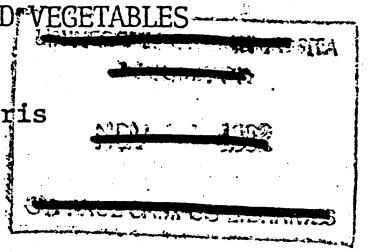
Division of Agricultural Sciences
UNIVERSITY OF CALIFORNIA

Working Paper No. 168 Rev.

EUROPEAN COMMUNITY ENLARGEMENT AND WORLD TRADE IN FRUITS AND VEGETABLES

Alexander H. Sarris



California Agricultural Experiment Station
Giannini Foundation of Agricultural Economics
March 1982

EUROPEAN COMMUNITY ENLARGEMENT AND WORLD TRADE IN FRUITS AND VEGETABLES*

Alexander H. Sarris
University of California, Berkeley, CA 94720

Abstract

World trade models for products differentiated by country of origin are specified and estimated for five categories of fruit and vegetable products, namely, fresh, dried, and processed fruit as well as fresh and processed vegetables. The models are used to project changes in world trade patterns and terms of trade in these products under the assumption of a European Community (EC) enlarged with Spain, Greece, and Portugal and to estimate partial equilibrium welfare effects of enlargement. The results indicate marked world terms-of-trade declines, some EC trade diversion, and substantial EC welfare gains in the fruit and vegetable sector.

EUROPEAN COMMUNITY ENLARGEMENT
AND WORLD TRADE IN FRUITS AND VEGETABLES

On January 1, 1981, Greece became the tenth country to join the European Community (EC). Spain and Portugal have also applied for full EC membership, and negotiations are underway with an anticipated date of both Spanish and Portuguese accession of 1986.

Agriculture has loomed large in the enlargement negotiations with Spain, Greece, and Portugal (SGP) given that the national product in these three countries depends much more on agriculture than in the average country of the former EC nine. Within agriculture, the concern in the EC has centered mostly on the so-called Mediterranean products (mainly fruit, vegetables, wine, and olive oil), the fear being that the protective umbrella of the common agricultural policy (CAP) of the EC will induce large excess supplies of these products in the enlarged community which might have adverse impact on the producers of similar products in the EC nine. Outside the EC, the concern regarding these products has been that the next enlargement will hurt exports to the EC of the remaining suppliers.

The EC (of nine), considered as a single entity, is the world's most important market for fruit and vegetable products. In 1977, it absorbed 54 percent of total world exports of fresh fruit, 47 percent of world exports of dried fruit, 53 percent of world exports of processed fruit, 60 percent of world exports of fresh vegetables, and 52 percent of world exports of processed vegetables. For SGP exports of these products, the EC market is even more important absorbing 76 percent of their combined exports of fresh fruit, 51 percent of exports of dried fruit, 71 percent of exports of processed fruit, 81 percent of exports of fresh vegetables, and 44 percent of exports of processed vegetables. On the other hand, SGP account for a rather small share of total EC imports of fruit and vegetable products.

Recent empirical literature on world trade of fruits and vegetables is very scant. Hunt projected excess supplies in 36 fresh fruit and vegetable products and estimated that international prices which would clear import markets assuming unchanged trade shares would decline for about two-thirds of his commodities. The Food and Agriculture Organization (FAO) of the United Nations recently pointed out that the enlarged EC will be much more self-sufficient in fruits and vegetables, a point that has been made by others as well (e.g., Hörmann and Hinton). It also pointed out that there might be some trade diversion of third country exports to the EC due to CAP preferences toward the three. No attempt, however, was made at estimating these effects. Finally, three recent studies by Agra Europe (1979, 1980a, and 1980b) which examine the agricultural implications of EC enlargement with SGP point out that fruits and vegetables could become burdensome products for the CAP without, however, any empirical estimates. From the above, it appears that the impact of EC enlargement on trade in fruits and vegetables is still an area of speculation with very few hard numbers to support the arguments.

The purpose of this paper is to assess the world prices and trade patterns that will arise after EC enlargement with SGP. Changes arising out of changing world supply and demand conditions alone, as well as because of changes in EC commercial policies (such as levels of tariffs, etc.), will be assessed. The welfare effects of enlargement in these products will also be estimated.

The separation of the projected trade changes into those that are due to secular supply and demand growth and those that are due strictly to enlargement is very important because, as will be seen, the enlargement-induced effects are very small compared to those due to general trends. Given the large variety of different fruit and vegetable products and the impossibility of collecting data for all of them, the analysis will be conducted in terms of

five broad aggregates, namely, fresh fruit (SITC 051),[1] dried fruit (SITC 052), processed fruit (SITC 053), fresh vegetables (SITC 054), and processed vegetables (SITC 055). World trade models that differentiate products according to their country of origin are constructed for each one of the above five product categories and used to project future trade patterns and terms of trade with and without enlargement.

The EC Protection System in Fruits and Vegetables

The system of protection in fruit and vegetable products of the EC consists of common customs tariffs (CCT) for imports of these products and internal regulations both designed to protect the EC producers.

The CAP regulations for the internal EC market in fresh fruit and vegetables, described in the EEC Council Regulation No. 1035/72, consist of quality standards and a price and intervention system. The regulation defines basic, withdrawal, and buying-in prices designed to place a price floor on domestic production and a reference price relevant for imports from third countries.[2] During the period for which reference prices apply, if an entry price (which is calculated daily by averaging the lowest EC market prices) stays .50 units of account below the reference price for two consecutive market days, then a levy equal to the difference between the reference price and the average entry price of the last two days is applied. Sampson and Yeats have estimated that, in 1974, the tariff equivalent of these levies for fresh fruit and vegetables is 37.1 percent, which is substantially higher than their estimated average level of CCT nominal tariff which is 16.4 percent.

The common organization of the market in processed fruit and vegetables of the EC is outlined in Council Regulation No. 516/77. Besides the CCT, control of imports is achieved, first, via a levy that is based on the sugar content

of the product and, second, via minimum import prices. Sampson and Yeats estimated the nominal tariff equivalent of EC levies on processed fruit and vegetables at 26.8 percent in 1974 compared with an average CCT of 26 percent.

The CCTs vary every year and in different seasons for each product, being higher during the periods of EC production and lower in off-season periods. Furthermore, the tariffs discriminate among countries of origin because the EC has signed agreements with several Mediterranean and other developing countries.

A Model for Projecting Trade Patterns

Given that a major objective of the study is the ex ante estimation of changes in trade patterns, a model is needed that differentiates products by country of origin.

The assumption of geographic differentiation is quite easy to rationalize for fruit and vegetable products given the diversity of varieties and the variability of production seasons in producing countries. The model outlined below is an extension of the one derived by Armington (1969a). Trade models using variants of the approach have been constructed among others by Armington (1969b); Branson; Artus and Rhomberg; Hickman; and Grennes, Johnson, and Thursby. A variant of the Armington method was also used by Resnick and Truman. We present only the final equations of the model referring the reader to Armington's (1969a) article for the derivations.

Assume there are r exporting countries and n importing ones in a particular product. The following notation will be used throughout:[3]

x_{ik} = quantity of exports of the product of the ith exporting country to the kth importing country in the base period. This will be measured by the base period value of the trade flow.

p_i^e = internal export price of the ith exporting country in the base period (excludes all export subsidies or taxes). This is normalized to one in the base period.

p_{ik}^m = landed price of imports of importing country k from exporting country i in the base period (includes all duties paid at port of entry deflated by country k's consumer price index). This is also normalized to one in the base period.

a_{ik} = base period ratio between the price of the product x_{ik} inside importing country k and the internal export price of the product in exporting country i. This is normalized to one in the base period.

x_i = total quantity of exports of the product from country i.

Normalization of a_{ik} to one in the base period does not, of course, mean that trade barriers are absent. Since, however, we work with percentage changes in all variables, the normalization does not matter, and, furthermore, the convention that all base prices are equal to one enables us to treat base-year trade flows in value terms as quantity flows.

Given the above definitions, the following relations hold:

$$p_{ik}^m = p_i^e \cdot a_{ik} \qquad i = 1, \ldots, r;\ k = 1, \ldots, n \tag{1}$$

$$x_i = \sum_{k=1}^{n} x_{ik} \qquad i = 1, \ldots, r. \tag{2}$$

Implicit in relation to (2) is the assumption that each exporting country exports a homogeneous product, albeit different than the product of another exporting country. Thus, x_i is well defined and represents aggregate quantity of exports of country i. Notice that the number $\sum_{i}^{n} x_{ik}$ does not represent anything tangible (i.e., quantity of some well-defined commodity) since each x_{ik} is by assumption a different product.

The heart of the model is an equation which describes changes in trade flows that has been derived by Armington (1969a) as follows.

$$(3) \qquad \tilde{x}_{ik} = \tilde{m}_k - \sigma_k(1 - S_{ik})\,\tilde{p}^m_{ik} + \sum_{\substack{j=1 \\ j\neq i}}^{r} \sigma_k\, S_{jk}\,\tilde{p}^m_{jk}$$

$$i = 1, \ldots, r, \qquad k = 1, \ldots, n.$$

In (3), the numbers S_{ik} are the base period value shares of imports of the product in the kth market, originating in the ith exporting region, m_k is a CES index of aggregate imports of the product in region k with absolute value of elasticity of substitution equal to σ_k, and tildes denote percent changes ($\tilde{w} \equiv dw/w_o$). From log-differentiating equations (1) and (2), we obtain

$$(4) \qquad \tilde{p}^m_{ik} = \tilde{p}^e_i + \tilde{a}_{ik} \qquad i = 1, \ldots, r,\ k = 1, \ldots, n$$

$$(5) \qquad \tilde{x}_i = \sum_{k=1}^{n} H_{ik}\,\tilde{x}_{ik} \qquad i = 1, \ldots, r.$$

where H_{ik} are the base period quantity shares of exports of the product from the ith exporting region to the kth market.

The percent changes in the aggregate import demands $\tilde{m}_k$ are specified as follows.

$$(6) \qquad \tilde{m}_k = \theta_k\,\tilde{Y}_k - \varepsilon_k\,\tilde{p}^m_k. \qquad k = 1, \ldots, n$$

where Y_k is real expenditure and p^m_k is a CES price index [which is a function of p^m_{ik}; see Armington (1969a) for details]. In (6), θ_k and ε_k are the expenditure elasticity and absolute value of the price elasticity of the demand by country k for aggregate imports of the product in question. The percent change in the import price index $\tilde{p}^m_k$ can be expressed as (see Armington):

$$(7) \qquad \tilde{p}_k^m = \sum_{i=1}^{r} S_{ik} \tilde{p}_{ik}^m \qquad k = 1, \ldots, n.$$

We make the assumption (and it is here that we depart from Armington and other previous studies) that the export supply of the ith exporting country is given by a relation of the type

$$(8) \qquad x_i = A_i (p_i^e)^{\eta_i} \cdot e^{\phi_i t} \qquad i = 1, \ldots, r$$

where η_i is the ith exporting region's price elasticity of export supply and ϕ_i is a trend constant. From (8), we obtain

$$(9) \qquad \tilde{x}_i = \eta_i \tilde{p}_i^e + \phi_i \Delta t.$$

Combining equations (3), (4), (5), (6), (7), and (9), we obtain a system of linear equations which, when combined with the equilibrium conditions

$$(10) \qquad \eta_i \tilde{p}_i^e + \phi_i \Delta t = \sum_{k=1}^{n} H_{ik} \tilde{x}_{ik} \qquad i = 1, \ldots, r,$$

yield r linear equations. When solved, these equations yield the percent changes in export prices and then successively the percent changes in trade flows. The exogenous variables of the model are the real expenditure changes in the importing countries ($\tilde{Y}_k$), the trade policy changes ($\tilde{a}_{ik}$), and the assumed growth rates of export supplies (ϕ_i).

Since the equilibrium model is nonlinear, the linearized projections are valid only for small departures from equilibrium. Since the projections reported below spanned a period of nine years which produced rather large departures from the base equilibrium, the following procedure was used. The time interval for the projections was first split into several equal smaller subintervals. For each subinterval, a linearized projection, as described

above, was made using as base the quantities, prices, and shares computed from the previous interval's projection. This procedure of successive linearizations produces a much closer approximation to the new equilibrium than a one-shot linearized projection which is the method that has been used in all previous models of this type.

The model, as outlined, can be used to answer the following two sets of questions. First, given that trade policies stay unchanged ($\tilde{a}_{ik} = 0$), what are the projected changes in trade patterns and real export prices (terms of trade) that could arise from various assumed real income and export supply changes in the trading countries? Second, what are the static trade effects of various changes in trade policies (namely, assume that $\tilde{a}_{ij} \neq 0$ while $\tilde{Y}_k = 0$ and $\phi_i = 0$)?

Before we proceed, some discussion of the methodology is in order. The CES import index function used implies that trade patterns and shares change only as a consequence of relative price changes. This is somewhat restrictive in the case of fruits and vegetables since quality upgrading of domestic production in some countries will render a larger share of their supplies exportable (especially to the EC). This was accounted for in the empirical estimation of the substitution elasticities (see Sarris, 1980) by including appropriate time trends. Furthermore, the CES function assumes the same substitution elasticity for the products of all exporters into a given market which might not be realistic. We did experiment with a CRESH import index function (see Hanoch, and Armington's appendix to the article by Artus and Rhomberg) which assumes different elasticities, but, with our data, the empirical estimation of its parameters proved impossible.

The models do not deal explicitly with domestic production or consumption but only with excess demands, thus implicitly assuming that internationally traded fruits and vegetables are different commodities than domestic ones.

For exported commodities, this is a reasonable assumption since the qualities of fruits and vegetables exported are usually quite different (better) than domestically consumed produce. For the import markets, however, there is usually direct competition between domestic production and imports. Our defense in this case is that, on the one hand, the estimated excess demands represent the difference between total domestic demands and supplies of export grade products and that, on the other, it is virtually impossible to construct aggregate measures of domestic production and consumption of fruits and vegetables (especially processed products). Finally, the trade models are still of the partial equilibrium nature. This is justified since fruits and vegetables are minor components of total consumption and production in all countries. Nevertheless, a full analysis of EC enlargement would require a general equilibrium framework.

Empirical Specification of the Trade Models

A world model such as the one outlined in the previous section was specified for each of the categories of fresh, dried, and processed fruits as well as fresh and processed vegetables.

The data used was obtained from the United Nations (UN) Commodity Trade Statistics data tapes. For the analysis, the world was divided into nine regions that were considered to represent well the trade patterns of fruit and vegetable products. The acronyms for the nine regions are as follows: EC, includes the nine EC countries; OWE, all Other Western European countries excluding SGP; SGP, Spain, Greece, and Portugal; EEU, centrally planned East European Countries; USA, United States; CNJP, Canada and Japan; OEX, major exporting countries of fruits and vegetables outside North Africa and Middle East. These are Mexico, Australia, New Zealand,

South Africa, Argentina, and Brazil; NAME, North African-Middle East countries. These are Cyprus, Israel, Turkey, Morocco, Algeria, Tunisia, Egypt, Iran, and Iraq; RSW, all the remaining countries of the world.

The UN country data were aggregated into trade matrices (in value terms) for the base year and for every (three digit) commodity. The base year was chosen to be 1977 since, for that year, we had the most complete origin-destination data. The detailed trade patterns and associated matrices of shares can be found in Sarris (1981).

The crucial parameters σ_k were estimated empirically using the methodology of Hickman and Lau [see Sarris (1980)]. The elasticity of substitution for the EC as a whole for one product category was obtained by weighing the individual country elasticities of substitution by the base-year share of each member country's imports of the product in total EC imports. Similar weighting was used for all other regions and parameters of the models. For the remaining countries and regions, we adopted the elasticity of import substitution estimates of Hickman and Lau for aggregate imports for lack of adequate data for estimation.

Income and price elasticities of imports [the parameters θ_k and ϵ_k, cf. equation (6)] for the EC countries were obtained empirically by applying the methodology of Houthakker and Magee. For the remaining countries, these parameters were obtained from various estimates of aggregate income and price elasticities of imports (Houthakker and Magee; Goldstein and Khan; and Stern, Francis, and Schumacher). In cases where no estimates were available, we assumed a value of one for import income elasticity and a value of .5 for import price elasticities. It was found impossible to estimate empirically the price elasticities of export supplies. We adopted the aggregate estimates of Goldstein and Khan for

the EC and the United States, while a value of 2.0 was used for the remaining regions.

In the basic simulations of the trade models, the assumption was made that the historical growth rates of export supplies of fruit and vegetable products will prevail in the future. These trends were estimated by regressing the logarithm of yearly total reported quantity exported by various countries or regions on a time trend.[4] The trends of real expenditure of the various regions of the world model were assumed to be the best available forecasts of growth rates of real incomes till 1986. These were compiled from data in Kost.

Enlargement is simulated in the trade models by changes in the parameters a_{ij} (cf., Section 3). Trade liberalization between two regions would imply a negative value for $\tilde{a}_{ij}$. A positive value for $\tilde{a}_{ij}$, in turn, denotes the institution of additional trade barriers between i and j. In the simulations, the most significant changes are the reductions in the tariffs and levies of the EC, facing the exports of fruit and vegetable products of SGP, and the lifting of trade barriers facing other exporters to SGP. The current levels of EC tariffs toward SGP were obtained by weighting the detailed commodity specific EC preferential tariff rates toward SGP by the shares of EC imports of individual products from these countries. To compute the aggregate preenlargement tariff equivalent (both tariffs and levies) of the EC toward SGP, we used the computed preferential tariff rates for 1978 of the EC toward SGP and the 1974 tariff equivalent of levies from Sampson and Yeats. The individual rates thus computed were weighted by the import shares of SGP into the total SGP imports of the EC of each product.

The percentage changes $\tilde{a}_{SGP,EC}$ thus found (using the standard formula $\tilde{a}_{ij} = dt_{ij}/1 + t_{ij}$, where t_{ij} is the preenlargement tariff equivalent) were computed as -32.13 (fresh fruits), -27.15 (dried fruits), -27.72 (processed fruits), -31.58 (fresh vegetables), and -26.91 (processed vegetables).

Finally, it was assumed that the additional barriers that SGP would lift toward imports from third countries would be equal to the tariff equivalent of EC levies obtained from Sampson and Yeats. It was also assumed that no change would occur in the tariff rates of SGP imports from the EC.[5] All other changes in the parameters a_{ij} are assumed equal to zero. Detailed exhibits of all the models' parameters can be found in Sarris (1981).

Empirical Results

Table 1 exhibits the projected real export prices in 1986 for the five categories of fruit and vegetable products considered. The left part of the table presents the projected prices under the assumption of no EC enlargement, while the right part exhibits the final prices that result after the effects of EC enlargement have been compounded to those of mere income and export supply changes. The figures at the bottom are world prices (i.e., terms of trade) obtained by weighting the individual export prices by the projected value shares of each exporter in total world exports (i.e., Paasche indices).

Comparing the values in the left part of the table with those in the right part, it can be seen that EC enlargement alone results in slight decreases in export prices of all exporting regions except for the export prices of SGP which are increased substantially by the enlargement. The most disturbing feature of the table, however, is the projected decline in world terms of trade of all fruit and vegetable categories. The worst

TABLE 1

1986 Indices of Export Prices of Fruit and Vegetable Products
(1977 prices equal to 100)

Country or region	Indices of export prices resulting from income and export supply changes					Final indices of export prices (including effects of EC enlargement)				
	(Fresh fruits)	(Dried fruits)	(Processed fruits)	(Fresh vegetables)	(Processed vegetables)	(Fresh fruits)	(Dried fruits)	(Processed fruits)	(Fresh vegetables)	(Processed vegetables)
EC	88.3	78.6	81.4	95.3	89.5	87.7	78.3	81.1	95.4	89.0
OWE	108.2	82.3	62.6	116.1	96.9	107.7	82.0	62.5	115.0	96.3
SGP	91.1	108.2	74.8	96.4	85.1	95.5	112.4	79.7	103.9	89.1
EEU	73.1	99.6	105.6	115.7	69.2	72.9	98.9	105.2	115.6	68.8
USA	95.6	104.2	96.4	97.6	95.7	95.5	103.9	96.3	97.5	95.5
CNJP	122.6	97.6	106.1	107.0	129.5	122.5	97.2	105.9	106.4	129.4
OEX	101.1	116.6	58.2	90.4	84.3	100.7	115.9	57.9	89.3	84.5
NAME	80.1	97.7	85.9	103.7	72.2	79.8	96.5	85.5	103.0	71.8
RSW	83.3	89.1	80.1	65.9	120.1	83.0	88.6	79.9	65.6	120.0
WORLD	87.7	100.3	77.1	89.0	92.8	88.0	100.9	77.3	89.7	93.3

Source: Computed.

outlook is for processed fruit whose world terms of trade is projected to decline by 23 percent in the next decade. The only category for which the medium term outlook seems tolerable is dried fruit. These results are the consequence of increasing export supplies of these commodities in the medium run coupled with a slowdown in world demand and have also been pointed out for a class of fresh products by Hunt.

Table 2 summarizes the projected changes in total exports of fruit and vegetable products for selected regions[6] that are due to income and export supply changes as well as those due solely to the effects of EC enlargement. It can be observed that, with the notable exception of SGP, the exports of all fruit and vegetable products of almost all exporting regions will fall as a result of EC enlargement. The amounts of the declines, however, are very small and, in many cases, about two orders of magnitude smaller (in absolute value) than the corresponding large export increases that are projected otherwise. In terms of the base values of exports, the enlargement-induced decreases almost never exceed 3 percent of the base figures. In the case of SGP, EC accession will mean sharp increases in total exports of the same order of magnitude and in addition to the increases expected otherwise. The small effects on other exporters and large effects on SGP are to be expected from the small falls in export prices of all exporters except SGP exhibited in table 1. From the figures at the bottom of table 2, it can be seen that world exports are expected to increase as a result of EC enlargement. This result comes about because a substantial trade liberalization will occur in one of the largest trade flows, namely, the one between SGP and EC.

Table 3, which considers the changes in net fruit and vegetable exports projected in 1986 for selected regions, is quite revealing. It can be seen from the left-hand panel of the table that most of the base year

Table 2. 1986 Projected Changes of Total Exports of Fruit and Vegetable Products

Country or region	Projected changes due only to income and export supply effects					Projected changes due only to EC enlargement				
	Fresh fruits	Dried fruits	Processed fruits	Fresh vegetables	Processed vegetables	Fresh fruits	Dried fruits	Processed fruits	Fresh vegetables	Processed vegetables
	thousand dollars (U. S., 1977)									
EC	419,437	31,030	435,487	1,010,075	627,882	- 15,132	- 434	- 8,721	2,555	-15,262
	(23.9)[a/]	(79.1)	(64.3)	(47.8)	(78.0)	(-.9)	(-1.1)	(-1.3)	(1.2)	(-1.9)
SGP	188,987	22,432	173,037	241,457	369,672	107,702	15,080	52,188	119,766	77,176
	(20.3)	(15.4)	(76.7)	(45.7)	(82.7)	(11.6)	(10.3)	(23.1)	(22.7)	(17.3)
USA	319,415	34,607	104,431	190,375	103,548	- 11,545	- 3,872	- 2,308	- 8,015	- 3,537
	(38.0)	(24.8)	(33.2)	(38.7)	(63.1)	(-1.4)	(-2.8)	(-.7)	(-1.6)	(-2.2)
OEX	137,916	7,093	669,392	286,916	66,695	- 6,952	- 881	-12,674	- 19,181	596
	(17.7)	(10.7)	(128.6)	(55.5)	(86.8)	(-.9)	(-1.3)	(-2.4)	(-3.7)	(.8)
NAME	413,555	48,579	81,810	157,015	132,259	- 11,493	- 5,699	- 2,074	- 7,791	- 2,833
	(42.2)	(26.1)	(56.3)	(35.9)	(123.4)	(-1.2)	(-3.1)	(-1.4)	(-1.8)	(-2.6)
RSW	1,153,619	42,494	307,924	1,180,028	97,230	- 27,125	- 1,332	- 5,245	- 17,571	- 1,636
	(52.9)	(60.3)	(68.0)	(110.1)	(16.8)	(-1.2)	(-1.9)	(-1.2)	(-1.6)	(-.3)
WORLD	2,700,000	192,175	1,900,000	3,100,000	1,500,000	33,919	2,498	18,574	66,538	51,983
	(35.1)	(28.7)	(70.4)	(55.4)	(62.5)	(.4)	(.4)	(.7)	(1.2)	(2.2)

[a/] Figures in parentheses represent the absolute changes as percent changes from the corresponding 1977 base values of total exports of each product from the relevant region.

Source: Computed.

Table 3. 1986 Projected Changes in Net Exports of Fruit and Vegetable Products

Country or region	Projected changes due only to income and export supply effects					Projected changes due only to EC enlargement				
	Fresh fruits	Dried fruits	Processed fruits	Fresh vegetables	Processed vegetables	Fresh fruits	Dried fruits	Processed fruits	Fresh vegetables	Processed vegetables
	thousand dollars (U. S., 1977)									
EC	-401,618	- 9,926	-625,547	-854,059	-339,412	- 53,166	- 7,272	-42,674	- 91,100	-84,128
	(-2,426,253)[a/]	(-275,577)	(-763,574)	(-1,238,296)	(-437,255)	(-2,426,253)	(-275,577)	(-763,574)	(-1,238,296)	(-437,255)
SGP	149,182	17,962	146,554	196,012	365,744	118,067	19,126	68,756	152,701	80,366
	(896,905)	(139,546)	(192,957)	(400,128)	(434,862)	(896,905)	(139,546)	(192,957)	(400,128)	(434,862)
USA	- 74,497	-16,105	-129,497	4,283	- 24,525	- 14,743	- 3,877	- 3,837	- 11,500	2,877
	(197,399)	(102,071)	(24,978)	(172,798)	(-112,485)	(197,399)	(102,071)	(24,978)	(172,798)	(-112,485)
OEX	17,182	- 6,202	636,129	187,481	23,625	- 7,740	- 1,037	-12,891	- 19,821	2,179
	(559,157)	(32,668)	(479,868)	(361,933)	(4,410)	(559,157)	(32,668)	(479,868)	(361,933)	(4,410)
NAME	336,445	43,995	63,485	78,862	119,769	- 11,668	- 5,725	- 2,101	- 7,965	- 2,708
	(876,567)	(178,790)	(121,104)	(322,055)	(89,502)	(876,567)	(178,790)	(121,104)	(322,055)	(89,502)
RSW	822,713	7,092	115,703	843,102	-105,209	- 28,240	- 1,559	- 3,991	- 18,715	- 1,061
	(1,713,384)	(16,677)	(191,850)	(640,441)	(261,202)	(1,713,384)	(16,677)	(191,850)	(640,411)	(261,202)

a/ Figures in parentheses denote the base-year value of net exports (= value of exports - value of imports) for the corresponding region and product.

Source: Computed.

net exporting regions (SGP, OEX, and NAME) are expected to expand their net exports given expected income and supply-demand growth trends. A notable exception is the United States which is a net exporter of all products except processed vegetables in 1977, and is projected to experience substantial falls in net exports even to the point of becoming a net importer in the case of processed fruit. This is a result of the so-called internationalization of the fruit and vegetable trade (see Mackintosh) and, in particular, the processed fruit and vegetable trade, with the attendant shift in the location of production toward the developing countries. EC enlargement, on the other hand (right-hand part of table 3), will certainly help even more the balance of payments of SGP, while having adverse consequences for most of the remaining regions. It can be clearly seen that SGP will reap the only total benefit from enlargement at the expense of almost everyone else including the EC (of nine). The magnitude of the "injuries," however, afflicted to all the other regions are quite small compared to the magnitudes of the changes that are expected to arise from the effects of income and export supply growth alone.

We now turn to the changes of trade flows between regions. Table 4 exhibits the major geographical changes in EC imports that are projected to occur in the future with and without EC enlargement. The geographical changes in trade flows resulting strictly from EC enlargement (right-hand panel) are as expected. The EC imports (which, as is seen from the figures at the bottom, will increase substantially) shift significantly toward SGP and away from all other traditional sources including other EC countries. The trade diversions can be large for some countries and products. The United States, for instance, will lose--as a consequence of

Table 4. 1986 Projected Changes in Geographical Origins of EC Imports of Fruit and Vegetable Products.

Country or region	Projected changes due only to income and export supply effects					Projected changes due only to EC enlargement				
	Fresh fruits	Dried fruits	Processed fruits	Fresh vegetables	Processed vegetables	Fresh fruits	Dried fruits	Processed fruits	Fresh vegetables	Processed vegetables
	thousand dollars (U. S., 1977)									
EC	268,601	8,098	383,348	812,734	514,368	- 35,225	- 1,334	-11,481	- 32,707	- 21,151
	(1,394,634)[a/]	(20,415)	(558,077)	(1,638,886)	(644,554)	(1,394,634)	(20,415)	(558,077)	(1,638,886)	(644,554)
SGP	121,743	4,404	129,517	204,905	176,541	129,910	18,339	60,434	143,593	104,528
	(715,158)	(74,782)	(160,623)	(426,301)	(196,623)	(715,158)	(74,782)	(160,623)	(426,301)	(196,623)
USA	27,187	4,375	36,241	50,128	46,822	- 5,480	- 2,595	- 1,769	- 1,759	- 2,720
	(200,180)	(51,474)	(79,774)	(107,866)	(70,081)	(200,180)	(51,474)	(79,774)	(107,866)	(70,081)
OEX	37,582	- 626	271,217	50,371	7,223	- 9,627	- 845	- 5,273	- 123	- 437
	(388,397)	(19,894)	(231,641)	(89,021)	(7,889)	(388,397)	(19,894)	(231,641)	(89,021)	(7,889)
NAME	150,368	18,834	69,523	128,700	102,020	- 16,233	- 5,327	- 2,067	- 2,910	- 3,297
	(575,027)	(122,174)	(113,572)	(332,247)	(82,528)	(575,027)	(122,174)	(113,572)	(332,247)	(82,528)
RSW	195,351	4,846	97,439	564,473	42,587	- 23,108	- 1,049	- 2,933	-10,173	- 5,104
	(835,706)	(19,000)	(137,586)	(567,123)	(166,908)	(835,706)	(19,000)	(137,586)	(567,123)	(166,908)
WORLD	821,055	40,957	1,061,034	1,864,134	967,294	38,034	6,838	33,953	93,655	68,865
	(4,184,539)	(314,789)	(1,440,703)	(3,352,885)	(1,241,748)	(4,184,539)	(314,789)	(1,440,703)	(3,352,885)	(1,241,748)

a/ Figures in parentheses denote the base-year values of EC imports from different origins.

Source: Computed.

enlargement--20 percent of the projected enlargement free increases in fresh fruit exports to the EC and almost 60 percent of the increase in dried fruit exports to the EC. Since EC imports from sources other than SGP and (as it turns out) SGP exports to destinations other than EC diminish, it is not clear a priori whether exports of other exporters to destinations other than EC will increase or not. It turns out that the results are mixed [for the complete results, see Sarris (1981)]. For the United States, for instance, while EC enlargement by itself leads to a decline of U. S. exports to EC and SGP, it nevertheless leads to increases in exports to the remaining Western European countries and the Canada-Japan area, two of the largest trade partners of the United States. The net effect for the United States, however, as already seen from table 3, is a small loss of total exports as a consequence of enlargement.

Despite the large trade flow changes indicated in table 4, world market shares do not change by substantial amounts after enlargement. The biggest changes turn out to be in the SGP shares of EC imports which rise by 2 to 5 percentage points (from 17 to 19 percent for fresh fruits, 22 to 27 for dried fruits, 12 to 14 for processed fruit, 12 to 15 for fresh vegetables, and from 17 to 21 percent in processed vegetables).

An approximation to the welfare effects of enlargement as far as fruits and vegetables are concerned can be computed by algebraically summing the export surplus and import surplus changes for each region and product using the aggregate excess supply and demand curves and the projected quantities and prices due only to income supply effects as points of departure. The results point out a substantial net welfare gain for the EC (of nine) in fruit and vegetable trade equal to 481 million U. S. dollars (in 1977 terms). SGP will also experience a welfare gain of 74 million dollars. Most of the other regions experience small total net

welfare losses (OWE -3, EEU -12, USA -2, CNJP 7, OEX -18, NAME -13, and RSW -20 million U. S. dollars) for a net world welfare gain of 494 million dollars yearly after 1986. The reasons for these results are that the major effects of enlargement are a trade liberalization in SGP-EC trade and subsequent increases in total imports of the EC which is a large net importer, as well as large increases in total exports of SGP which is a substantial net exporter (cf.,table 3).

The accuracy of the preceding results was checked with a series of sensitivity runs where a wide range of different assumptions about the model parameters, income and export supply, growth rates, and export-import price differentials were simulated. The basic results as far as terms of trade and trade patterns are concerned turn out to be very robust [for the detailed sensitivity results, see Sarris (1981)].

Summary and Conclusions

The major results of the study can be summarized as follows. Current trends in export availabilities of fruit and vegetable products, combined with current forecasts of income growth over the next decade, point toward substantial deterioration in export prices of these products in the medium run. The only exception seems to be the category of dried fruit but, even there, the projection of world export prices in real terms are hardly above the 1977 levels. EC enlargement will result in an improvement of export prices of fruits and vegetables of SGP and a very slight additional deterioration of export prices of other world exporters. When weighted properly, these effects point toward slight increases in world prices of fruit and vegetable products over those forecasted without EC enlargement.

EC enlargement is projected to cause substantial increases in the net exports of fruit and vegetable products of SGP. Furthermore, it is projected to cause slight declines in net exports of all other exporting regions. However, in some products (notably processed vegetables), EC enlargement implies small increases in net exports of most other exporting regions.

As expected, EC enlargement will lead to substantial changes in the pattern of origin of imports of fruit and vegetable products of the EC. The attendant trade diversions can be substantial for some countries as a proportion of their enlargement free projected export increases to the EC. However, the declines in exports to the EC of exporting regions other than SGP are much smaller than the increases of SGP exports to the EC. In other words, enlargement implies a net increase in EC-9 total imports of fruits and vegetables.

The results must be qualified somewhat by the fact that no consideration was given to quality changes, marketing strategies, and interproduct substitution (eg., fresh versus processed) as determinants of trade patterns. Nevertheless, it seems that these considerations would probably not upset the major result which is that the detrimental effects to the international markets for fruits and vegetables are bound to come mostly from the general trends in world supplies and incomes. EC enlargement will only be a marginal factor in the general pattern of international trade of these products and a beneficial influence within the enlarged European Community. It seems, therefore, that the furor created from the prospect of EC enlargement with SGP, as far as fruit and vegetables are concerned, is largely unjustified.

Footnotes

*The research for this paper was done under Cooperative Agreement No. 58-319V-8-2724X between the U. S. Department of Agriculture (USDA), Economics and Statistics Service, and the University of California, Berkeley. The author would like to thank the late B. Hiller, T. Reardon, and K. Stamoulis for research assistance; and I. Everts, R. Friend, T. Josling, D. Kelch, T. Lianos, R. Mildon, J. C. Montigaud, K. Moulton, T. Nederveen, R. Pasca, and F. Pfahler for data and helpful suggestions. Responsibility for errors and omissions remains with the author.

[1]SITC stands for Standard International Trade Classification.

[2]Reference prices are applied on a seasonal basis to cucumbers, tomatoes, apples, cherries, grapes, lemons, mandarins, peaches, pears, and oranges.

[3]Time subscripts will be suppressed throughout to simplify notations since everything will refer to the base period and changes from it.

[4]The exports might have been affected by changes in relative export prices over the estimation period. This was not accounted for.

[5]We could not obtain information about the levels of protection of SGP in fruit and vegetable products. However, SGP imports of these products are very small (less than .5 percent of total world imports) and, hence, only minimal distortions are introduced by the assumptions governing SGP tariff rates.

[6]The omitted regions OWE, EEU, and CNJP are mainly importing ones.

References

Agra Europe. "The Agricultural Implications of EEC Enlargement, Part I: Greece." Agra Europe Special Report. No. 3, 1979.

_____. "The Agricultural Implications of EEC Enlargement, Part II: Portugal." Agra Europe Special Report. No. 5, 1980a.

_____. "The Agricultural Implications of EEC Enlargement, Part III: Spain." Agra Europe Special Report. No. 6, 1980b.

Armington, P. S. "A Theory of Demand for Products Distinguished by Place of Production." IMF Staff Papers 16. 1969a.

_____. "The Geographic Pattern of Trade and the Effects of Price Changes." IMF Staff Papers 16. 1969b.

Artus, J. R., and R. R. Rhomberg. "A Multilateral Exchange Rate Model." IMF Staff Papers 20. 1973.

Branson, W. H. "The Trade Effects of the 1971 Currency Realignments." Brookings Papers on Economic Activity. No. 1, 1972.

European Communities Official Journal, Issues No. L 118/1 of 20-5-1972 (contains regulation No. 1035/72 on the common organization of the market in fruit and vegetables) and No. L 73/1, 21-3-1977 (contains regulation No. 516/77 on the common organization of the market in products processed from fruit and vegetables).

Food and Agriculture Organization of the United Nations. Commodity Review and Outlook, 1979-1980. Rome, 1979.

Goldstein, M., and M. S. Khan. "The Supply and Demand for Exports: A Simultaneous Approach." Review of Economics and Statistics. 60(1978): 275-286

Grennes, T., P. R. Johnson, and M. Thursby. "The Economics of World Grain Trade." New York: Frederick A. Praeger, Inc., 1978.

Hanoch, G. "CRESH Production Functions." Econometrica. 39(1971).

Hickman, B. G. "A General Linear Model of World Trade." The International Linkage of National Economic Models, ed. R. J. Ball. New York: North-Holland Publishing Co., 1973.

Hickman, B. G., and L. J. Lau. "Elasticities of Substitution and Export Demands in a World Trade Model." European Economic Review. 4(1973): 347-380.

Hinton, W. L. "Implications for the Trade in Fruit and Vegetables in an Enlarged European Community." Mimeographed. Cambridge, England: University of Cambridge, 1978.

Hörmann, D. M. "Considerations on the Effects of the EEC Enlargement for the Common Market Policy for Fruit and Vegetables." Paper presented at the 5th International Symposium on Horticultrual Economics, Budapest, Hungary, 5-7 Sept. 1977.

Houthakker, H. S., and S. P. Magee. "Income and Price Elasticities in World Trade," Review of Economics and Statistics. 51(1969):111-125.

Hunt, R. D. "Fruit and Vegetable Exports from the Mediterranean Area to the EEC." World Bank Staff Working Paper No. 321, 1979.

Kost, W. E. "International Macroeconomic Forecast Summary." Mimeographed. U. S. Department of Agriculture, ESS, May, 1980.

Mackintosh, M. "Fruit and Vegetables as an International Commodity." Food Policy. 2(1977):277-292.

Resnick, S. A., and E. M. Truman. "An Empirical Examination of Bilateral Trade in Western Europe." European Economic Integration, ed. B. Balassa. Amsterdam: North-Holland Publishing Company, 1975.

Sarris, A. H. "Geographical Substitution Possibilities in the European Economic Community's Imports of Fruit and Vegetable Products in View of the Next Enlargement." Giannini Foundation Working Paper No. 118, University of California, Berkeley, June, 1980.

_____. "World Trade in Fruit and Vegetable Products with a European Community of Twelve Countries." Mimeographed. Department of Agricultural and Resource Economics, University of California, Berkeley, April, 1981.

Sampson, G. P., and A. J. Yeats. "An Evaluation of the Common Agricultural Policy as a Barrier Facing Agricultural Exports to the European Economic Community." American Journal of Agricultural Economics. 59(1977): 99-106.

Stern, R. M., J. Francis, and B. Schumacher. Price Elasticities in International Trade: An Annotated Bibliography. London, Trade Policy Research Center, 1979.