

In 1998, NFC-OJ and NFC-GJ gallon sales accounted for 3.9% and .8% of the juice and nectar market, respectively. NFC accounted for 10.5% of total OJ gallon sales and for 41.1% of total GJ gallon sales. On an annual per capita basis, NFC-OJ and NFC-GJ gallon sales stood at .2 gallons and .05 gallons in 1998, respectively.

Comparison of European and U.S. Market for NFC-OJ

The market for NFC-OJ is more developed in the U.S. than in Europe, with the NFC share of the OJ market at 32% in the U.S. in 1997-98 (Table 2), versus 10.5% in Europe in 1998. Per capita retail sales of NFC-OJ in 1998 was about a gallon in the U.S., versus .2 gallons in Europe. In the U.S., NFC-OJ gallon sales have grown from 105.4 million gallons in 1989-90 to 286.4 million gallons in 1998-99. These U.S. sales occurred in retail chains doing \$2 million or greater (all-commodity) business annually. The overall market for NFC-OJ in the U.S. is substantially larger than the \$2 million or greater market. Although exact data on the overall

Table 1. European juice/nectar sales in retail stores.^a

Category	1993	1994	1995	1996	1997	1998	% Avg Annual Growth
	----- Million Gallons -----						
Juice/Nectar	2,021	2,110	2,185	2,198	2,262	2,309	2.7
Nectar	619	615	620	606	611	626	.2
Juice	1,402	1,495	1,565	1,592	1,651	1,683	3.7
Orange Juice	724	745	794	811	836	852	3.3
NFC Orange Juice	53	60	67	75	81	89	11.1
Grapefruit Juice	40	42	43	45	46	46	2.8
NFC Grapefruit Juice	11	13	15	17	18	19	11.5
----- Percent Share of Juice/Nectar -----							'93 to '98 Share Change
Juice/Nectar	100.0	100.0	100.0	100.0	100.0	100.0	.0
Nectar	30.6	29.2	28.4	27.6	27.0	27.1	-3.5
Juice	69.4	70.8	71.6	72.4	73.0	72.9	3.5
Orange Juice	35.8	35.3	36.3	36.9	36.9	36.9	1.1
NFC Orange Juice	2.6	2.8	3.1	3.4	3.6	3.9	1.3
Grapefruit Juice	2.0	2.0	2.0	2.0	2.0	2.0	.0
NFC Grapefruit Juice	.5	.6	.7	.8	.8	.8	.3
----- Percent Share of Orange Juice/Grapefruit Juice -----							'93 to '98 Share Change
Orange Juice	100.0	100.0	100.0	100.0	100.0	100.0	.0
NFC Orange Juice	7.3	8.0	8.5	9.2	9.7	10.5	3.2
Grapefruit Juice	100.0	100.0	100.0	100.0	100.0	100.0	.0
NFC Grapefruit Juice	27.5	30.7	34.9	37.3	38.7	41.1	13.6
----- Per Capita Gallons -----							% Avg Annual Growth
Juice/Nectar	5.3	5.5	5.7	5.7	5.9	6.0	2.4
Nectar	1.6	1.6	1.6	1.6	1.6	1.6	-.1
Juice	3.7	3.9	4.1	4.1	4.3	4.3	3.4
Orange Juice	1.9	1.9	2.1	2.1	2.2	2.2	3.0
NFC Orange Juice	.1	.2	.2	.2	.2	.2	10.7
Grapefruit Juice	.1	.1	.1	.1	.1	.1	2.5
NFC Grapefruit Juice	.03	.03	.04	.04	.05	.05	11.1

^aAustria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

SOURCE: Industry sources.

Table 2. U.S. retail orange-juice sales in grocery stores doing \$2 million annual sales.

Oct-Sep Season	NFC		Other		Total	
	Mil. Gal.	% Total	Mil. Gal.	% Total	Mil. Gal.	% Total
1988-89	105.4	14	649.8	86	755.2	100
1989-90	112.6	16	589.3	84	701.9	100
1990-91	125.7	17	628.5	83	754.2	100
1991-92	140.6	19	609.3	81	749.9	100
1992-93	175.4	22	632.5	78	807.9	100
1993-94	191.6	24	612.2	76	803.8	100
1994-95	207.5	26	599.2	74	806.7	100
1995-96	216.4	27	573.5	73	789.9	100
1996-97	223.8	28	572.6	72	796.4	100
1997-98	260.9	32	558.0	68	818.9	100
1998-99	286.4	36	508.0	64	794.4	100
1999-00e	305.6	39	486.4	61	792.0	100

SOURCE: ACNielsen.

U.S. market are not reported, in 1999-00, Florida produced 559 million gallons of NFC-OJ, of which an estimated 433 million gallons will be consumed in the U.S. market.

From 1993 to 1998, the 11.1% annual growth in retail NFC gallons sales in Europe was greater than the growth in the U.S. which was at 8.3% (Table 3). The European growth rate is comparable to the U.S. growth rate in the earlier 1990's. The U.S. growth rate surged in 1997-98 to 16.6% and then decreased to 9.8% and an expected 6.7%, in 1998-99 and 1999-00, respectively.

Table 3. U.S. versus European retail NFC orange-juice sales.

Season	U.S.		Europe	
	Mil. Gal.	% Change	Mil. Gal.	% Change
1992-93	175.4		52.9	
1993-94	191.6	9.2	59.9	13.2
1994-95	207.5	8.3	67.2	12.2
1995-96	216.4	4.3	74.5	10.9
1996-97	223.8	3.4	80.7	8.2
1997-98	260.9	16.6	89.4	10.9
Average		8.3		11.1

SOURCE: U.S.: ACNielsen; Europe: industry sources.

Suppliers of NFC-OJ

Based on a report by the U.S. Department of Agriculture (USDA), the U.S. has become the largest foreign supplier of NFC-OJ to Europe (Table 4). The USDA reports that in 1998 European Union NFC-OJ imports were 35 million gallons of which 17 million gallons were from the U.S. (U.S. Department of Commerce data on U.S. exports of NFC to Europe, discussed below, differ somewhat from this USDA import data but follow a similar trend). Other foreign suppliers of NFC-OJ include Brazil and Israel, the latter of which has experienced a decline in NFC-OJ exports to Europe in the 1990's. Recalling that European retail sales of NFC-OJ were 89 million gallons in 1998, the 35 million gallons of foreign imports would account for 39% or less of the retail market (less to the extent some of the imports may be sold in restaurants or institutional outlets). These data suggest that, in 1998, 54 million gallons or more of NFC-OJ came from production in Europe, which is consistent with USDA data showing that Spain, Italy and Greece produced 132 million gallons of OJ in 1997-98 (Table 5). Data on oranges utilized for processing in the Mediterranean region (Table 6) support the European OJ production data.

U.S. NFC Exports to Europe, Prices and Consumer Income

U.S. Department of Commerce data show U.S. NFC-OJ exports to Europe have grown from about 3 million gallons in 1978 to about 23 million gallons in 1999 (Table 7). NFC-GJ exports to Europe have ranged from under a million gallons to 3.6 million gallons over this period. From 1993 to 1998, the U.S. exported about 13 million gallons of NFC-GJ to Europe, which represents about 14% of the NFC-GJ retail sales of 93 million gallons over this period (Table 1).

There may be a number of factors impacting the demand for NFC citrus-juice products in Europe, but, two factors, price and income stand out. Increases in European per capita real

Table 4. European Union orange-juice imports, by select origin.

Product/ Calendar Year	Total	Brazil	U.S.	Other	Total	Brazil	U.S.	Other
	----- Million Gallons -----				----- Percent of Total -----			
<u>FCOJ</u>								
1990	571	422	17	131	100	74	3	23
1991	672	558	20	94	100	83	3	14
1992	692	616	28	48	100	89	4	7
1993	681	599	34	48	100	88	5	7
1994	794	691	56	48	100	87	7	6
1995	1,006	835	101	70	100	83	10	7
1996	1,052	863	137	53	100	82	13	5
1997	1,090	883	153	54	100	81	14	5
1998	1,149	919	138	92	100	80	12	8
<u>NFC</u>								
1990	35	4	4	27	100	11	12	77
1991	36	6	4	26	100	16	12	72
1992	34	7	7	21	100	20	20	60
1993	33	4	11	18	100	12	33	55
1994	36	3	14	19	100	9	38	53
1995	39	6	17	16	100	15	43	42
1996	27	4	11	12	100	15	41	44
1997	29	4	13	11	100	15	45	40
1998	35	7	17	11	100	19	49	32
<u>FCOJ+NFC</u>								
1990	606	426	21	158	100	70	4	26
1991	708	563	24	120	100	80	3	17
1992	727	623	35	69	100	86	5	10
1993	714	603	45	66	100	84	6	9
1994	830	694	69	67	100	84	8	8
1995	1,045	841	117	87	100	80	11	8
1996	1,079	867	148	64	100	80	14	6
1997	1,118	887	165	66	100	79	15	6
1998	1,184	926	155	103	100	78	13	9

SOURCE: U.S. Department of Agriculture, Foreign Agriculture Service, "World Horticultural Trade and U.S. Export Opportunities," February 2000.

Table 5. Orange-juice production for select Mediterranean countries.

Season	Greece	Italy	Spain	Total
----- Million Gallons -----				
1989-90	17.31	62.58	25.07	104.96
1990-91	14.85	41.79	27.85	84.49
1991-92	14.41	68.58	45.96	128.95
1992-93	16.43	53.58	33.42	103.44
1993-94	11.09	48.22	34.82	94.12
1994-95	16.43	42.86	66.85	126.14
1995-96	17.96	51.44	82.16	151.57
1996-97	20.61	47.15	54.31	122.08
1997-98	20.61	44.94	66.29	131.84
1998-99	13.93	34.72	60.72	109.37
1999-00	18.66	42.89	62.22	123.78

SOURCE: U.S. Department of Agriculture, Foreign Agriculture Service, "World Horticultural Trade and U.S. Export Opportunities," August 2000 and various issues.

Table 6. Oranges utilized for processing, by select Mediterranean countries.

Season	Greece	Italy	Spain	Israel	Morocco	Turkey	Other	Mediterranean
----- Thousand MT -----								
1994-95	224	510	525	200	35	92	68	1,654
1995-96	249	650	550	200	82	86	74	1,891
1996-97	288	600	595	141	6	89	67	1,786
1997-98	293	600	762	142	118	74	56	2,045
1998-99	195	461	698	59	85	97	52	1,647
1999-00	290	600	715	140	100	105	60	2,010
----- % Mediterranean -----								
1994-95	14	31	32	12	2	6	4	100
1995-96	13	34	29	11	4	5	4	100
1996-97	16	34	33	8	0	5	4	100
1997-98	14	29	37	7	6	4	3	100
1998-99	12	28	42	4	5	6	3	100
1999-00	14	30	36	7	5	5	3	100

SOURCE: U.S. Department of Agriculture, Foreign Agriculture Service, "World Horticultural Trade and U.S. Export Opportunities," August 2000 and various issues.

Table 7. U.S. orange-juice and grapefruit-juice exports to Europe.

Calendar Year	Orange Juice				Grapefruit Juice			
	FCOJ		Other OJ (NFC)		FCGJ		Other GJ (NFC)	
	Volume	Price	Volume	Price	Volume	Price	Volume	Price
	Mil. SSE Gal.	\$/Gal.	Mil. SSE Gal.	\$/Gal.	Mil. SSE Gal.	\$/Gal.	Mil. SSE Gal.	\$/Gal.
1978	13.954	1.34	3.2982	2.25	3.290	1.12	.853	1.91
1979	16.213	1.23	3.7215	2.54	5.106	1.24	1.043	1.91
1980	21.747	1.20	5.4953	1.76	5.300	1.66	1.472	2.00
1981	27.944	1.13	6.5209	1.69	4.194	1.27	1.759	1.83
1982	20.371	1.12	5.0818	1.72	5.423	.99	1.639	1.91
1983	21.836	1.03	3.3139	1.89	3.422	.89	1.104	1.92
1984	16.532	1.23	3.0114	2.04	4.122	.85	1.119	1.86
1985	8.312	1.50	1.5134	2.90	1.556	1.29	.671	1.95
1986	13.835	.98	1.6440	1.98	1.452	1.45	.884	2.42
1987	16.705	1.15	2.5682	2.04	1.554	1.66	.934	2.37
1988	19.698	1.44	4.3053	2.15	4.864	1.40	1.385	2.52
1989	15.903	1.81	3.2008	2.95	1.460	2.33	2.281	2.56
1990	17.937	1.83	2.8457	3.55	2.184	2.08	1.877	2.76
1991	17.537	1.44	5.0704	2.64	3.425	1.67	2.075	2.29
1992	20.690	1.47	8.9429	2.75	3.904	1.69	2.083	2.43
1993	34.418	1.46	8.6506	2.68	5.511	1.78	1.950	2.13
1994	29.606	1.45	14.3542	2.37	4.300	1.86	2.698	2.07
1995	41.678	1.57	10.0458	2.13	7.458	2.31	2.156	2.17
1996	36.620	1.54	8.5547	2.45	8.595	2.13	1.810	2.41
1997	70.860	1.33	8.0853	2.49	11.131	2.03	.770	2.24
1998	45.498	1.40	21.1219	1.64	6.636	2.37	3.601	1.23
1999	37.396	1.49	23.0771	1.85	15.489	1.46	.652	2.29

SOURCE: U.S. Department of Commerce.

income¹ (Table 8) and decreases in real prices² (Table 9) seem to be supporting the observed growth in European NFC-OJ gallon sales over the mid 1990's. Regression analysis of the U.S. Department of Commerce data on U.S. NFC-OJ exports to Europe provides an indication of the NFC-OJ demand relationship. The log of U.S. NFC-OJ exports to Europe was regressed on the

¹ Real per capita income was measured, by country, as gross domestic product divided by population divided by the consumer price index.

² The real NFC-OJ price was measured, by country, as the U.S. FOB price in dollars times the exchange rate (the country's currency per dollar) divided by the country's CPI.

Table 8. Growth in per capita real gross domestic products, by country.

Country	Percent Change in Per Capita Real Gross Domestic Product ^a								Annual Growth 1993-97
	1990	1991	1992	1993	1994	1995	1996	1997	
	-----%-----								
Belgium	2.4	1.4	2.0	-.5	2.2	1.8	.7	2.8	1.9
Denmark	1.8	1.3	1.0	.4	3.8	2.6	2.3	2.6	2.8
Finland	-.9	-8.9	-5.9	-1.6	4.2	6.4	3.5	6.6	5.2
France	1.7	.3	.3	-1.5	2.3	1.5	.3	1.8	1.5
Germany	4.3	-10.4	1.8	-2.5	2.2	2.0	.5	1.2	1.5
Greece	-.5	2.4	-.9	-2.1	1.8	2.7	2.4	4.8	2.9
Ireland	3.8	.0	2.7	5.6	5.5	8.5	9.9	10.7	8.6
Italy	12.5	4.1	.0	-1.6	1.3	2.6	1.5	1.8	1.8
Netherlands	3.3	1.0	.4	-1.1	1.7	1.9	1.6	3.6	2.2
Norway	1.5	1.7	-.2	2.1	3.5	3.5	8.0	3.0	4.5
Portugal	4.1	5.9	3.6	-1.3	3.4	3.6	4.1	4.3	3.9
Spain	4.1	3.2	1.3	-1.6	1.3	2.7	1.7	3.6	2.3
Sweden	-.9	-3.4	-3.1	-4.7	2.5	4.5	2.2	2.1	2.8
Switzerland	1.7	-1.9	-2.6	-2.0	.7	-.9	-.9	.7	-.1
U.K.	-2.8	-1.8	.0	3.4	3.1	1.4	2.6	2.8	2.5

^aPer capita gross domestic product calculated as gross domestic product divided by population divided by the consumer price index.

SOURCE: International Financial Statistics – International Monetary Fund.

log of real price and a time variable (income was strongly correlated with time and only time was included in the regression to avoid multicollinearity). The regression estimates indicate that the demand for NFC-OJ in Europe may be elastic, with the elasticity of gallons sales with respect to price estimated at -1.3 (a 1% decrease in price results in a 1.3% increase in gallon sales, and vice versa). The growth rate in NFC-OJ demand, including the impact of income, was estimated at 11% per year. (Since changes in exchange rates and inflation across European countries tended to be correlated, the exchange rate and consumer price index (CPI) for France, the largest consumer of NFC-OJ, was used to adjust the U.S. export price in dollars to CPI deflated Francs.) For comparison the price elasticity of demand for U.S. and Brazilian FCOJ was estimated at -.64, with the demand growth rate, including the impact of income, estimated at 2%. Many factors besides (own) price and income probably impact European demand for OJ products, and

Table 9. Real U.S. FOB prices for NFC-OJ, by country.

Item/ Country	1990	1991	1992	1993	1994	1995	1996	1997	1998
U.S. NFC-OJ Export Volumes and Prices for Europe									
U.S. FOB Price:									
\$/Gallon	3.55	2.64	2.75	2.68	2.37	2.13	2.45	2.49	1.64
Million Gallons	2.85	5.07	8.94	8.65	14.35	10.05	8.55	8.09	21.12
Real Price: U.S. NFC FOB Export Price in Country Currency Divided by CPI									
Belgium	118.6	87.4	83.6	85.5	71.3	55.6	65.9	76.2	50.3
Denmark	22.0	16.4	16.0	16.3	14.0	10.9	12.7	14.2	9.3
Finland	13.5	10.3	11.6	13.9	11.1	8.3	10.0	11.5	7.5
France	19.2	14.5	13.8	13.9	12.1	9.6	11.0	12.7	8.4
Germany	6.0	4.5	4.1	4.0	3.3	2.6	3.2	3.7	2.5
Greece	562.7	402.6	378.7	387.8	327.3	257.7	284.7	311.3	211.7
Ireland	2.1	1.6	1.7	1.6	1.4	1.3	1.2	1.5	1.0
Italy	4,253.3	3,081.1	3,034.1	3,614.0	3,147.8	2,714.9	2,846.4	3,129.7	2,060.3
Netherlands	6.4	4.8	4.7	4.6	3.8	3.0	3.4	4.0	2.6
Norway	22.4	16.6	16.2	17.7	15.2	11.9	14.0	15.2	10.3
Portugal	506.2	342.4	306.1	332.6	289.4	227.5	258.7	292.8	192.9
Spain	361.7	259.0	251.1	290.8	258.3	206.6	233.0	268.4	177.1
Sweden	20.9	14.5	14.3	18.0	15.2	12.4	13.5	15.4	10.5
Switzerland	5.0	3.7	3.6	3.5	2.8	2.1	2.5	3.0	2.0
U.K.	2.1	1.3	1.4	1.6	1.4	1.1	1.2	1.2	0.8
Real Price Relative to 1990 Level									
Belgium	1.00	.74	.71	.72	.60	.47	.56	.64	.42
Denmark	1.00	.74	.72	.74	.64	.49	.58	.64	.42
Finland	1.00	.76	.86	1.03	.83	.62	.74	.85	.56
France	1.00	.76	.72	.73	.63	.50	.58	.66	.44
Germany	1.00	.74	.68	.67	.55	.42	.53	.62	.41
Greece	1.00	.72	.67	.69	.58	.46	.51	.55	.38
Ireland	1.00	.74	.77	.75	.67	.60	.58	.70	.46
Italy	1.00	.72	.71	.85	.74	.64	.67	.74	.48
Netherlands	1.00	.74	.73	.71	.59	.47	.54	.62	.41
Norway	1.00	.74	.73	.79	.68	.53	.62	.68	.46
Portugal	1.00	.68	.60	.66	.57	.45	.51	.58	.38
Spain	1.00	.72	.69	.80	.71	.57	.64	.74	.49
Sweden	1.00	.69	.68	.86	.72	.59	.64	.74	.50
Switzerland	1.00	.74	.72	.70	.57	.43	.49	.60	.40
U.K.	1.00	.62	.65	.75	.67	.50	.58	.58	.38

SOURCE: International Financial Statistics – International Monetary Fund; U.S. Department of Commerce.

omission of these factors due to lack of data may bias the present demand estimates. Nevertheless, the results of this analysis suggest that price and income have been important factors underlying the increases in NFC-OJ demand that have been occurring in Europe.

Concluding Remarks

The markets for NFC-OJ and GJ products in Europe appear to be promising, growing at roughly 11% per year from 1993 through 1998. NFC's high quality and fresh taste, the perception that NFC is more natural than other products made from concentrates and NFC's convenient ready-to-serve form seem to be underlying the demand growth. Part of this growth also seems to be related to growth in real income in Europe. NFC-OJ demand appears to have further been supported by decreases in the real NFC-OJ price for U.S. product. The European demand for U.S. NFC-OJ was estimated to be price elastic. The U.S. is the largest foreign supplier of NFC to Europe, followed by Brazil, but domestic suppliers appear to account for the largest market share.