QUANTITATIVE STUDY OF THE EFFECTS OF THE EUROPEAN COMMUNITY ENLARGEMENT ON THE PROCESSED TOMATOES MARKET. PARTICULAR REFERENCE TO THE CASE OF THE PORTUGUESE SECTOR

Doctoral Dissertation

by

Maria Teresa de Noronha Vaz

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UNIVERSIDADE DO ALGARVE

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Maria Teresa de Noronha Vaz

Dissertação apresentada na Universidade do Algarve para a obtenção do grau de Doutor em Ciências Económicas (Economia)

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IN MEMORY OF MY PARENTS

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I am grateful to my husband, Winchil, for having taught me the persistence necessary for this work and for finding the time to help me in the translations of this text. I appreciate the patience of my son Erich who supported many of my moments of intolerance.

The collaboration of colleagues and friends allowed the exchange of ideas and many fruitful discussions. To all of them I am thankful, but I want to mention in particularly the following names: Doctor H.-C. Behr, for his help in the use of the model; Doctor H.-H. Jahn and Professor E.Schmitt for their advice; Engª Teresa Costa Neves and Paulo da Ponte for their support with data and graphics. An acknowledgement to my colleagues from the Unidade de Economia e Administração, particularly to Professor A. Pimpão, who amiably received me in the UEA and created good and agreeable working conditions.

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1. INTRODUCTION

AIMS OF THE WORK

It is well known that the enlargement of European Community by the integration of Portugal and Spain raised concerns not only with respect to the impact that an extended Common Agricultural Policy (CAP) had on international markets of different commodities but also on the fact that the European Market achieves surpluses in certain commodities whose production has a strong financial support from the CAP. Production of processed tomatoes is one of the typical examples of such a situation. In this case, both Portugal and Spain have a significant position in the world trade of tomato processed products but at the same time other countries like Italy and Greece almost achieve levels of self sufficiency for the European Markets.

Since these two recently integrated countries had different trade policies for the products under consideration prior to adhesion to the EC, different medium term reactions to the application of the CAP are expected.

We intend to simulate, in so far as possible, the situation described above in a Multi-Country Equilibrium Simulation Model, so we shall be working with different processed products (concentrate and peeled) on a static basis. This will allow us to have, for the sector, a quantitative method of calculating variations in supply and demand quantities as well as expected

prices for the different countries considered in the model projections. This presupposing, of course, changes of subsidies, minimum grower prices and quotas. The use of such an analytical criterion allows a judgement based on the quantitative impact of the parameters, thereby being more reality-near than the usual descriptive analyses.

The important role that the tomato production sector has for agriculture in Portugal stimulates the study of the consequences of the "model-expected" new equilibrium prices and quantities on farmer's and regional incomes. Also here, whenever the available portuguese data permits it, the use of a quantitative method will be attempted.

The main aim of this study is, therefore, to apply model simulations to available data of the processed-tomato industry and detect the international market changes as well as possible consequent income instabilities in Portugal.

DESCRIPTIVE PLAN OF THE WORK

The tomato processing industry was chosen as an interesting sector where the CAP and its instruments have been able to strongly promote production and trade.

Two distinct sections will be carried out in this work. The first section will involve a detailed study of the international market of processed

tomatoes. We intend to characterise and describe the international trade in this sector over the last ten years and to carry out a theoretical economical analyses of the three fundamental decisions of the CAP that may have an effect on this trade: production subsidies, production quotas, variations in producer prices.

So, our main interest is to select a simulation model, based on an equilibrium situation between supply and demand, able to reproduce this market situation, create plausible scenarios and use them for projections. Such methodology will involve procedures related to the choice of parameters and simulative modelling, development of an appropriate computer program and, in what concerns model projections, a study of the relationship between different possibilities of political decisions and consequent parameter variation.

As a result of the projections, we shall obtain new equilibrium quantities and prices that will allow us to describe future perspectives for international trade in the commodity considered and also provide the values which will serve as a base for the second section.

The second section will be restricted to a study of the portuguese sector. An overview of the productive and entrepreneurial structures, considering the labour productivity and its agrarian institutional context, as well as a detailed description of the financial supports for development of the tomato-processing industry in Portugal before 1986, will be presented. Here

we use a quantitative method which relates the equilibrium values obtained for Portugal in the first section, to national data in order to estimate socio-economical indicators such as farmer's and regional incomes and fluctuations of the trade balance. To conclude this part we would like to consider, on an empirical basis, the inclusion of "non-observable" variables that may alter the results obtained.

The research done to obtain reliable data supplied much more information than being directly used for the two blocks described above. Since such information and data could eventually be useful for other studies, or would consist in a support to the contents of this work, it has been compiled and annexed in the form of appendices.

2. THE COMMON AGRICULTURAL POLICY: MARKET REGULATIONS AND STRUCTURAL SUPPORTS.

2.1. GENERICAL GOALS OF THE CAP, POLICES AND RESULTS.

In the early 1980's when the economic policies of the U.S.A. and Europe took different directions and Japan increased its importance in the world markets, a growing market imbalance became the focus of the present economic problems. The USA had followed a line of tight monetary control and expansionary fiscal policy. Europe, on the contrary, decided to develop liberalisation in the industrial and services sectors. However, contrary to these sectors in the world markets, protectionism of agricultural commodities had intensified, increasing the distortions of the trade patterns.

Reasons for the distinct development of market regulations in this sector have been analysed (see Kruger, 1983) and may be considered to be the result of conditions created for most european countries by the second world war. Among the more important reasons we can consider the following:

1) High european dependence on food crops from the U.S.A., Australia, Canada, New Zealand and Argentina.

2) Devastation of rural areas, socially justifying the support to the farm sector.

In addition to this the post-war agricultural policy of the other countries, notably that of the USA, has accentuated the imbalance:

1) The changing monetary policy and consequent variation of exchange rate tended to reduce U.S.A. exports and incentivate productions in other countries (Moyer and Josling, 1990).

2) The inefficiency of the domestic policy of the U.S.A. also contributed substantially to the problem. Kramer (1986) has analysed most of the commodity programs that have been developed in the U.S.A. with criticisms based on the fact that they were attracting resources into production of unprofitable commodities or even that this kind of programs have focus on price rather then on income risk.

Bullock (1984) summarises the structural characteristics of the U.S. agriculture criticising the use of agricultural price support programs with arguments based on the fact that during the 1980-1982 period, farms with annual gross sales in excess of U.S. $500,000- were producing about 60% of the US annual net farm income represented only about 1% of the total farms, while 72% of the rest of the farms produced only about 13% and were operating on average, at a loss.

3) The developing countries instead of creating a solid rural basis, using the comparative advantages that they had for the agricultural sector, tried to follow and give support to a quick growth settled on the usual industrialisation process. Such an option contributed to the degree of imbalance in these countries and probably made them to lose, for many years, the possibility of competition in both agricultural and industrial sectors.

Indeed the CAP of the EC, has been having major effects on the world agriculture but its main impact in the domestic production came after the weakening of the US$ when subsidies to support prices had to increase in Europe to keep its export level in the world markets.

As a consequence the budgetary weight represented by agriculture as well as the increasing surpluses in production of agricultural commodities, became the main concerns of european policy makers. This first problem, characterised as the asymmetry of the european budget is illustrated with the fact that 70% of its expenses are being used in agricultural policy and 30% in the area of social, regional and development policies. Yet, the complex social implications of a protected agricultural system have to be considered.

Since income is self-sustained and no credits are allowed to cover debts in the E.C., the use of the budgetary revenues is being directed mainly to the agrarian sector. Understanding such a situation from its globality we should keep in mind that wastes in the utilisation of comparative advantages are taking place more than ever. While the developed countries restrict their budget in supports for the industrial sector, where they generally have such advantages, they are simultaneously taking away the opportunities of the developing countries to improve their agricultural sector, due to the deterioration of the trade conditions that such policies promote (Spahn, 1987).

Another major problem is the permanent dependence of the success of CAP decisions upon the monetary policy of the USA. In this case particularly, the agricultural sector is very sensitive to variations of real exchange rates. Such can be considered a strong restriction to the development of an effectively protected agricultural policy.

New efforts are required from almost all concerned entities to solve the present problems. The common opinion is that the present world market system based essentially on regulations such as the CAP in Europe, tax regulations in the USA or Preferential Trade Agreements practised by other countries sets a framework for agriculture that is no longer transparent to the simple rules of demand and supply. Whether such efforts should be based only upon an institutional change or whether they should require an entirely new definition and concept of the market rules (Weinschenk, 1985), is still in discussion. The hypotheses that the agriculture policy definitions of the EC are very influenced by its unique institutional structure supports the former case (Runge and Witzke, 1987).

Considering the problems referred to above, the analysis of the difficulties involved in achieving world trade liberation seems opportune. Such an approach was brought up by Schmitz (1988) who use the Compensation and the Pareto principles to analyse the rule of special interest groups in the GATT. In this study the EC plays a most important part and only a dynamic analysis based on the Compensation Principle gives the theoretical support to freer trade. However, as from any policy change, also

in this case there are losers notably small producers who may not be able to cover costs at free trade prices and therefore will require compensative amounts to moderate their income losses and prevent regional or social instabilities.

2.1.1. PRICE POLICY IN THE EC AND THE STABILITY OF THE WORLD MARKETS

The present situation in the world markets shows that the European Community has become one of the most important trade partners and as such its stability will influence the conditions for the international trade of agrarian products and correlated industries.

The levels of agrarian prices practised in the EC are higher then the ones existent for the rest of the world.

A liberalisation of the international trade in agricultural products will possibly decrease prices creating lower production and higher demand. This will promote imports, a situation that sooner or later will lead to the increase of the world prices. Therefore, a knowledge of the amount of the resulting changes in production is of interest for each country, although a clear prediction is improbable. Predictive models, in order to have applicability, require that the degree of confidence existent in the chosen elasticities be high, which imposes a very restrictive condition. As such, it is not surprising that the arguments of the different countries towards the change in the

european agricultural policy, are difficult to justify in quantitative terms and reflect only the different expectations relative to the perspective of different trade patterns.

Koester (1985) selected basically three characteristics that would define the expected relations:

1) Those who are exporters of the most agricultural products would be happy to deal with an expanded market at higher prices - it would be the case of the USA.

2) Countries whose imports would stay at the same level independent of the reduced competitivity in the EC would be negatively influenced. They would have to bear the higher prices without reaching the positive result in the trade balance. Especially the developing countries would be in this group.

3) Some net importer countries could be able to surmount difficulties if the increase in prices could allow them to be exporters at least in some commodities.

Indeed, it is difficult to judge whether or not the CAP contributes to the price stabilisation of agricultural products. The conditionants for it are a complex system of supply, demand and stock variations. Hinton (1991) describes the situation as follows: If it is considered that due to CAP prices are kept higher inside Europe then in the rest of the world, it is to be expect that Europe will, as a consequence, develop the conditions to produce more whereas the rest of the world will develop the conditions to produce less.

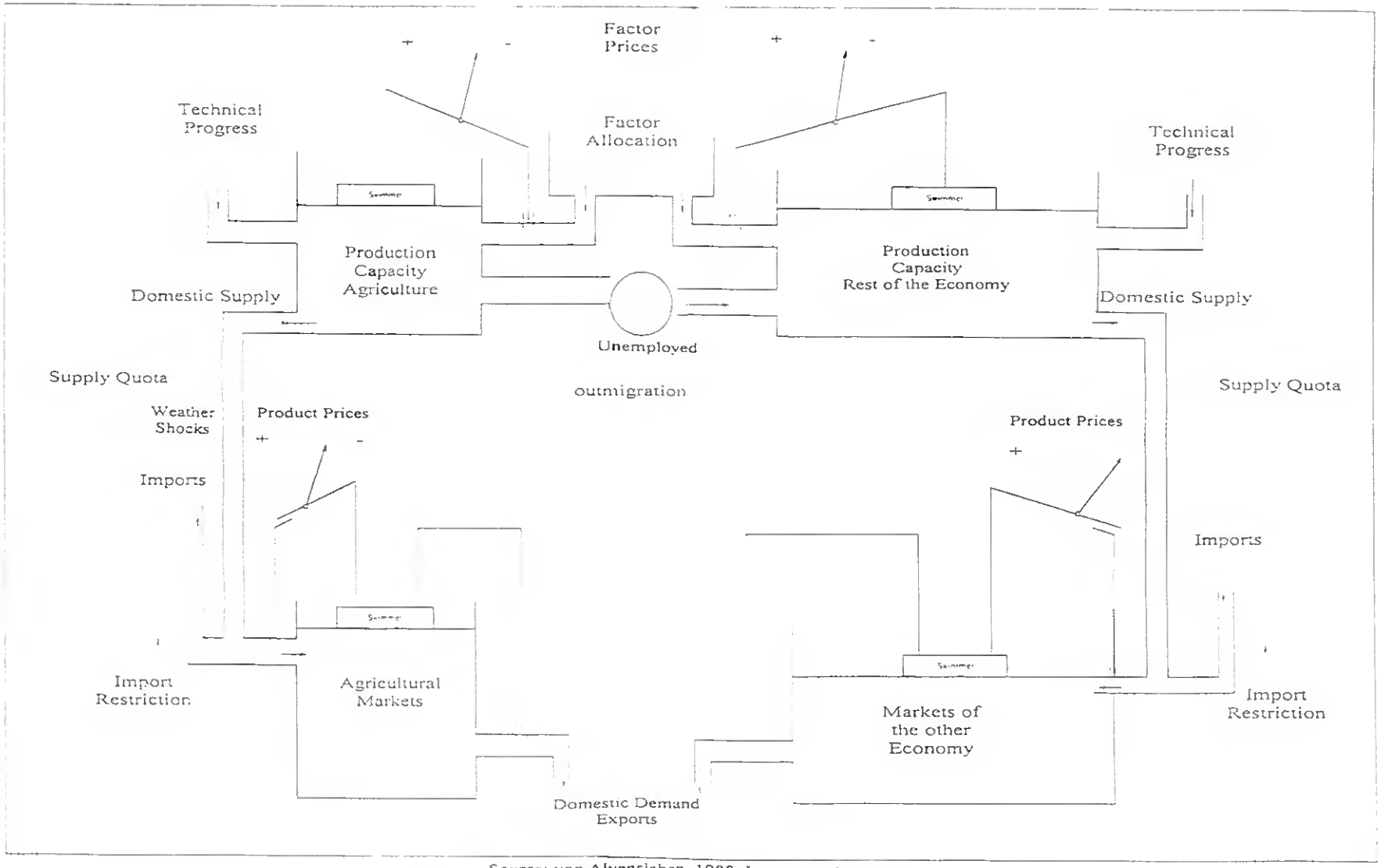
Changes in production amounts (or in the elasticities of supply and demand), however, are not the essential reasons for changes in the world prices. These are much more the consequence of stockage of the products. The exporters receive a differential correspondent to the difference between the price used in the internal market and that of the rest of the world. Thus their advantage is to keep their stocks constants. The CAP decisions stipulate the stock variations and the pressures on the world markets are essentially a consequence of these.

We have seen the consequences for the agricultural sector from different price policies. However, we should not forget the complex world in which this price and other market policies are taking place.

Alvensleben (1988) compared a two sectors model of the economy with a system of water basins with self regulation and explained the causes of structural change in agriculture as well as the effect that different market policies had upon this system. The Figure 2.1 shows how agriculture and the rest of the economy are interrelated particularly in certain areas as for instance, resource allocation, unemployment and domestic demand.

Figure 2.1

Comparison of a Two-Sector-Model fo the Economy with a System of Water Basins



Source: von Alvensleben, 1988, Lecture on the Seminar "EEC Agricultural Markets and Policy - Problems and Tendencies in the Community of the Twelves", Evora

2.1.2. PRICE FORMATION AND THE COMMON AGRICULTURAL POLICY

Price formation in the internal market, is seen as an instrument to achieve objectives of trade and agricultural policy through its function as a regulator of incomes and safeguard of consumer preferences. The mechanism leading from price formation to income regulation or consumer protection is based in price fixing and income supports but it is in many ways restricted, by the interrelation between supply and demand.

Price formation in the CAP is known to be a very complex mechanism resulting from international prices and internal prices, the latter stipulated at a level able to guarantee production to farmers. The fixing of such agricultural prices is made in ECU's and these have to be reconverted in national currencies using both the green rate or the compensation amounts as additional regulators.

The list of instruments affecting supply may be grouped as follows: 1) Subsidies, favourable credit conditions and minimal price guarantees are instruments causing direct expansion in production; 2) Other instruments like import restrictions, export subsidies and processing supports, have as immediate effect, rise in prices and incomes. In such a case, contraction in the demand is possible and this may eventually affect supply in a restrictive way; 3) Indirect influences, such as investments, supports, research,

education, and improvement of advisory services, may also develop supply but with a medium or long term effect.

If we consider the achievement of increases in agricultural incomes, directly through higher minimal producer prices, we have to expect that the consequent increases in supply would promote the possibilities of price decreases and new income reductions. Besides, it should be considered that while price mechanisms are quick procedures, the policy making process is slow, particularly in horticulture.

As such, price formation is a very risky regulator of incomes if one of the assumptions of the agricultural policy is to develop together with an income policy. In this case the combination of an intervention price and price compensation to the farmers, serves to regulate the risk.

2.1.3. THE CAP AND THE INTEGRATION OF PORTUGAL AND SPAIN

The influences of the integration of Portugal and Spain in the EC upon the international markets are related with the formation or enlargement of any customs union on trade flows. As trade barriers disappear lower cost imports substitute some high cost domestic production, causing a consequent new order in the production processes and consequently eventual demand expansion due to price decreases - the so called trade creation effect.

This has been the concern of several authors who have been trying since the 1980's to determine losses and gains resulting from the integration of Portugal and Spain in the EC, using mainly analyses of trade flows. Some attempts to derive conclusions from aggregated studies have been undertaken (Sawer, 1984; Donges et al., 1982). Other authors have concentrated the analyses on specific sub-sectors (Tangermann et al., 1986) or specific products (von Alvensleben et al., 1986).

A recent econometric model of bilateral trade flows (Plummer, 1991) calculates "changes in allocative efficiency stemming from the expansion of the EC". The study considers trade creation and trade diversion for two conceptually distinct phases of integration. The first phase considers the incremental effects of the accession as a result of the disappearance of bilateral tariffs and the second measures the total change in allocative efficiency due to preferential association between the EC and recently integrated countries, (see Table 2.1.1).

The sector of fruits and vegetables represents 13,7% of the EC(12) agricultural output. The contribution of such products for this output is illustrated in Table 2.1.2. In this area Spain is a major exporter of citrus, tomatoes, strawberries and onions (Hinton, 1991). The sector is organised, as in most of the other Mediterranean countries, relying on low costs of production and not having to face tariffs or other import controls. It may well happen that in the competition process Spain pushes the products of non EC countries out of the european market. Table 2.1.3, representing the

evolution of exports of horticultural products in Europe, can support this statement. However, the degree of competitiveness of the country with the northern European countries like the Netherlands or Germany, is not such an easy issue.

Much in this "competitive race" depends on the determinant technological factor. The use of new technologies presupposes a transition of a traditional production system to an industrial one, permitting a continuous adaptation of the agricultural activity to the market conditions in order to achieve optimisation levels. Such does not allow the survival of many traditional production systems of the mediterranean areas (Ramos Real, 1991) so that the potential competitiveness becomes dependent on both the social context and the speed at which the transition is possible.

Portugal on the contrary having a very problematic agricultural sector with a very deficient marketing structure presents very few productions with dimensions to compete in the european market. Tomato production for paste was for a long time one of these products and therefore our interest in studying the recent changes occurring in the sector.

TABLE 2.1.1.

Estimates of Net Trade Creation (1984 Prices)

Commodities	Spain	Portugal	EC10
Meat	-2.2	-0.3	-97.4
Dairy Products	9.2	0.4	-88.8
Cereals	-65.2	-35.3	-146.5
Sugar	5.8	22.8	-899.2
Tobacco	-135.7	-7.2	-132.1
Leather Products	-3.6	0.2	-12.9
Rubber	9.2	2.5	-25.8
Textiles	13.0	1.0	-171.9
Paper Products	-9.9	-4.4	-690.0
Iron & Steel	-1.8	12.9	-719.7
Total Agriculture	-188.0	-19.6	-1328.1
Total Manufacture	7.0	12.2	-1620.3
Total	-181.0	-7.4	-2948.4

Source: C. Plummer (1991) "Efficiency effects of the accession of Spain and Portugal to the EC".

TABLE 2.1.2.

Iberian Participation in EC Vegetable and Fruit Production by Areas and Quantities (%, 1987)

Products	Area	Production
All Brassicas	36.00	37.02
Vegetables - Leafed or Stalked	24.48	23.29
Tomatoes for Fresh and Process	31.20	27.70
Other Annual Cultivated Fruit	47.75	38.77
Roots and Tubers	33.99	26.02
Pulses	18.02	24.18
Apples and Pears	28.40	15.93
Grapes for Table	28.72	19.23
Stone Fruit	24.63	19.11
Citrus Fruit	54.84	59.82
Berries and Kiwis	22.00	23.08
Other Fruit	78.41	85.00

Source: L. Hinton (1991) "The European Market for Fruit and Vegetables".

TABLE 2.1.3

Evolution of Exports of Horticultural Products (1984 to 1989)

(1,000 U.S. dollars)

Northern European Countries	1984	1985	1986	1987	1988	1989	84/89
Belgium - Luxemburg	593	657	939	1,197	1,262	1,462	147%
Federal Republic of Germany	578	627	846	1,062	1,194	1,220	111%
The Netherlands	2,151	2,077	2,688	3,353	3,786	3,953	84%
United Kiungdom	254	264	368	492	396	460	80%
Southern European Countries							
France	1,209	1,276	1,624	2,120	2,269	2,335	93%
Spain	1,998	1,840	2,582	3,302	3,674	3,682	84%
Portugal	102	95	119	122	153	162	59%
Italy	2,043	2,226	2,631	3,101	3,232	3,209	57%
Greece	681	689	809	864	601	955	40%
Turkey	931	932	1,232	1,441	1,585	1,292	39%

Source: OECD

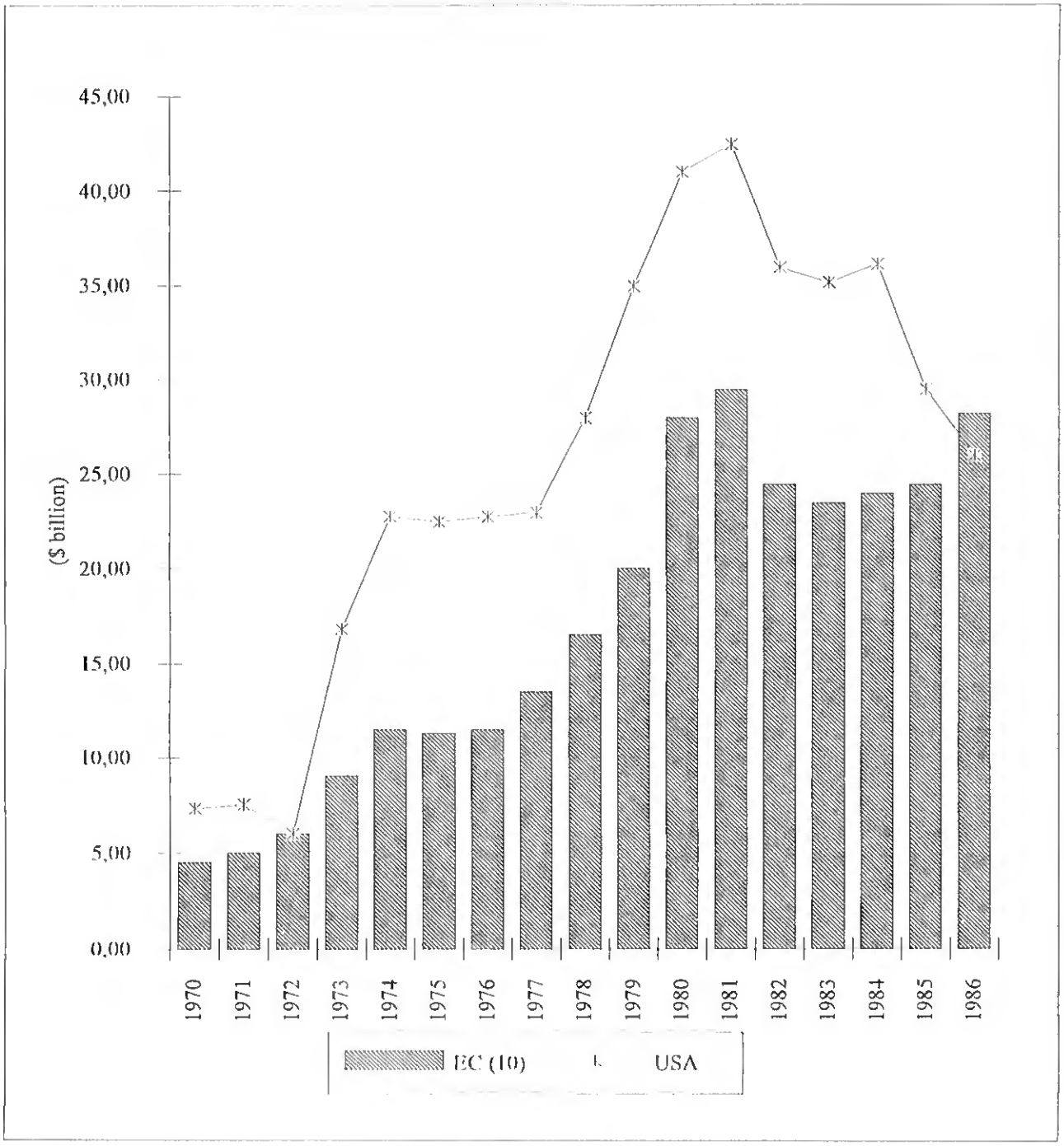
2.1.4. THE STRUCTURAL POLICY OF THE CAP

The market and the price policy of the EC, absorb about 90% of the CAP budget spent in avoiding production surpluses, controlling price pressures and subsidising some non-competitive sectors. The fact that only a small part of this budget is oriented to the structural policy has created serious additional difficulties for regions with disadvantages in the farm structure (Santos Varela, 1988).

The immediate results of the CAP allowed Europe, a traditional importer of agricultural products, to become not only self-sufficient but also to export successively more of its surpluses. The observation of Figure 2.2 shows a high increase in exports of agricultural products since the early 1970's followed by a slight decrease between 1980-1986. This accentuated tendency promoted decreases in the real agricultural prices.

The Memorandum of Siena, 1984, proposes that an equilibrium in the agricultural market could only be achieved if prices could decrease about 20%. The EC is in a situation of creating structural surpluses in cereals, milk, beef, sugar, wine, olive oil (for detailed values see Santos Varela, 1988). A reorganisation of the productive structure of the EC is consequently necessary but such a reorganisation must take into account the special case of countries like Portugal, whose agricultural structure does not have the characteristics referred to above.

Figure 2.2
Agricultural Exports of the USA and EC



Source: H.W. Moyer and T. Josling, 1990, in:
"Agricultural Policy Reform: Politics and Process in the EC and USA"

2.2 PERSPECTIVE FOR FUTURE POLICIES

The expansion of european agricultural activity during the past two decades was characterised especially by an increase in productive intensity, by regional and entrepreneurial specialisation of production and a consequent concentration of agricultural activity in ever smaller rural areas. This situation developed in a parallel and interrelated form with the problems referred to in the first part of this chapter. Thus, any alteration of the CAP cannot be undertaken exclusively on the basis of the problems of production surpluses and budgetary deficits but must also consider our increasing responsibility to the environment and the equilibrium of the ecosystems (de Haen, 1985). Changes based upon consumer preferences and tastes with a tendency towards improved quality, are evidently also of fundamental importance in this process.

Logical suggestions for future agrarian policies should then tend to encourage extensive use of land resources without at the same time resorting to monocultures. Such encouragement would, however, create large regional discrepancies and because of market reasons would reduce the possibility of increases in farm incomes. These concepts reflect, by their nature, long term tendencies opposed to those that the market imposes and that will be considered to be of short term and are presented below:

If we consider agricultural activity in the U.S.A. which until 1985 suffered strong decreases in production, it may be expected that during the

decade of the 1990's recovery begins due to a combination of reduction in the value of the US dollar and application of low interest rates that permitted the farmers to survive situations of debt created during the 1970s and 1980s (Drabenstott and Barchema, 1990). On the other hand, GATT negotiations are determinant for the future market tendencies and the policy promoted by the US for a free trade in world markets is blocked by the EC and Japan who attempt to delay liberalisation since they fear the consequent results upon prices and farmers' incomes. The expected liberalisation of the sector will cause a reduction of world prices leading to a better use of comparative advantages, in some cases improving the situation of developing countries but also creating strong changes in European farmer incomes. According to projections presented by Schmidt (1988), it is to be expected that these market considerations and long term tendencies referred to above lead to the development of some agricultural productions as described in Table 2.2.1.

TABLE 2.2.1.

Projections for Areas and Productions of Some Agricultural Products (EC 12)

Products	Areas	Production	Area	Production
	1981	1985	1995	1995
Cereals	36226	150281	30100	160400
Sugar	2034	13730	1500	12000
Oil Seeds	3248	6131	6000	16000
Nuts	1402	2469	2300	6900
Total	42910	172611	39900	195300

Source: Schmidt (1988)

As far as developing countries are concerned, arguments relative to imports as well as exports of these countries have to be considered. Particularly in such countries imports in food products are very dependent on EC price policies, US technology and East block price variations, so that positive effects from trade are directly linked with trade liberalisation in the developed countries. The risk of increases in their food costs and increases in external dependence in the sector is very high if "prudent actions to search cost reducing technology change are not taken in the future" (Schuh, 1983). This means that for such countries, economical development would have a more effective basis if settled on the expansion of their agricultural markets, than if the only expectation is to profit from the downward trend of the world prices. Specially with respect to fruits and vegetables the opportunities in the future for those countries are related to the consumption of exotic agricultural products in case increases in exports is a goal to achieve.

Also, the more recent studies that argue against this kind of policy to defend diversification in the agricultural sector of their countries and define new targets are very important to be considered (Timmer, P., 1992). They suggest new strategies for the policy makers: first, the stability provided by a well-diversified and flexible agricultural economy; second, the process of diversifying a rural economy as a significant source of income for rural areas; and third, diversifying cropping patterns in order to achieve a more sustainable growth avoiding the dependence created by intensive cultivation of single crops.

3. PRODUCTION AND PROCESSING OF TOMATOES

The production of processed tomatoes has a characteristic common to the production of all processed products, i.e. from the producer to the consumer, the original product is worked up in different procedures and until being consumed is influenced by economic forces from three different areas: 1) The demand for food, 2) the structure of supply and 3) the competitiveness of the sector.

Connor et al., 1985, tried to survey the trends of these economic forces over the last decades for the food processing industry. It is expected that in the future, assuming that incomes increase, the consumption of processed foods will turn into a higher demand for frozen products. Consumer's preferences have moved in the last 15 years to fresh vegetables, this is attributed to the consumer's increasing concern about health. Processed vegetable in the USA grew very little (less then 1% a year) with the exception of tomatoes that have been more consumed due to the increasing use of ready made food (Vegetable Situation and Outlook Report, August, FRS, USDA, 1987).

The processing sector transforms the raw product in processed food, adding to it labour and capital. The market structures with its main determinants, supply and demand conditions, support the commercialisation of the final product. So evidently the tomato-processing industry is dynamically interacting with the farmer and consumers' sectors.

It is expanding to international dimensions and is facing therefore constrains of micro and macro policies. Archibald et al., 1985, illustrate the dimension of such a policy environment for the food processing industry.

Figure 3.2 shows the different phases and their interrelations up to the point of obtaining the final product for the tomato-processing industry. Indeed, only a specific analysis of each of these points would allow a conclusion regarding the capacity of each country to vary its production depending upon price incentives or other financial supports which may be applied to the products.

Our study dedicates more special attention to the influence that variations in minimum grower prices and subsidies to processors could have on variations in production and trade. The reason for this decision is the fact that these two factors have been the goal of large interventions by the EC in the last decade.

Eventually a market study on tomato processed products should extend itself to all the varieties of tomato derivatives: peeled, paste, concentrate, catsup, chilli sauce, pulp, puree and juice. This study will deal mainly with the products paste and peeled, sporadically giving some attention to other products. The reason is the difficulty to obtain time series data to work on quantitative procedures for products different from paste and peeled.

Because the intention of this chapter is to create a working basis for the quantitative analyses to be developed later, mainly three groups of questions will arise:

1. Production evolution in the different countries over the last decade (1980 - 1990).

2. Price and subsidy policies related to these products over the last five years.

3. An analyses of the development of trade relations as a consequence of the policies referred to above.

The great lack of statistical information did not allow us to obtain uniform and coherent data. This obliges us to accept the possible occurence of errors arising mainly from:

1) Use of different periods of time as it was the case for calendar and agricultural years.

2) Use of different sources of information like Italy and E.C.

3) Cases in which quantities of other kinds of analogous by-products are included in the available information without possibility of distinction (an example is the inclusion of "concentrate" under the heading "paste", in some cases without discrimination).

4) Different data series relative to short periods and of different origins, which have to be put together in order to get values for more extended periods (the case of some production values).

The data was grouped in countries of common economic characteristics for the processing of tomatoes. Thus the following groups

were created: EC (Greece, Italy and France); Spain and Portugal; United States of America; Other Mediterranean Countries (Israel, Turkey and Marroco); and Rest of the World.

FIGURE 3 1

PROCESSING OF TOMATOES: AGRICULTURE AND INDUSTRY

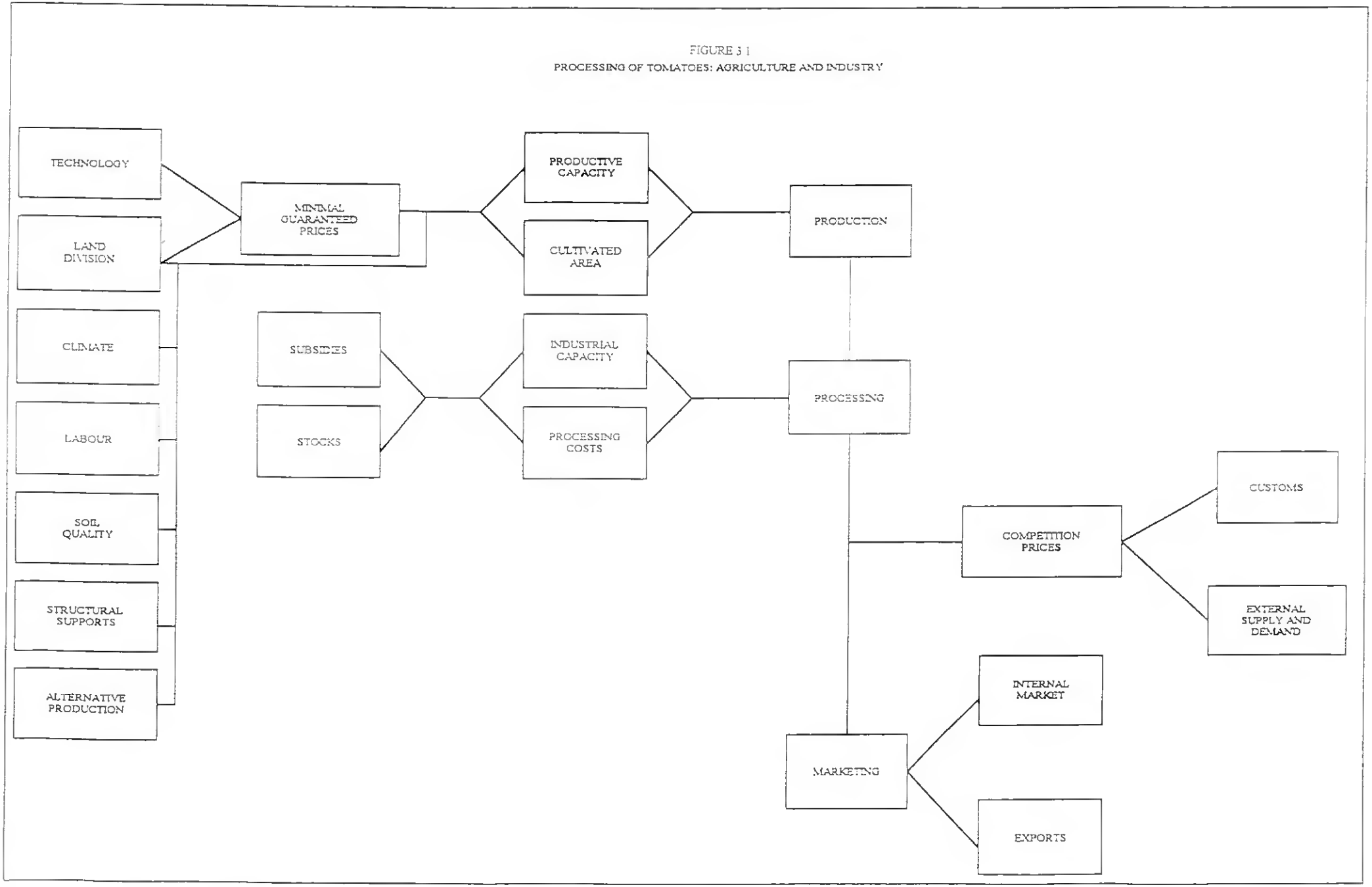
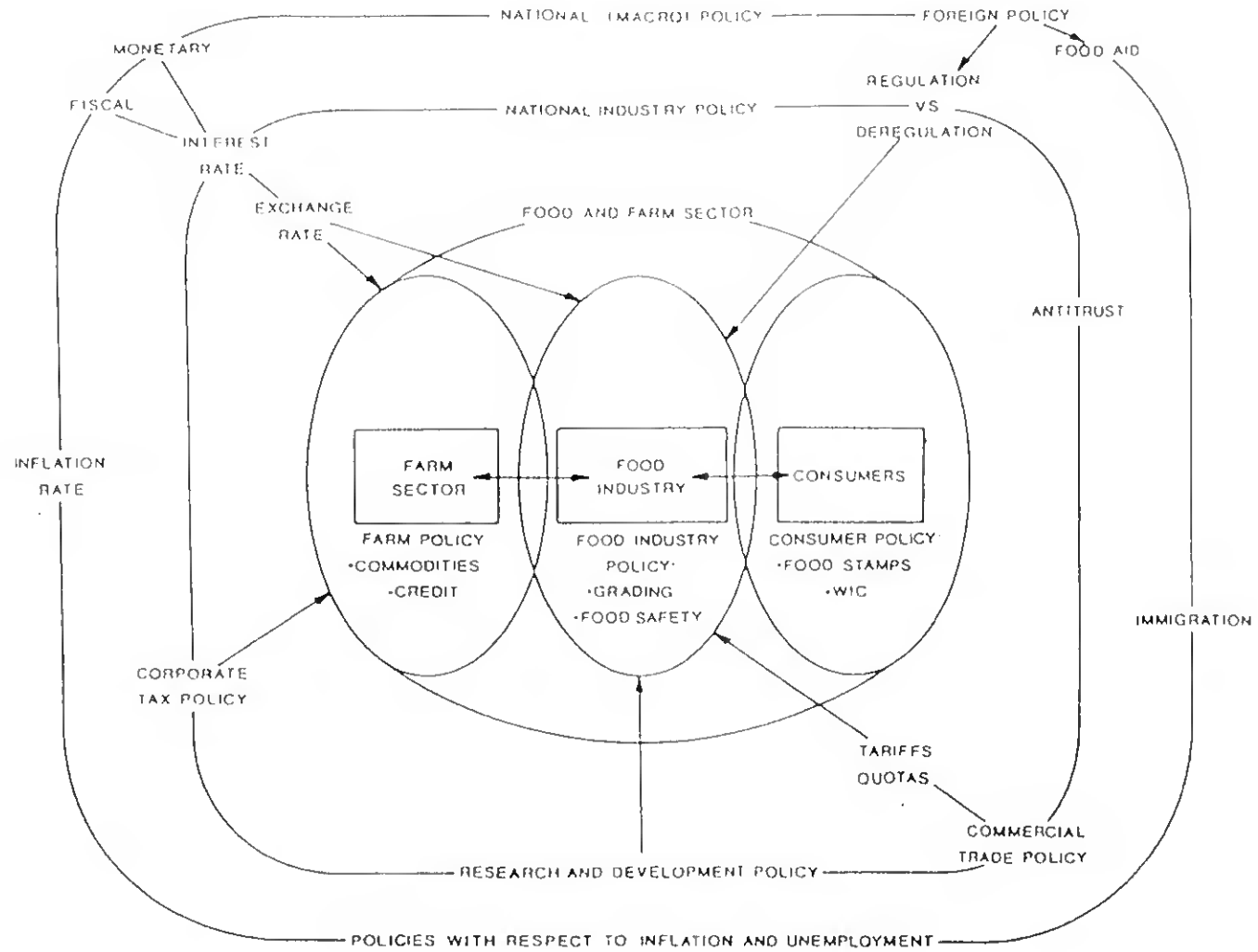


FIGURE 3.2

THE POLICY ENVIRONMENT FOR FOOD PROCESSING INDUSTRY



Source: Archibald, McCall and McCorkle, 1985

3.1 SITUATION ON INTERNATIONAL MARKETS: PRODUCTION AND CONSUMPTION

During the period 1980/1981 production dropped in almost all countries. This was the result of climatic conditions that especially affected countries in the mediterranean area.

In 1981 production continued to drop, threatening a difficult situation which the EC decided to combat by introducing specific measures to help increase production. A subsidy was guaranteed to tomato processors if they would agree to pay a certain minimum price to farmers. These subsidies evidently benefitted essentially the French and Italian producers since Greece was still not completely integrated at this stage in the EC.

In 1982, an increase in production of tomatoes for processing is noted in almost all countries with the exception of Italy that, due to climatic and management reasons was unable to benefit from an immediate effect of the measures applied in the preceding year. In the following two years, 1983 and 1984, production progressively increased, attaining the highest values recorded until then. The next two years were characterised by slight decreases in production, 1987 saw a dramatic change in the market for processed tomato products in the Mediterranean Basin, specially for paste (Foreign Crop Estimates Division, USDA). For a better appreciation of these variations Table 3.1.1 was made considering the most important producer countries. The total 1988 production of tomatoes for processing in

Table 3.1.1.

Production of Tomatoes for Processing (Units: 1.000 metric tons)

Country	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
USA	6649	5634	5186	6622	6377	6967	6511	6707	6895	6639	8200
Canada	416	380	451	490	383	500	480	490	500	520	1000
Mexico	200	220	170	180	190	240	250	300	393	300	400
Italy	3635	3083	3050	2800	4400	5000	3899	2917	2929	3100	3150
France	393	416	377	357	328	340	392	342	23	239	310
Greece	998	1500	1189	1193	1265	1570	1319	706	825	976	1156
Portugal	542	454	386	480	533	620	742	542	421	461	480
Spain	418	499	477	543	878	1080	746	473	571	713	781
Israel	122	166	181	240	295	270	251	196	186	177	150
Taiwan	365	491	274	378	370	na	277	276	225	262	200
Turkey	na	na	na	na	na	na	1100	700	760	900	1050

Sources: Revista do Agricultor, Jan./Fev., 1992

GLW der Kommission der EG, 1987; Foreign Crops Estimates Division, USDA, 1987; and

Food and Agriculture Service, USDA, February 1983; February 1985; July 1988;

Group de Travail des Politiques et des March_s Agricoles, OCDE (1991) "Situation and Perspectives of the Tomato Market in the OECD".

Note: For 1989 the values are estimated.

Table 3.1.2.

Cultivated Areas for Tomato for Processing (Units: 1.000 ha)

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
USA	155.5	125.0	140.3	119.7	130.2	108.2	103.6	119.5	118.2	118.
Canada	9.4	9.1	9.5	9.9	9.4	9.9	11.4	11.3	10.9	12.3
Mexico	4.0	3.4	5.0	5.0	5.5	4.5	5.5	5.0	6.0	5.5
Italy 1)	112.1	96.2	107.9	111.5	na	na	na	124.0	138.0	150.0
France	10.0	6.0	5.7	6.7	9.6	9.2	8.9	8.9	8.3	8.4
Greece	20.1	10.1	16.5	20.8	19.3	18.8	19.7	22.4	28.1	27.9
Portugal	23.5	17.5	21.5	21.3	19.3	18.4	14.0	17.5	20.0	22.0
Spain	26.0	15.4	20.0	19.7	14.6	14.0	15.9	22.3	23.0	28.2
Israel	4.5	3.3	3.9	4.9	na	na	na	4.9	6.2	5.7
Taiwan	4.6	2.2	2.4	2.4	na	na	na	5.3	7.7	8.5
Turkey	25.0	25.5	26.0	26.0	26.0	26.0	26.3	na	na	na

Sources: Foreign Crops Estimates Division, USDA, 1987; and Food and Agriculture Service, USDA, April 1979 ; July 1981; February 1985;

Note: 1) Includes fresh tomato areas

seven major producer countries of the mediterranean basin was about 8% more then in the previous year. Table 3.1.2, illustrate the repercussion of the local increase in production of tomatoes upon the percentage of areas dedicated to this culture.

The processing industry consumes almost all the produced tomatoes in paste and peeled. Figures 3.3 and 3.4, at the end of the chapter (54, 55, 56 and 57), show the development that these finished products had in different countries during the last 10 years.

At the moment it can be referred that the production of the USA is about 50% of the world's total. European production is mainly in the product concentrate for which Italy contributes with about 60%.

In EC the biggest consumers are England and Germany. Also in France, Holland, Canada and Japan as well as ex-URSS and Middle East the consumption is high.

3.2 PRICE AND SUBSIDIES POLICIES FOR THE SECTOR

As was already referred to in the second chapter of this work, the recent enlargement of the EC puts it into a very significant position in the world exports of agricultural products. Tomatoes for processing belong to the group of products that highly contribute to this position but they have been also heavily supported. To have an idea, from 1985 to 1986 this value had decreased from 835 million ECU's to 429.2 of which 250.4 were attributed to tomato processed products (EG Komission, 1987). On the other side the importance of the US as an exporter and the capacity of american production to compete at a medium term with production supported by governmental policies has been questioned (Schwartz, 1986).

The system to support production and processing is constituted both of internal regulations and customs protection. We will describe three types of instruments of the agricultural policy: prices, import controls and subsidies that were channelled to this sector during the period 1978 up to 1989:

Up to 1977 there were few incentives to production and trade in processed fruits. These had import levies stipulated on bases of sugar content as its only protection.

The introduction of a processing aid scheme appeared in 1978 and was applicable to tomato concentrate, peeled tomato and tomato juice. Subsidies to processors who contracted growers to produce at pre-defined

minimum prices, were introduced. Later there was an extension of the support system to frozen tomatoes and tomato flakes.

The basic regulation of the Common Market Organisation (CMO) to which processed tomatoes belong is the Reg. N°. 516/77 later modified by Reg. N°. 3454/80. These regulations serve many other products besides tomatoes: dried figs, sultanas, horticultural products prepared with or without sugar, fruit juices and other processed vegetables. They establish the trade regime, the production supports and the prices to be considered for all products. In this case the trade regulations allow the mechanism of compensatory amounts to be applied to these products in order to ensure the preference for the european products. The prices and production supports are interdependent . Financial support is given to the processors that on a contract basis will pay the growers a minimal pre-defined price. Such minimal price is stipulated considering both, the price level of the previous campaign and the evolution of the production costs of the sector. The subsidy paid to the processors is fixed so as to compensate the difference between the price level of these products being produced in the EC and the level of them coming from the world markets (Santos Varela, 1987).

In May 1979, Spain, France, Greece, Italy and Portugal set together to found AMITOM, an international mediterranean association for processed tomatoes. The objective was to stimulate the improvement of quality and the organisation of the market of such products (Miklichansky, 1980). But the costs of supporting increasing production obliged to the introduction of

quotas in 1982. A maximum of 4.7 million tons production of fresh tomatoes was allowed, of which 3 million were destined to concentrate and 1.3 to peeled.

Later, in 1984, more adjustments had to be made when the accession of Portugal and Spain into EC made a new competitive situation evident. There was a reduction on processing subsidies and a new basis for their calculation (net weight was used instead of gross weight). Also lower minimum grower prices and a definition of quality criteria were established. In the case of Greece a continuos increase of the Minimum Guarantee Price (MGP) is noted with small variations since 1984 for all products except crushed tomatoes. After 1987 all products are included in the communitary system.

For the next period, 1985/1986, the new limiting quotas were defined for each country. Italy was restricted to 3.8 million tons of raw tomatoes and Greece to 1.4 million tons eligible for subsidies. Table 3.2.1 reports the EC quotas for processed tomato products during the 1988/1989 season. The situation of Portugal and Spain is reduced basically to the area of concentrates and peeled. The level of practised MGP's, was still considerably low.

In the period from 1983 up to 1985, particularly in the case of concentrates, for EC(9) and for Greece gross decreases in subsidies are observed. Greece suffered during this period from more drastic measures

than did the other member countries. For crushed and concentrate products and after slight increases, the subsidies show a very attenuated decrease in 1987. Greece which since this year is totally integrated in the EC benefits from increases in all products.

TABLE 3.2.1.
EC Quotas for Processed Tomato Products
Raw Material Usage, 1989-1991

Countries	1989	1990	1991	1989-1991
Italy	1.655.000	1.655.000	1.655.000	0
Greece	967.000	967.000	967.000	0
France	298.622	278.691	278.691	-0.07
Spain	370.000	500.000	550.000	+0.49
Portugal	685.000	747.445	832.945	+0.22
EC12	3.975.622	4.148.636	4.283.636	+0.08

Source: Group de Travail des Politiques et des Marchés Agricoles (1991) "Situation and Perspectives of the Tomato Market in the OECD", OECD.

Also still in the area of processing subsidies, those attributed to Portugal and Spain were very much lower than those practised in other member countries. It must be noted that this large difference in the price and subsidy policy will disappear up to the year 1993 in which integration of these two countries will be completed. This levelling of supports suggests that either Portugal and Spain will benefit from the high increases in MGP's and subsidies, renewing record levels of european production, or the support system will have to be reduced to the other member states. For a complete illustration of these values, Table 3.2.2 and Table 3.2.3, supply the information on guarantee prices and subsidies in use up to 1989 and 1993 respectively.

TABLE 3.2.2.
Variations in Producer Prices (Units: ECU / m. tonne)

Country	Types	1981	1982	1983	1984	1985	1986	1987	1988	1989
EC9	1a	155.1	165.2	169.3	167.6	162.6	154.5	147.5	147.5	147.5
	1b	117.0	124.6	127.6	127.6	123.8	117.7	113.5	113.5	113.5
	2	97.1	103.1	105.6	105.5	102.4	94.7	89.1	89.1	89.1
	3	92.8	98.8	101.3	100.2	97.2	92.3	89.1	89.1	89.1
Greece	1a	110.6	125.8	137.1	143.5	147.0	147.1	147.5	147.5	147.5
	1b	78.4	90.7	100.0	107.0	110.5	111.3	113.5	113.5	113.5
	2	65.4	75.3	84.3	88.5	91.4	89.6	89.1	89.1	89.1
	3	61.0	70.6	78.1	83.0	86.1	87.1	89.1	89.1	89.1
Spain	1a	55.1	na	na	na	na	79.4	87.8	99.7	111.6
	3	na	na	na	na	na	53.6	57.9	64.2	70.4
Portugal	3	na	na	na	na	na	58.1	61.6	67.1	70.4
U.S.A.	ns	56.0	70.9	75.4	82.4	88.5	na	na	na	na
Israel	ns	na	85.5	na	na	na	74.5	66.1	na	na

Sources: L. Garoyan, K. Moulton (1987) "The Processing Tomato Indiustry in Greece", University of California, Berkeley.
USDA Horticulture and Tropical Products Division. FAS, September 1985, August 1986, July 1988. and August 1989.

Note: Types: 1a = Peeled S. Marz.; 1b = Peeled Roma: 2 = Crushed; 3 = Concentrate; na = Data not available; ns = Not Specified.

TABLE 3.2.3.
Variations in Subsidies (Units: ECU / m. tonne)

Country	Types	1985	1986	1987	1988	1989	1990	1991	1992	1993
EC9	1a	124,1	117,5	115,8	116,7	114,4	na	na	na	na
	1b	90,8	86,4	82,3	83,2	80,7	na	na	na	na
	2	47,9	38,9	37,0	na	na	na	na	na	na
	3	270,0	282,6	297,3	326,9	317,2	317,7	312,6	309,8	292,9
Greece	1a	83,1	87,3	115,8	na	na	na	na	na	na
	1b	63,2	68,1	82,3	na	na	na	na	na	na
	2	33,2	30,7	37,0	na	na	na	na	na	na
	3	338,8	259,8	297,3	326,9	317,2	317,2	242,9	275,0	292,9
Spain	1a	na	39,2	35,7	52,6	68,3	na	na	na	na
	3	na	157,3	172,7	179,6	207,8	207,8	242,9	275,0	292,9
Portugal	3	(64,5)	184,3	194,4	196,8	220,1	220,1	251,2	279,1	292,9

Sources: USDA Horticulture and Tropical Products Division, FAS, September 1985, August 1986, July 1988, and August 1989.
Eng. T. Costa Neves, INGA, Lisboa (1992) Personal Communication.

Note: Types: 1a = Peeled S. Marz.; 1b = Peeled Roma; 2 = Crushed; 3 = Concentrate
na = Data not available.

3.3. TRADE FLOWS AS A RESULT OF POLITICAL MARKET REGULATIONS

From an analyses of the evolution of the export values of tomato paste and peeled tomatoes, presented in Tables 3.3.1 and 3.3.2 we conclude the following:

1) A growing increase in the total values of world exports, except for the years 1983-1985.

2) Portugal and Spain show an accentuated tendency to export increases.

3) The US have an interesting situation due to the decrease in exports of paste.

4) The exports of Taiwan show the greatest expansion rate, having almost doubled in the period between 1981 and 1986.

5) Large increases in the total value of exports of peeled tomatoes, particularly notable in the european exports.

6) Since 1983 existence of new levels of exports of peeled tomatoes in Spain, Taiwan and Other Mediterranean Countries.

We have tried to analyse the significance of exports of tomato paste in the total production of tomatoes for processing. The ratio Export/ Production indicated in Table 3.3.3 represents such variations.

The ratio shows an evolution characterised by a slope after 1985, a period in which production did not increase so spectacularly but exports of paste kept on finding markets. In 1989 this tendency stopped.

Italy is by far the first producer of the EC. It is followed by Greece, Spain and Portugal. Therefore we consider that it would be interesting to calculate the evolution of the same ratio just for Italy.

In our opinion, the influence of the accession of Portugal and Spain on the trade in processed tomatoes plays a most important role in this work. The fact that the EC is the world leader in the market of processed tomatoes and that the levels of participation of Portugal and Spain in this market are also very high, makes it difficult to forecast the long term influence that the extension of the communitary regulations to these two countries will have on the trade of these products.

TABLE 3.3.1.
Exports of Tomato Paste (1,000 metric tonnes)

Country	1982	1983	1984	1985	1986	1987	1988	1989
EC10	150,1	211,4	202,0	168,4	209,9	361,9	474,7	401.0
Port & Sp	89,3	61.7	52,5	74,2	96,5	141.2	132,0	141.0
U.S.A.	12.0	11.6	3,2	2,8	2,7	na	na	na
OMC	17.6	20.4	30,1	26,4	24,3	na	na	na
Taiwan	21.6	42.3	42,8	57,8	41,0	33.4	30,0	29.9

Source: USDA Horticulture and Tropical Products Division, FAS, February 1982; June 1988.
NIMEX
External Trade Statistics for Portugal, France and Italy.

TABLE 3.3.2.
Exports of Peeled Tomatoes (1,000 metric tonnes)

Country	1982	1983	1984	1985	1986	1987	1988	1989
EC10	401,5	412.4	374,7	396,2	479,3	453.6	489,7	503.8
Port & Sp	12,3	46.3	73,9	82,8	69,5	48.7	52,0	60.0
U.S.A.	na	na	na	na	na	na	na	na
OMC	na	na	na	na	na	na	na	na
Taiwan	2,3	6.1	9,9	18,7	11,8	6,8	7,0	6.1

Source: USDA Horticulture and Tropical Products Division, FAS, February 1982; June 1988.
NIMEX
External Trade Statistics for Portugal, France and Italy.

Table 3.3.3

Variations in Contribution of Exports in the Total Production of Tomatoes

(EC, 1982 to 1989)

	Production (1000 mt)	Exports of Paste (1000 mt)	Exp / Prod. Ratio
1982	5,373	290.6	0.05
1983	7,404	347.4	0.05
1984	8,610	330.6	0.04
1985	7,098	329.6	0.05
1986	4.980	374.4	0.08
1987	4,769	536.5	0.11
1988	5,489	636.7	0.12
1989	5,877	571.9	0.10

(Italy, 1983 to 1990)

	Production (1000 mt)	Exports of Paste (1000 mt)	Exp / Prod. Ratio
1983	2,282	252.0	0.11
1984	3,092	274.5	0.09
1985	2,111	306.4	0.15
1986	1,502	267.0	0.18
1987	1,555	244.0	0.16
1988	1,567	249.1	0.16
1989	2,063	270.1	0.13
1990	1,842	263.1	0.14

Source: Own calculations based on data from MICOFEL, C.F.C.E., Bulletin mensuelle, 12/92

In principle it is not to be expected that the situation that occurred after the accession of Greece will repeat itself in the case of Portugal or Spain, since the starting positions with respect to the MGP's and subsidies now offered are very different from those of the early 1980's. The attitudes of agricultural policies, at that time directed to improving production levels in the southern regions, are now primarily oriented by the necessity of avoiding creation of surpluses. On the other hand, if we consider the export levels, the Spanish fraction of the market being similar to that of Greece for paste and much superior for the peeled product, we have to recognise that Spain is in a much more advantageous position to benefit from the price and subsidy policy. In these countries a combination of factors not only related to the possible external supports, will be determinant in the establishment of output variations and possible trade conflicts in the enlarged community.

These factors are: 1) Incidence upon external trade: a) Disappearance of export subsidies after 1986 (Spain); b) Application, since 1986, of the Common Customs Tariffs (CCT's) which impose advalorem duties on imports from third countries (Schwarz, 1987) restricting import of products from non-EC countries; c) Elimination of custom barriers within the EC (for Spain from 1993, for Portugal since 1990). 2) Incidence upon internal production: a) Application of MGP's initially substantially below that for the rest of the EC countries, becoming equal to these in 1993; b) Varying processing subsidies; c) Application of production quotas during the first four years of membership: Spain, 667000 and Portugal, 694137 m.tons of tomatoes for processing.

3.4. COMPETITIVENESS AND CONSTRAINTS IN THE WORLD FOR THE TOMATO PROCESSING INDUSTRY

It is not our intention to present here an international market study, since that work has been carefully developed by K. Moulton and we would not do any better then to repeat and resume his research in the area. However for the purpose of convenience and based on data obtained mostly in his work we have prepared Appendix 3.4 in which the information relative to production structure of the tomato processing sector for different countries may be found.

We have observed that mainly the mechanisation level and the production costs are very distinct from country to country and that problems and constraints are related in one form or the other with each of their structures.

We have seen that production in Italy, the leading producer in Europe, can not adjust easily to high mechanisation levels due to size of the farms. The fact that farmers will benefit from profits only if production reaches the level of 700 kg/ha which at the moment is 550 kg/ha (Silvestri and Siviero, 1986) and the barrier caused by farm size obliges the country to face progressively more rentability problems.

Tomatoes for processing is still a first choice alternative for farmers in countries like Taiwan or Turkey. In Turkey there is an optimistic outlook in

spite of two major problems: the first is the subsidies system that supports other alternative crops to tomatoes as sunflower and wheat (see Buelbuel, 1988) and the second, and more important, is the very high cost of financing the industry.

In 1988, considering an inflation rate of about 60%, the interest rate for loans for commercial purposes was as high as 100%, making investments practically prohibitive so that only those firms belonging to holding companies that had their own access to capital (USDA, FAS, July 1987) were able to surmount such a financial crisis. Nevertheless expansion is expected, accentuating a concentration tendency of the processing industry to grow fewer and more powerful firms.

Due to currency devaluations and inflation, Israel runs risk of having a stagnating industry that is also characterised by its high degree of technical sophistication in the fields. The best farms get 80 - 120 mt/ha and about 30% - 40% of all fields are machine harvested (see Runsten and Moulton, 1988).

The expected direct influence of mechanisation upon production levels and consequently upon international market shares has shown itself as debatable in the case of the USA, namely California, where many factors have contributed to change the competitive position of californian industry (see Runsten and Chalfant,1988).

Traditional producer countries such as Portugal that could offer comparative advantages in the past (due to climatic conditions, cheap labour costs, irrigation possibilities) have to deal now with lack of competitivity since the present processing structures do not offer processors the guarantees of constant incomes and are, therefore, desperately seeking new production technology.

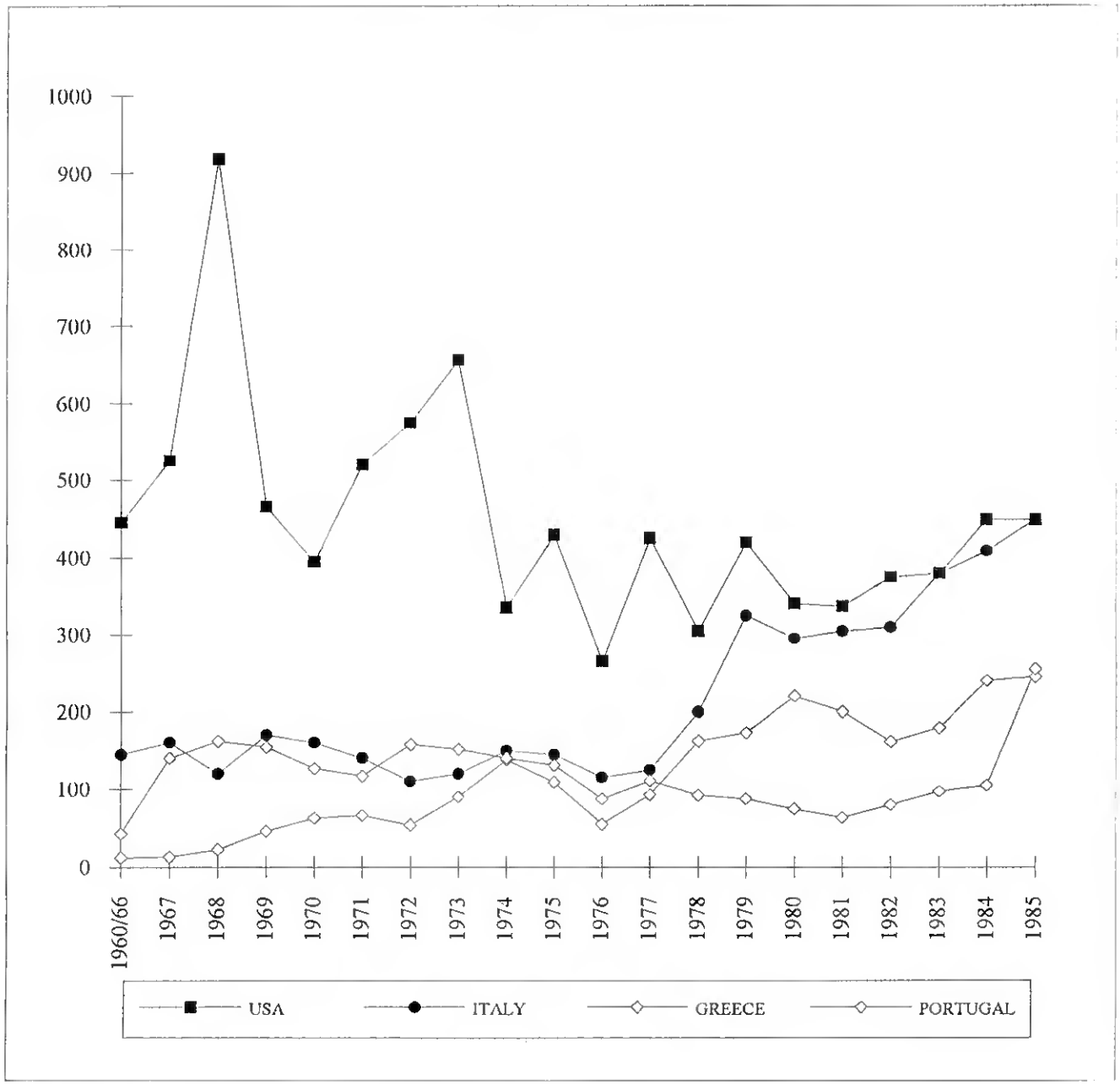
Also to consider is the fact that the expected decreases in supply resulting from different policies in Europe may very well be replaced by new lower cost productions from other countries that are not traditional producers like Mexico, Tunisia, Turkey and Thailand.

A study made by Montigaud et al. (1987) tried to analyse constraints and points of strength of several processed fruits and vegetable systems including the tomato sector. According to these authors the structures of five processed fruits and vegetable systems (tomatoes, peaches, onions, plums and mushrooms) in France have sensitive points that are points of constraints, of advantage and of regulation. In the tomato processing industry constraints are the necessity of technical innovation and the "requirements of the central buying offices of the retail industry that lay more and more on the system through prices, quantities, products or services".

However, such constraints meet several points of regulation, namely the diversification of the farming systems, the inter-profession and the reaction of the processing firms: considering their possibilities of

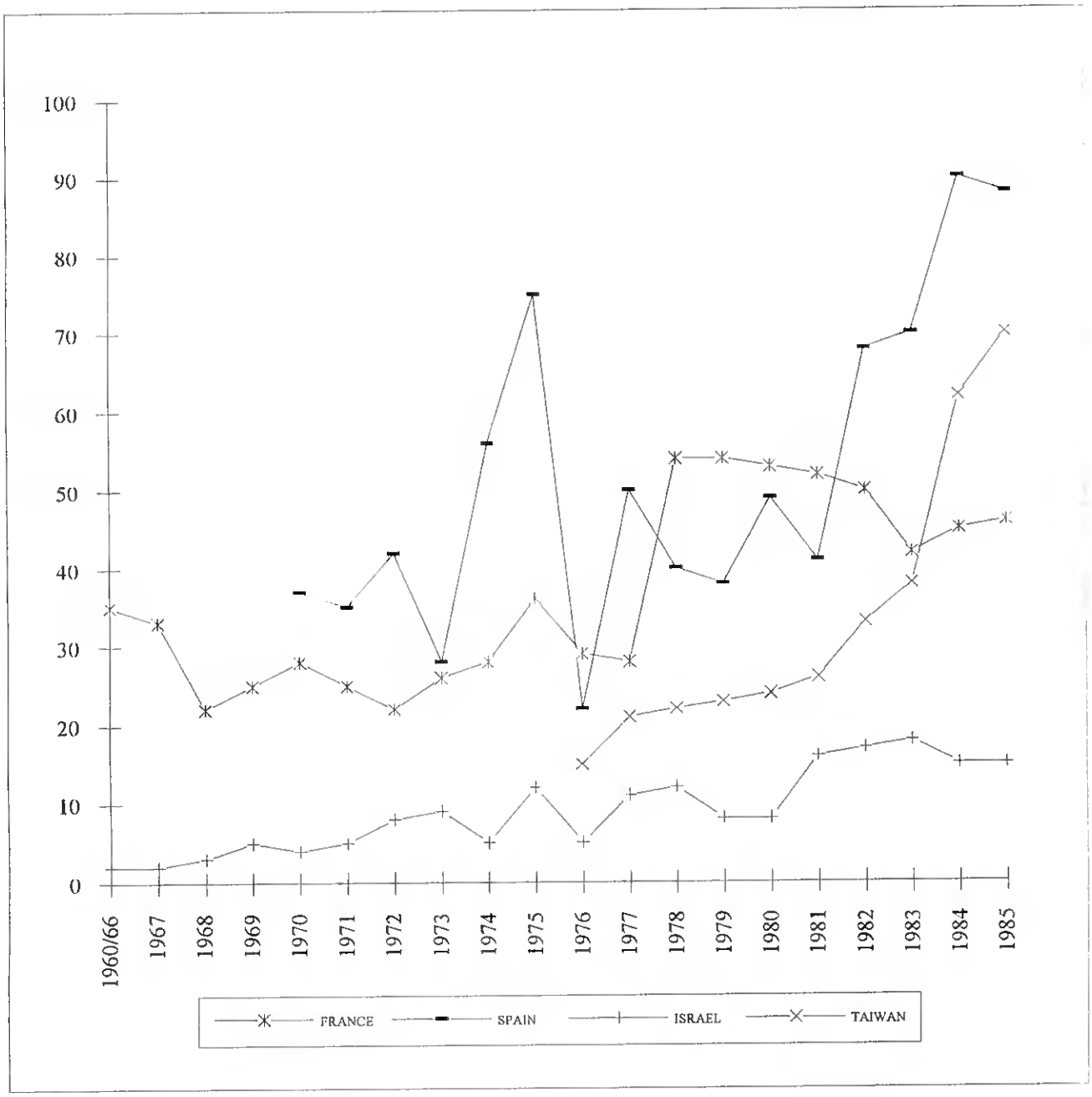
reallocations, of manufacturing high added value products or even increasing investments to save labour.

Figure 3.3 (1)
Production of Tomato Paste in Metric Tons



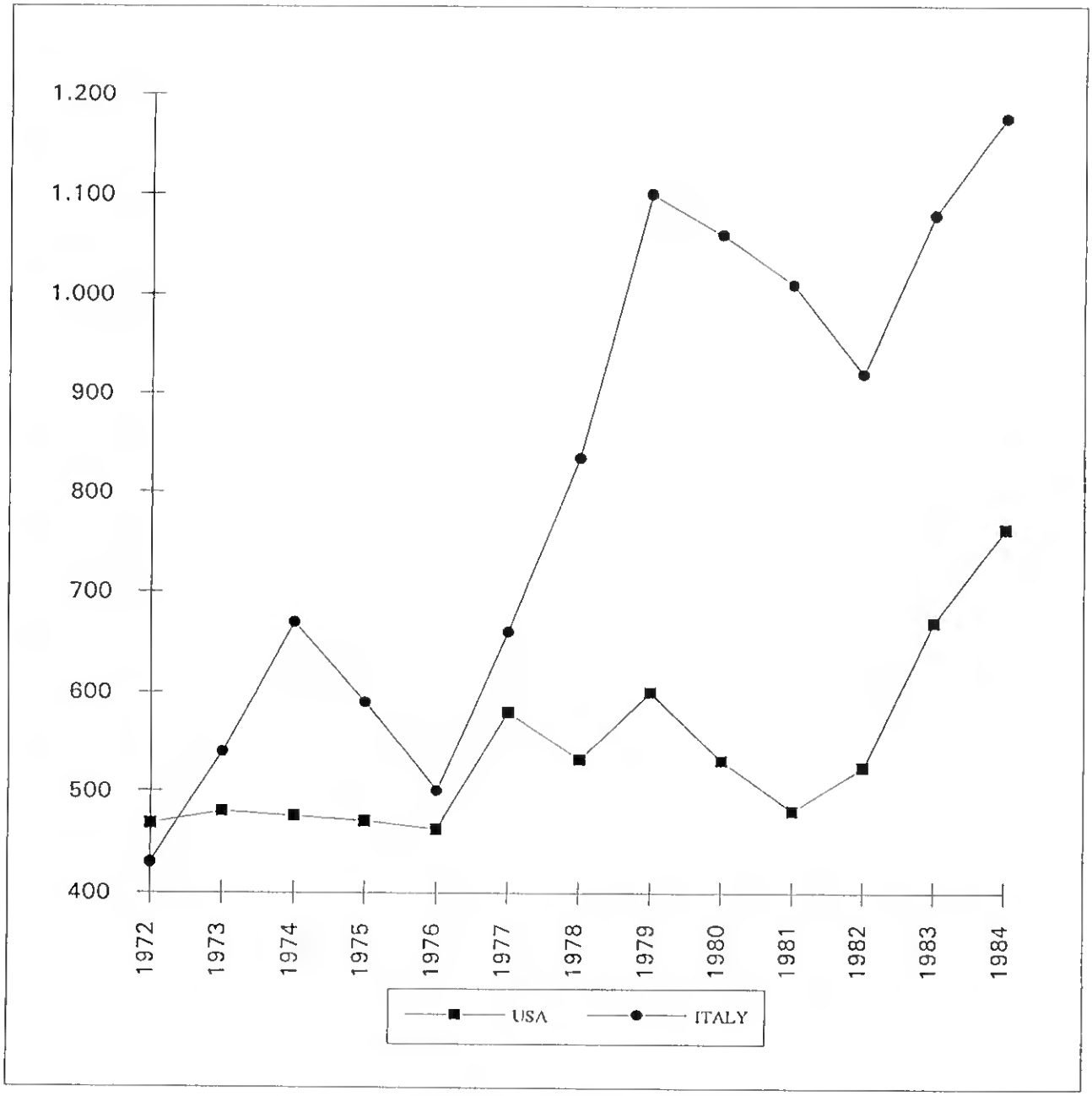
Source: Horticultural and Tropical Products Division
FAS/USDA February 1983, 1984, 1985, 1986, 1988,and October 1987

Figure 3.3 (2)
Production of Tomato Paste in Metric Tons



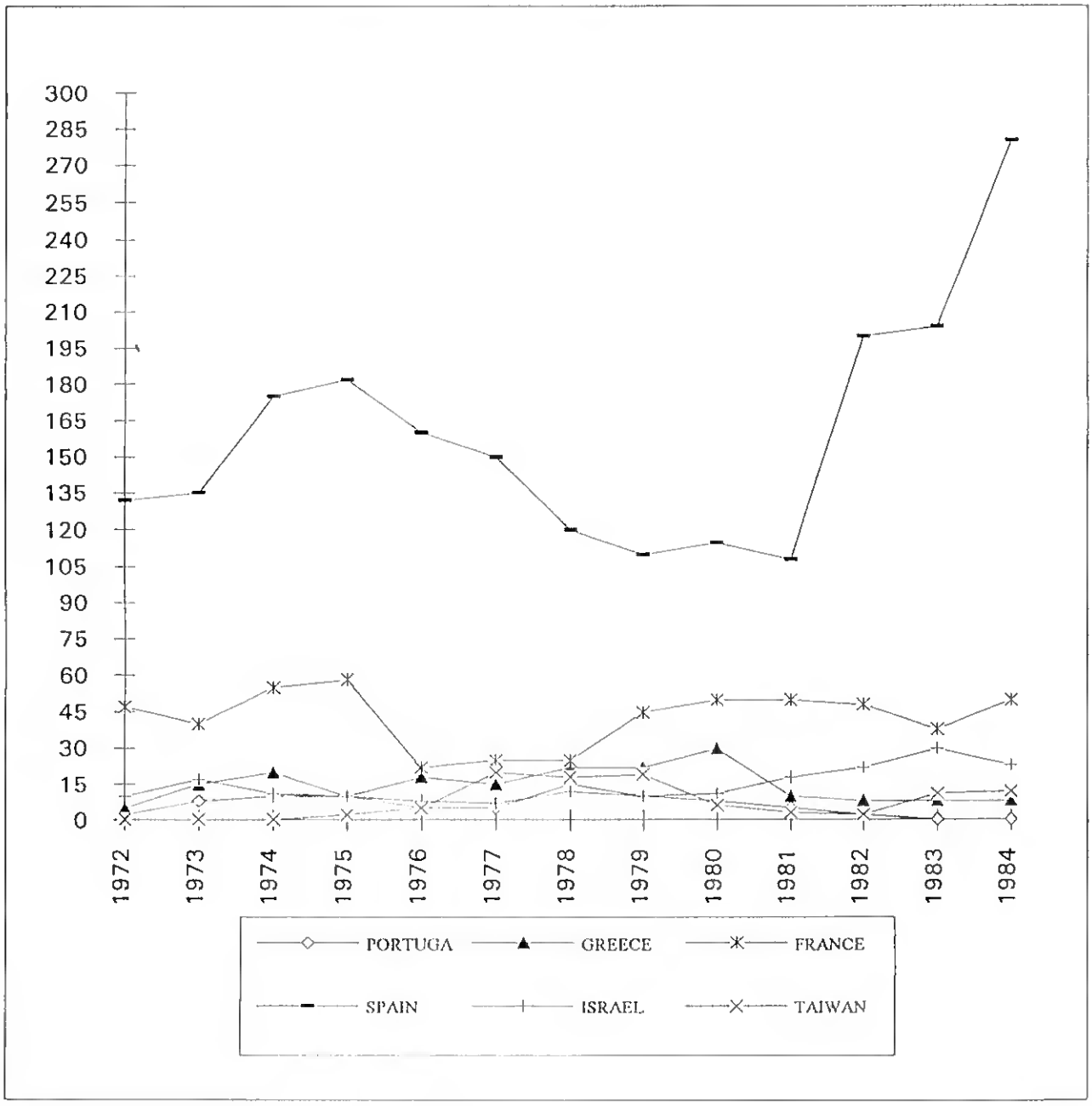
Source: Horticultural and Tropical Products Division
FAS/USDA February 1983, 1984, 1985, 1986, 1988,and October 1987

Figure 3.4 (1)
Production of Peeled Tomato in Metric Tons



Source: Horticultural and Tropical Products Division
FAS/USDA February 1983, 1984, 1985, 1986, 1988 and October 1987

Figure 3.4 (2)
Production of Peeled Tomato in Metric Tons



Source: Horticultural and Tropical Products Division
FAS/USDA February 1983, 1984, 1985, 1986, 1988 and October 1987

4. THE USE OF A SIMULATION MODEL FOR PROJECTIONS OF INTERNATIONAL TRADE PATTERNS

4.1. SELECTED STUDIES AND SELECTION OF SIMULATION MODEL

4.1.1. The impact that the european agricultural policies have upon international trade in the sector became of a more generalised interest when the established market situation was altered by the integration of Greece, Portugal and Spain into the EC.

This promoted much research about the farm sector as a whole and of its subsectors in particular and both studies of equilibrium within the international trade markets as well as studies of the possible reactions within the national economies were undertaken. Empiricism was frequent and many studies were based on a very narrow quantitative support (Hinten, 1978; Hormann, 1977; Montigaud, 1983). Initially, in attempts to describe the reflexes of expected political changes on the subsectors, models of the optimisation type were chosen to develop a quantitative analysis (linear and quadratic programming).

Examples are the studies concerning the european market for stone-fruits published by Weindlmaier (1976) or the analyses of the effects of the enlargement of the EC. to Portugal and Spain upon the portuguese farm sector made by Brito Soares (1981). These sort of optimisation models,

called normative, are essentially prescriptive and therefore generally used to suggest the optimal utilisation of resources, to propose adjustments and specify cost minimising methods, or to solve related problems. The approach is, however, the object of many criticisms related to the restrictions it imposes when estimates of the effects of different political decisions in a given system are desired. Quantitative effects, resulting from real applied agricultural policies, have been a major concern since 1980 (von Alvensleben, 1980).

With the increased availability of advanced computational techniques, new static or dynamic methods based on simulative experiments have been increasingly used to describe agricultural systems and suggest alternative solutions.

Simulation is essentially a technique that attempts to model a real system, considering mainly the relations to be observed and experimenting on it with the manipulation of variables, called instruments. In such a mathematical model, the interactions among the components of the system are first defined and are checked by comparison of the computed results obtained with all important available knowledge and statistical data. When an acceptable representation is achieved, usually after several trials with the instrumental basis, it serves as a point of departure for the typical phase of a simulative study: the projections.

The first example we want to refer to is the study of Sarris (1983), for whom "the impact of EC enlargement on trade of fruits and vegetable products seems to be a area of speculation with a few hard numbers to support the arguments", and who tried to surmount this gap by simulating parameters related to the international trade of the farm sector for the most important products involved in the integration problem. His model aggregates the different products and goes later into the details of the ones of his particular interest. Because of its complexity the model does not allow considering one product individually. And, as the author himself comments, the emphasis on specific products makes such an analyses impossible due to the missing disaggregated data.

Tangerman (1982) has attempted to overcome such difficulties by using a system with simple algorithms to reflect a market equilibrium situation with linear functions and reproduce a small number of parameters for a few restricted, well-defined products. Since then this type of simulative study has been much used in market studies of products for which dynamic factors do not seem to play a dominant role (von Alvensleben and Behr, 1986; Frenz and Manegold, 1986). The attraction of this approach lies in its simple presentation as well as in the fact that using a methodology of comparative statics always permits the introduction of changes in its exogenous variables.

Based in very similar principals as those models are the much more recent models MISS developed in Rennes, France, in order to evaluate and

quantify effects of EC and USA trade liberization. The analyses entails the estimation of political preference weights, game theory, a partial equilibrium world trade model based on the year 1986 (Mahe, Roe, and Johnson, 1991) for eight commodities.

The study we are presenting follows the methodology of Tangermann (1982) and offers quantitative methods to support possible changes in the market of tomato processed products. In its methodology it is very close to the MISS model with limitations in the amount of policy parameters used and because it stayed restricted to the paste product. Cross relations between these and other alternative crops were not our concern.

In spite of the importance of tomato production for the farm sector of the mediterranean region and its intimate relationship to the food industry, the product has not yet received due attention by quantitative studies specially in Europe. In the United States several studies appear (Brandt, 1981; Melnick, 1985; and Logan, 1985). Yet some authors have seriously studied the marketing chances of such products (Bavarez, 1985; Miranda de Oniz; 1979 and the Centre Francais du Commerce Exterieur, 1977). Schwartz (1986) discussed the theoretical basis to motivate market changes. Moulton, in several studies, has extensively examined the market conditionalisms of different countries offering excellent evaluations of the international situation in the production and trade but without the intention of providing quantitative prognosis.

4.1.2. SELECTION OF A SIMULATION MODEL

The theoretical bases of a programming procedure for the agricultural sector take into account the fact that the factors intervening in both the supply and the demand functions often have their origin in the most indirect and remote causes of the behaviour of farmers and consumers. For this reason one of the main objectives for the development of programming is to acquire a deeper knowledge of these causes and reproduce them quantitatively in so far as is possible.

The information then required (Garcia, P., 1992) is based upon:

- knowledge of the actors involved in the market and their decision making framework;
- knowledge about the surrounding economic, political and social institutions;
- knowledge of the technical, social and other forms of constrains which influence production processes , consumption, etc;
- relevant principals of economic theory which can be applied to explain the supply and demand of products;
- methodologies which can be appropriately employed and awareness of their advantages and disadvantages;
- the availability and accuracy of market data.

The practical implications of procedures tending to satisfy such needs can not be neglected since the better the model represents reality the more

complicated its structure becomes (thereby requiring a more exhaustive search for the data base) and the more restricted is its use.

All the available techniques have their limitations and try to surmount, in one way or another the following problems:

1) Difficulties in formulation of not directly observable and quantifiable factors;

2) Difficulties on constructing time-series: data multicolinearity (aggregating different variables under the same factor creating a wrong cause-effect relationship), inconsistency (adding up values which belong to different contexts), incoherence (when working sometimes with processed products with different designations).

The choice of an appropriate general methodology depends, therefore, on some factors that surpass the possibilities of theoretical formulation and encounter practical restrictions. It becomes necessary to combine the priorities of objectives with the existing possibilities.

The choice of a non-parametric approach (Mahe, 1988), is essentially supported by the attractiveness of this method. It uses only the conditions imposed by a data set, by the international trade equilibrium and the correct mathematical formulation of the equations, putting apart the calculations for the estimation of the parameters which being introduced exogenously into the model make the analysis is thus free from econometric specification

errors. Of course, estimation of parameters is not because of that considered an unnecessary step, being on the contrary still very important, although falling in a different goal of study.

The model we have chosen is a simplified trade model which simulates in a comparative static way, different and alternative policy options. The world can be disaggregated in as many regions as necessary and it may include in its development an N number of products. For the all regions we have to assume a similar structure of supply and demand behaviour. If we want to introduce alterations to it, these structure has to be such as to allow changes resulting from parameter alterations, different departure situations or changes in the policy instruments.

In the case in hand we wish to reproduce a situation of general equilibrium between supply and demand of one individual product which means that we will not have to deal with the model of a complete sector but one in which trade fluxes between countries are very important. We are neither considering remote causes such as long term production policies affecting micro-level agricultural systems nor do we consider changes in the mobility of the resources. On the other hand the commodity is an annual product, very dependent on climatic conditions, for which cultivation varies with market oriented short term decisions like price expectations or profitability of alternative crops.

Moreover, our interests on these products are quite specific, thereby justifying an analysis made on a relatively high level of disaggregation. This characteristic is a strong practical hindrance to the estimation of econometric functions.

Since the objective is to discuss hypothetical policy decisions based on trade flows, we have to reproduce the trade relations in all its extension considering the producer and the consumer blocks and their trade relations. That is why, all main producers for which data was available, were considered and set together in groups of similar commercial objectives. Ours has, therefore, to be a multi-country model.

Data for the base period correspond to a normal or representative year. Quantities are drawn from a world-wide balance sheet for each region (group of countries) and commodity (paste and, very occasionally, peeled).

In conclusion our choice fell upon a model with the following characteristics:

1) Positive approach :

The goals of modelling agriculture deal with two different levels of decision, that of the farmers and that of the policy makers. To deal adequately with a maximisation of a policy goal, a model should contain the specification of policy instruments and a set of relationships to describe how the producers will react to different policies. So the positive approach can be

solved under different assumptions about policy parameters and the solutions provide information about consequences of policy changes (Hazell and Norton, 1986).

2) Equilibrium :

The world trade of the commodity is completely described and is supposed to be in equilibrium.

3) Comparative :

Methodologically, it observes reflexes from different policies and compares the simulated situations with status quo prognosis.

4) Static :

Conditions of change cannot be altered for the period of the projection.

For a better discussion of the choice of this method we need to compare the possibility of using an analysis based on a dynamic model in a similar situation. In favour of this is the restricted nature of the problem, i.e. to consider dynamic linkages such as farmers incomes and its reflexes upon alternative investments or crops for the next year, investments in modern technologies affecting the capacity of production in more recent periods, a very common practice in tomato processing industry or even changes in the structural composition of the processing firms. However, such an option would not be compatible with the expectation of finding reflexes in the trade

flows of the different countries to be studied and consequently quantitative issues about the consequences for the international markets would not be possible.

Considering the objectives referred to above, the solution seems to be the adoption of a model based on comparative-static methodology. This uses alternative projections to explore effects of external factors such as alternative domestic policies.

Also, this model allows performing sensitivity analyses able to incorporate values of uncertainty such as:

1) Changes in technology can be considered to be represented in the endogenous shifts along the production function, or they can be represented by considering increases in unit yields.

2) The use of different elasticities brings certainly interesting advantages for the method. We shall discuss in chapter 4.3.2. how the variations of their values can modify the effects of changes in political parameters and prove this further in the chapter dedicated to the discussion of results.

4.2. ADVANTAGES AND LIMITS OF A SIMULATION MODEL

The strength of a simulation model lies in its capacity to represent functional relationships between the components of a system whose behaviour has been previously defined. In such mathematical formulations, exogenous variables are the independent variables, attributed independently of the system. They occur from two different options: 1) They can be parameters previously established by the policy objectives which condition the environment; 2) They can be stochastic variables got from parallel calculations (Oury, 1971).

From the theoretical point of view such studies, not being normative, do not have the restriction related to obtaining "the optimal" solution which may be subject to discussion if we admit the complexity of a socio-economical system and the possible ambiguity involved with the definition of "optimum". From the practical point of view, the simple comparison from the initial results with other existent information permits testing the validity of the model and the values attributed to their variables.

Consecutive revisions, make the model more adaptable to the reality and offer also the chance of surpassing missing data, since alternative plausible hypothesis for the data can be given. In the same way subjects related to decisions in situations of uncertainty can be by-passed (Halter and Dean, 1964).

4.3. THEORETICAL ANALYSES OF APPLIED INSTRUMENTS

The effects of alternative market policies may be deduced only if we consider the behaviour of producers and consumers simultaneously as well as the mechanisms of governmental intervention in the market systems.

4.3.1. THE BEHAVIOUR OF THE PRODUCER

The behaviour of the producer reflects itself in the potential supply of the agricultural product and in the real values that supply achieves. Factors determining the potential supply are: 1) Price of the product, 2) Price of the factors, 3) Availability of the fixed factors of production, 4) Level of technical development, also in alternative products, 5) goals and other behaviour components of the producer including price and production risk. The real supply is however different from the potential one, because one has to add unexpected situations like changing weather conditions and illnesses to this determinants (Behr, 1987).

The analysis of how factors 1, 2, and 3 are able to create supply variations, has been developed in the field of neo-classical theory (Heady, 1961 or Stamer, 1966). Technological development effects upon supply have been the concern since Solow, till today. The approaches made by Ruttan (Hayami and Ruttan, 1985) and others have developed a whole area of Dynamic Models of Production Technologies (see Ball et al., 1989). Also, how behaviour components 5, are able to influence supply and how to

quantify the resulting effects, mainly the effects of uncertainty and risk is per se another very important research area (Just, 1982).

In general the problem is to separate each of the factors or determinants in order to quantify as far as possible, the resulting movement of the supply curve. The form of the supply curve is dependent on its elasticity.

The short term perspective is particularly interesting for our study since political decisions on conjunctural measures affect short term parameters directly and factors of a dynamic nature are not being considered.

The "short term" tendencies explain the relative inelasticities. The agricultural sector, unlike other sectors, is dependent upon natural conditions which are difficult to programme. Production cycles, seasonability, inflexibility of production, perishabilities and uneconomic storage costs are only some of the reasons to justify relatively inelastic behaviours in the supply of agricultural products.

Also typical for the farm sector is the existence of fixed factors in the production costs. Moreover, the immobility of factors like land, work and machinery decrease the possibility of using opportunity costs to get rapid reactions to supply opportunities. These tendencies for inelasticity can, however, change: first as described in the theory of asset fixity (Johnson,

1960), if the considered period is related to price contraction or expansion, and second, depending on the intensity of soil utilisation (Jahn, 1987).

In a long term perspective the supply becomes more capable of presenting rapid reactions to price changes. This is due to the possibility of variations in the arable area, technological modifications able to allow different production intensities, or even alterations in the decision-making process of the farmers.

4.3.2. THE BEHAVIOUR OF THE CONSUMER

We do not intend to develop here an issue about demand analyses not only because that is not considered in the concept of our work but also because the problem overview is extremely complex.

For processed products the demand considered is composed by two different behaviours. That of the consumers of paste and that of the consumers of fresh tomatoes for processing, the canners. Of course, the second group reflects almost perfectly (restriction due to the existence of stock variations and non perishability of the product) the behaviour of the first group.

Factors able to explain the consumer behaviour are mainly taste and preferences indirectly influenced by marketing technics, social habits and income, even if the demand income elasticity decreases when the food

products are essential as is the case of processed products. These factors are difficult to quantify and therefore much of demand analysis is based on consumer expenditure surveys with all the difficulties inherent to modelling and data preparation (aggregation, density, expenditure of research) (Thomas, 1987).

Using an equilibrium system, as we did in this study, managed to surpass some difficulties resulting from the general approaches of complete demand systems, as for instance: 1) Assumptions that prices are exogenous and supply is perfectly elastic (improbable for specific agricultural products); 2) The data available for food demand estimates are time series observation of price quantities bundles: 3) If this system gets an external influence, both demand and supply adjust meaning that we may expect a biased estimation of parameters and consequent under estimation of true variables (Thurman, 1986) or (Hayes, 1992).

In principle if the consumers have their nutritional needs satisfied, price elasticities of demand should be inelastic based on the fact that decreasing prices would not increase the consumer wishes. However most of food products, particularly meat and fruit are surrogable, giving the consumer the alternative to use price changes.

Thus another indirect factor of consumption of agricultural products is the production and use of alternative or related products, the cross price

elasticities between both products indicating their degree of complementarity or substitutivity.

There have been simulative studies using such elasticities to exploit existing or potential relations between the products. The importance of considering this kind of cross effects has been proved by Frenz (1986) who studied the consequences for the international market arising from a decay in prices of cereals, milk, beef, pork, poultry and eggs. Using a closed and equilibrium model too, the author defines the reaction coefficients to reproduce the absolute value of elasticities in the price variations. The higher these values are, the more intense is the competition of the two products. In the case of milk, for instance, a decrease in its prices in the EC can create distinct situations (increase or decrease in prices) for the international beef market depending on whether the values of cross price elasticities of these products is 0 or positive. We will describe the assumptions we made for these parameters in our model later in chapter 5.1.

4.3.3. THE GOVERNMENTAL INTERVENTION

The governmental intervention makes use of several instruments: Tariff and quota regulations try to restrict the entrance of products into the importing countries while other instruments like deficiency payments and variable import levies promote the domestic production of such countries. Export subsidies attempt to secure production in exporting countries, thereby creating an artificial situation which affects the global supply and demand

situation for these products. An alternative requires the liberalisation of this situation based on comparative advantages and international division of labour.

Since agricultural policies are implemented to a certain extent with price manipulation as an instrument, the consequences that these have upon supply and demand behaviour and consequently on its equilibrium, have to be discussed in a theoretical context which mainly considers such parameters.

The market regime in the European Community, determines the different protectionism measures for prices dependent upon the situation of the product on the international market. These measures may be exerted at either the distribution phase (fixed ad valoren tariffs, variable levies, import interventions, intervention buying or export subsidies) or at the production phase (minimum grower prices or subsidies to industry and quotas restrictive to production increases). This kind of interventionism influences the relations between prices inside and outside of the Community, affecting the price structure in non-community markets as well.

In our study the policy variables are represented by subsidies, tariffs, quotas and minimum guarantee prices, whose use as theoretical mechanisms and interventionist effects we would like to discuss briefly.

The possible effects of a subsidy upon production stimulates production and causes a shift in the supply curve, moving the equilibrium

point to an inferior level of prices and superior production quantities. Whether or not such a reaction means greater advantages for the farmers depends upon the elasticities of the related curves. Also, if the products are competing in the internal market with non-subsidised foreign products, then in the internal market only a part of the production is stimulated (von Alvensleben, 1980). This is due to the fact that the impulse obtained by the internal supply is moderated by a reduction in the quantities of external supply.

If alterations happen in both the elasticities and the number of subsidised products, it can be observed that the effects of the same amount of subsidies can have different effects on the farmers' incomes.

Tariffs are a restriction that obliges the global supply curve to move to the left, creating a market situation characterised by reduction in produced quantities and increases in prices. However, since the supply curve of internal products is different for the domestic producers, this new situation can improve their supplied quantities. Also in this case, different elasticities are responsible for different responses of production to the tariffs. The higher the supply elasticity is, the more accentuated is the effect of a price increase upon the produced quantities due to decreasing import supplies. In the same way production quotas restrict the amount of production and again the relative position of supply and demand define the degree of efficiency with which these instruments work. If the demand curves are more inelastic,

larger increases in prices for the same variations in quantities are allowed. Consequently the expected effect on the produced quantity is smaller.

In the case that quotas are introduced on imports the inelastic behaviour of the new foreign supply creates such an inclination in the total supply that new equilibrium prices rise up and consumed quantities decrease, this new situation being a stimulant to domestic producers. Under such circumstances, in spite of a decreased imported quantity the prices for foreign producers are kept above the initial price that they would be paying without the introduction of quotas.

The introduction of minimum guarantee prices in the process of price formation alters the elasticity of any defined supply curve, making it completely inelastic until the point where the prices are defined. So, the intensity of the effect of this instrument upon global supply depends on the amount of imports for the domestic market; they will define an equilibrium point where more quantities are achieved at inferior real prices.

4.4. CHARACTERISATION AND MATHEMATICAL FORMULATION

The choice of a system of equations that reproduce with conviniance a certain trade situation has four alternatives (Tangerman, 1982). Following this author we will describe them and justify the set of equations that we have chosen for our model.

4.4.1. DEFINITION OF VARIABLES AND PARAMETERS

For all the different sets of equations the definition of variables is as follow:

EC(10), SP, OMC, RW	groups of countries: European Community with 10 member states, Spain and Portugal, other Mediterranean Countries, Rest of the World;
S(i,k), D(i,k)	quantities supplied and demanded of the product i in country k;
i	is the "well-defined" product (in terms of production period or specified quality);
a(i,k), b(i.k), c(i,k)	are parameters of supply;
d(i.k), e(i,k), f(i,k)	are parameters of demand;
Gk, Gt	are price differentials;
t(i,k)	is the applied tariff to imports of product i from country k;
sub(i,k)	is the applied subsidies amount to product i from country k;
P(i,k)	is the price of the product i in country k, out of EC;
P(j,k)	is the price of other related product in country k;
P(i,d)	is the price of the product i in country d, inside EC;
PI i	is the intervension price for the product i;
PR i	is the price reference of the product i;

4.4.3. SYSTEMS OF EQUATIONS

A - EC is a net importer of the product at domestic price superior to reference price. This means that "fix ad valorem tariffs" are applied to the imported products. The set of equations representing such situation would be the following:

$$S(i,k) = a(i,k) + b(i,k) \cdot P(i,k) + c(i,j,k) \cdot P(j,k)$$

being: $k \varepsilon$ (EC 10, SP, OMC, RW)

$$D(i,k) = d(i,k) + e(i,k) \cdot P(i,k) + f(i,j,k) \cdot P(j,k)$$

being: $k \varepsilon$ (EC 10, SP, OMC, RW)

$$P(i,k) = Gk \cdot P(i,d)$$

when: $k \varepsilon$ (EC10)

$$P(i,k) = Gk \cdot P(i,d) / [1 + t(i,k)]$$

when: $k \varepsilon$ (SP,OMC,RW)

$$\Sigma S(i,k) = \Sigma D(i,k)$$

B - EC is still a net importer of the product when domestic price equals price reference, such means that levies have to be applied and consequently the set of equations would have to be slightly different:

$$S(i,k) = a(i,k) + b(i,k) \cdot P(i,k) + c(i,j,k) \cdot P(j,k)$$

being : $k \varepsilon (EC10, SP, OMC, RW)$

$$D(i,k) = d(i,k) + e(i,k) \cdot P(i,k) + f(i,j,k) \cdot P(j,k)$$

being : $k \varepsilon (EC10, SP, OMC, RW)$

$$P(i,k) = Gk \cdot p(i,d)$$

$P(i,d)$ = PR i, domestic price equals price reference

$$P(i,k) = Gk \cdot PR\ i$$

when: $k \varepsilon (EC10)$

The market equilibrium will be found outside the EC, given the considered EC net imports. But as imports still flow into the EC, the price differences between non EC countries still depend on the country specific tariffs. Gt, represents the price differencial of a specific country.

$$m(i) = \Sigma\ (k \varepsilon EC10)\ [D(i,k) \cdot PR\ i - S(i,k)]$$

$$m(i) = \Sigma\ (k \varepsilon SP, OMC, RW)\ [S(i,k) - D(i,k)]$$

$$P(i,k) \cdot [1 + t(i,k)] / Gk = P(i,t) \cdot [1 + t(i,t)] / Gt$$

when: $k \varepsilon (SP, OMC, RW)$

C - In this case there is no trade. Two different market equilibrium represent on one side the domestic EC market and on the other side the remaining markets.

$$S(i,k) = a(i,k) + b(i,k) \cdot P(i,k) + c(i,j,k) \cdot P(j,k)$$

when: $k \varepsilon (EC10, SP, OMC, RW)$

$$D(i,k) = d(i,k) + e(i,k) \cdot P(i,k) + f(i,j,k) \cdot P(j,k)$$

when: $k \varepsilon (EC10, SP, OMC, RW)$

$$\Sigma (k \varepsilon EC10) [S(i,k) - D(i,k)] = 0$$

$$P(i,k) = Gk \cdot P(i,d)$$

when: $k \varepsilon (EC10)$

$$\Sigma (k \varepsilon SP, OMC, RW) [S(i,k) - D(i,k)] = 0$$

$$P(i,k) / Gk = P(i,t) / Gt$$

when: $k \varepsilon (SP, OMC, RW)$

D - This case represents the situations in which domestic prices decrease until the point where the equilibrium of supply and demand is exceeded and EC produces a surplus even at the intervention price level. In this case surpluses have to be put out of the market (consideration of export subsidies or inferior uses).

$$S(i,k) = a(i,k) + b(i,k) \cdot P(i,k) + c(i,j,k) \cdot P(j,k)$$

$$D(i,k) = d(i,k) + e(i,k) \cdot P(i,k) + f(i,j,k) \cdot P(j,k)$$

$$P(i,k) = Gk \cdot P(i,d)$$

$$P(i,d) = PI\ i$$

$$m(i) = \Sigma\ (k \varepsilon EC10)\ [D(i,k) \cdot PIi - S(i,k) \cdot PIi] + Ui$$

Since EC exports more then imports, m(i) will be negative. Ui, represents quantities for inferior uses.

$$m(i) = \Sigma\ (k \varepsilon SP, OMC, RW)\ [S(i,k) - D(i,k)]$$

$$P(i,k) / Gk = P(i,k) / Gt$$

when: k ε (SP, OMC, RW), and assuming no price protection in this countries.

4.4.4. CHOICE OF A MODEL FOR PROCESSED TOMATOES

As seen from the past set of equations the model works in comparative statics. When initial equilibrium is disturbed by a policy change the whole market system reacts so that both, equilibrium amounts and prices, adjust (Guyomard, Tavera and Trochet, 1991). As the model is solved by a numerical analyses routine, there is a large flexibilty in combining policy instruments because the choice of variables is free.

The behaviour of the model depends on the policy instruments that in each case were considered. For our case, those which may affect production and international trade of tomato paste more deeply are: The subsidies to processors, the tarriffs of the international agreements, the minimal guarantee prices offered to growers and the quota system. The exchange rate between ECU and dollars was considered to be constant, but such could also be considered another policy instrument - in such a case a different set of equations had to be formulated.

Tomatoes, not being perenial products, allow changes in the decision process in a relatively short period and are therefore particularly influenced by different minimal prices attributed to the farmers. As the observation of statistical data shows, the supplied amounts of processed products changes with the values of the political support. Also the fact that the product to be worked with is processed, obliges us to establish several restrictions besides those referred to in the previous sections.

In such a situation we are in fact dealing with two different supply curves:

1) The supply of the fresh product - influenced by the prices offered by processors to growers;

2) The supply of the processed product in the worl markets, whose prices are influenced by different supports to the related industry (subsidies to processing or to export).

Therefore in order to be possible to attain our objectives, either two different supply curves or a relation between the two curves, have to be considered. We have decided to establish a relationship between the supply price of processed products and the Minimum Guarantee Prices (MGPs) for the fresh product. This relationship compromises the entire transformation process and should be described not simply by an equation, but by an entire model able to reflect its great variability in costs and rentability from country to country - such would represent an ideal set of conditions and a new and different goal of study, it would relate the response capability of each country and processing structure to the different political variables to be considered. What such a study would require is a very detailed analysis of such structures, something that in practice is very difficult to obtain as we could realise after putting together the material for the Appendix 3.4.

We have therefore put apart such an approach with the feeling that it could have been a very interesting direction to give to the study if we had much more time to work on it.

Our solution was to define a coefficient of transformation which, applied to the practised producer prices determinates the supply price of the processed product. This coefficient is essentialy not much more then the percentage that payments to farmers represent in the cost structure of the industry of each country.

Introducing such coefficients makes the model more flexible to the different industrial structures of the countries and this is certainly an interesting advantage to be used.

The new parameter is not a policy parameter in the context that we have defined policy parameters, so we are keeping its value constant for the different countries and time periods. Even so we would like to call the attention for the new possibilities that could be developed working on such a coefficient. Supposing the availability of data (one of the serious restrictions), much information could be obtained, essencially related with the role that industrial structure of each country could have upon changes in the international trade policies. In the next system of equations we have defined this coefficient as Processing Coefficient of the product i, (Proc.Coef.(i)).

The fact that the model is in equilibrium as well as modelling objectives, oblige the supply price of the transformed product in all countries to be determinated by the market conditions. However a mechanism is necessary to define the existence of a minimal price in the EC, which determining the primary supply in the Community uses the transformation coefficient to establish the value of the several derived supplies of the different countries that result in the global demand.

If the country is not a market leader and has nevertheless the influence of minimal producer prices, the way to include them in the system of equations is to consider the supply price of the product as function of price in leader country and also of the prevailing producer prices inside that country, such value being susceptible to external variations (one of the policy parameters).

If on the other side, the producer prices variations should not be considered because they are rather an effect of price equilibria, then we have attributed to this parameter a fixed value i.e. no variations were considered (the case of the U.S.A.).

After having tested linear functions for our model, we have realized in the validation phase that the spead of the reactions was very far away from the reality. The alternative use of the Cobb-Douglas functions brought us however, to more suitable results and therefore we have used it.

and demanded product, the more apropriated set of equations resulted the following:

$$S(i,k) = a(i,k) \cdot Px(i,k)^{b(i,k)} \cdot Px(j,k)^{c(j,k)}$$

for k ε (EC10, SP, USA, RW)

$$D(i,k) = d(i,k) \cdot Py(i,k)^{e(i,k)} \cdot Py(j,k)^{f(j,k)}$$

for k ε (EC10, SP, USA, RW)

$$Px(i,k) = Proc.Coef(i) \cdot MGP(i,k)$$

when k is a market leader

$$Px(i,k) = [Px(i,1) + MGP(i,k)] / [1 + t(i,k)]$$

when k is not a market leader

$$Py(i,k) = Px(i,k) - sub(i,k)$$

when k ε (EC10, SP, USA, RW)

$$\Sigma S(i,k) = \Sigma D(i,k)$$

Finally, and because of the very interesting trade interdependence between the United States and Europe for processed tomatoes we have considered this country separately.

4.5. RELATIONSHIP BETWEEN THE DIFFERENT POSSIBILITIES OF POLITICAL DECISION AND PARAMETER VARIATIONS

As we could understand the above referred model has restrictions. However as an instrument to be used in efficient evaluation of policy decisions it may be useful in many circumstances. The following summary was developed to systematise some conditionalisms of production, that are expected to change in time and can be related to adequate instruments or expected solutions that such a model could suggest.

Our special attention will be given in this work to the last group of policy variables, which are the basis for the amount of projections to be reported in the next chapter.

THE MODEL AS AN INSTRUMENT - SUMMARY

Condicionalisms	Variables	Instruments	Solutions
Technological changes	S(i,k)	Introduction of trend variables	Endogenous shifts of S(i,k)
Imponderability of productive factors	S(i,k)	"	"
Changes in taste	D(i,k)	"	Endogenous shifts of D(i,k)
Product, cycles sazonabilities inflexibilities perishabilities unecon.storages	Price elast of Supply	Sensitivity analyses	Different inclination in S(i,k)
Different charact of food products	Price elast of Demand	Sensitivity analyses	Different inclination in D(i,k)
Relations with other products	Cross elasticities	Use of + or - for subst. or complem.	S(i,k) = F[P(j,k)]
Incidence of benefits for growers and processors	Policy variables: Subsidies, Garant. Prices Quotas or Tariffs	Use of different values for such parameters	Shifts on Supply and Dem. Curves

5. COMPUTING PROCEDURE

5.1. MATERIALS AND METHODS: COMMENTS ON THE CHOICE OF THE PARAMETERS

Although the general methodology relative to the model to be used has been already defined, specifications about the way to set the data together have to be defined.

1. The product was considered in the following processing qualities: paste, peeled and other products. Our study is based on the product paste. The used equivalencies are: estimated fresh equivalent was obtained by multiplying product weight by 6 for paste, 3.3 for sauce and 1.5 for peeled (source: US Department of Commerce, Bureau of Census).

2. The groups of countries are: European Community (EC), for which production and export values are from France, Italy and Greece; Portugal and Spain; the group of other Mediterranean Countries associates Turkey, Israel and Morocco as far as data is available; U.S.A; and the rest of the world. To this last group the values were given in order to be possible to consider the model a closed one. The analysis in itself is made mainly for European producer countries, Spain and Portugal, and the United States.

Among several problems, we encountered serious difficulties in obtaining data with the required disaggregated level for each of the different

groups and also find discrepant data as a result of the different origins of the information. Using market studies already published, it was tried to surmount these discrepancies. In some cases empirical estimations were used, the values not being the real ones but those expected to report the market tendencies properly.

3. The time period for the projections is based in data relative to 1986 and extends to 10 periods. Possible deviations can be detected if 1987, 1988, 1989, are considered base years and projections might be done for a shorter period. We consider such confirmation important though we shall not use this criterion in this study for reasons of time.

4. In the model, flows in trade patterns represent changes in Supply and Demand parameters, the supply, being a sum of production and imports and the demand, a sum of exports and internal consumption.

5. Stock variations should have been considered in the analysis and in the calculations, but had to be ignored because of non-availability of serial data.

6. Estimation of elasticities is generally done using econometric methods in time series data. In this case the criteria to choose their values is related with the characteristic "comparative-statics" of the model. First probable values for the elasticities were established based on studies previously done (experts' suggestions) (Jahn, 1987). Then different

projections were done for different alternative values (sensitivity analysis).

7. The subsidies were evaluated in Ecu/m.t of the processed products. In Chapter 3, the development of subsidies and minimal grower prices was illustrated. For purposes of the calculations, whenever subsidies or minimal prices had to be used in the model, the rate of equivalence between fresh and finished product was 10.0 in stead of 6.5, the usual equivalence rate for paste. The reason for this better suiting rate are probably due to reasons related with wastes or stocks.

5.2. MODEL VALIDATION

The simulation model is used to judge the advantages of alternative instruments to be applied in a posterior period to that for which a previous analyses has been done.

The main problems of model validation are, on one side the data base that has to report the past period and on the other side the necessity of properly reproducing the already used instruments in order to obtain the model results that should approximate the real data tendencies. Of course, it is absolutely indispensable to have in mind that the real values are in reality a function of numerous amount of other parameters not considered in the model. Therefore the model validation is only able to reproduce the significance of the instruments used in the analyses considering an ex-post

simulation study (Behr, 1987).

Linear regressions were obtained from the data related to the time period 1980-1986 and were prepared for all studied countries. The appendix 5.2: "Status-quo Projections", offers a detailed information about data, chosen curves and correlation coefficients.

For the model validation the values referred above were compared with the projection of the previously defined model based on 1980 and for a time period of 6 years. This projection tries to apply policy instruments such as guarantee prices and subsidies used during that period. The chosen elasticities for the sensitivity analysis are not constant, their values have different patterns for different countries, and are specified in Table 5.2.1. The increase of elasticities after 1983, for the groups of countries specialised in production of tomato paste, reflects a higher sensibility of the markets to changes in supply price and is probably related to technical changes. For calculation of minimal prices and subsidies, the production of Greece was considered as part of the production of the first group of countries.

The results of the model validation are shown in Figures 5.1, 5.2 and 5.3 where the model projection, the linear regression results and the observed values of supplied and demanded quantities are shown for EC, SP, and U.S.A.

TABLE 5.2.1

Values Used for Elasticities (1981-1985)

Year	Supply Elasticities					Demand Elasticities
	EC(10)	SP	OMC	U.S.A.	Rest of World	All Countries
1981	0.3	2.0	2.0	1.0	1.0	0.4
1982	0.3	2.0	2.0	1.0	1.0	0.4
1983	2.0	2.5	2.5	2.0	1.0	0.4
1984	2.0	2.5	2.5	2.0	1.0	0.4
1985	2.0	2.5	2.5	2.0	1.0	0.4

Values Used for Subsidies (1981-1986)

Year	EC(10)	SP	U.S.A.	US $ per ECU
1981	36.7	10.0	30.0	0.90
1982	44.0	16.8	22.0	1.02
1983	46.0	17.4	12.0	1.12
1984	37.0	17.4	0.0	1.22
1985	26.0	17.4	0.0	1.30
1986	27.0	17.4	22.0	1.02

Observed Values for Producer Prices (1981-1986)
(Units: ECU / m.t.)

Year	EC(10)	SP
1981	81.3	54
1982	87.7	57
1983	94.1	54
1984	95.1	51
1985	93.0	52
1986	90.0	54

Figure 5.1
Comparison Between Ex-Post Projections and Real Supply Values of USA

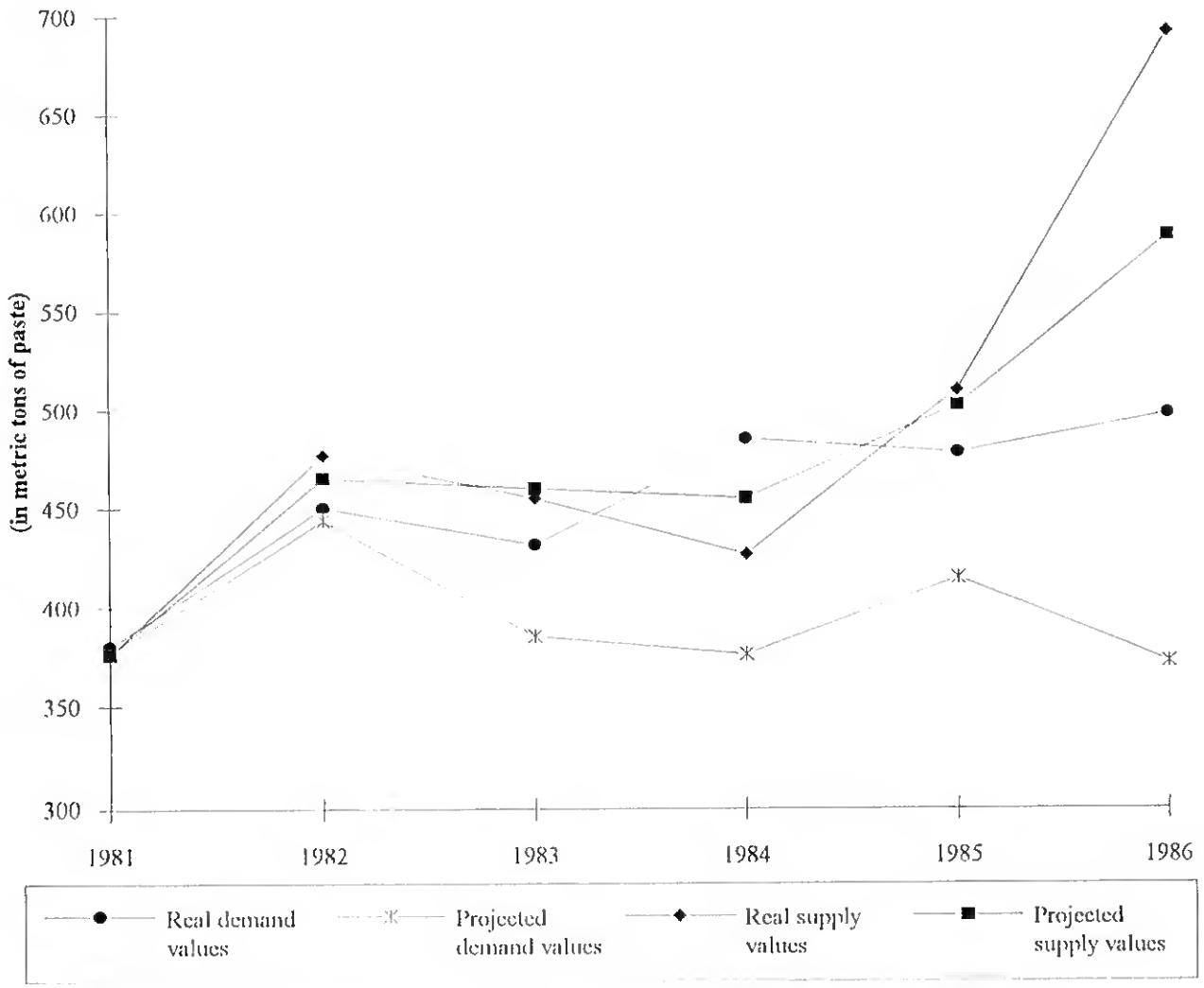


Figure 5.2
Comparison Between Ex-Post Projections and Real Supply Values of EC (10)

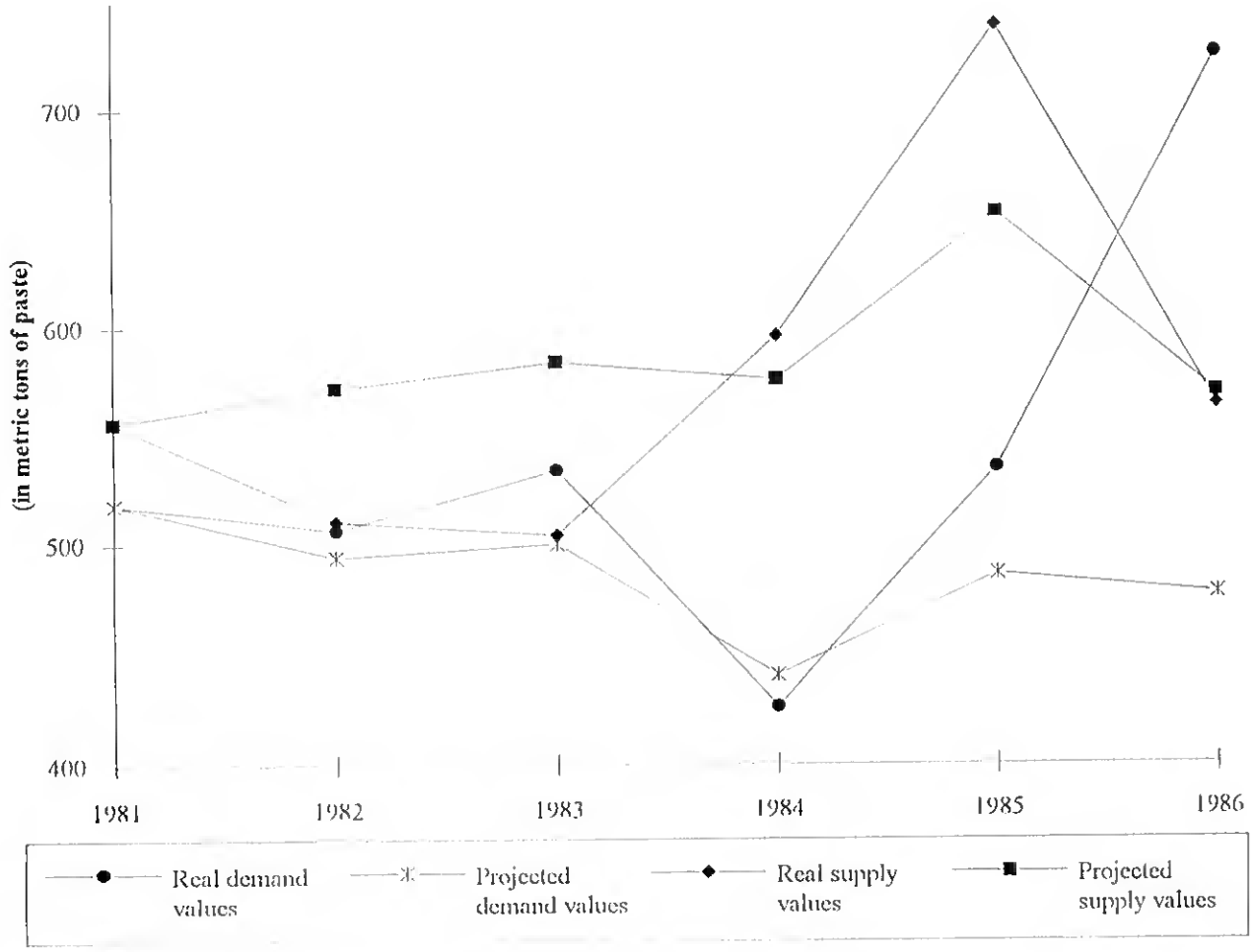
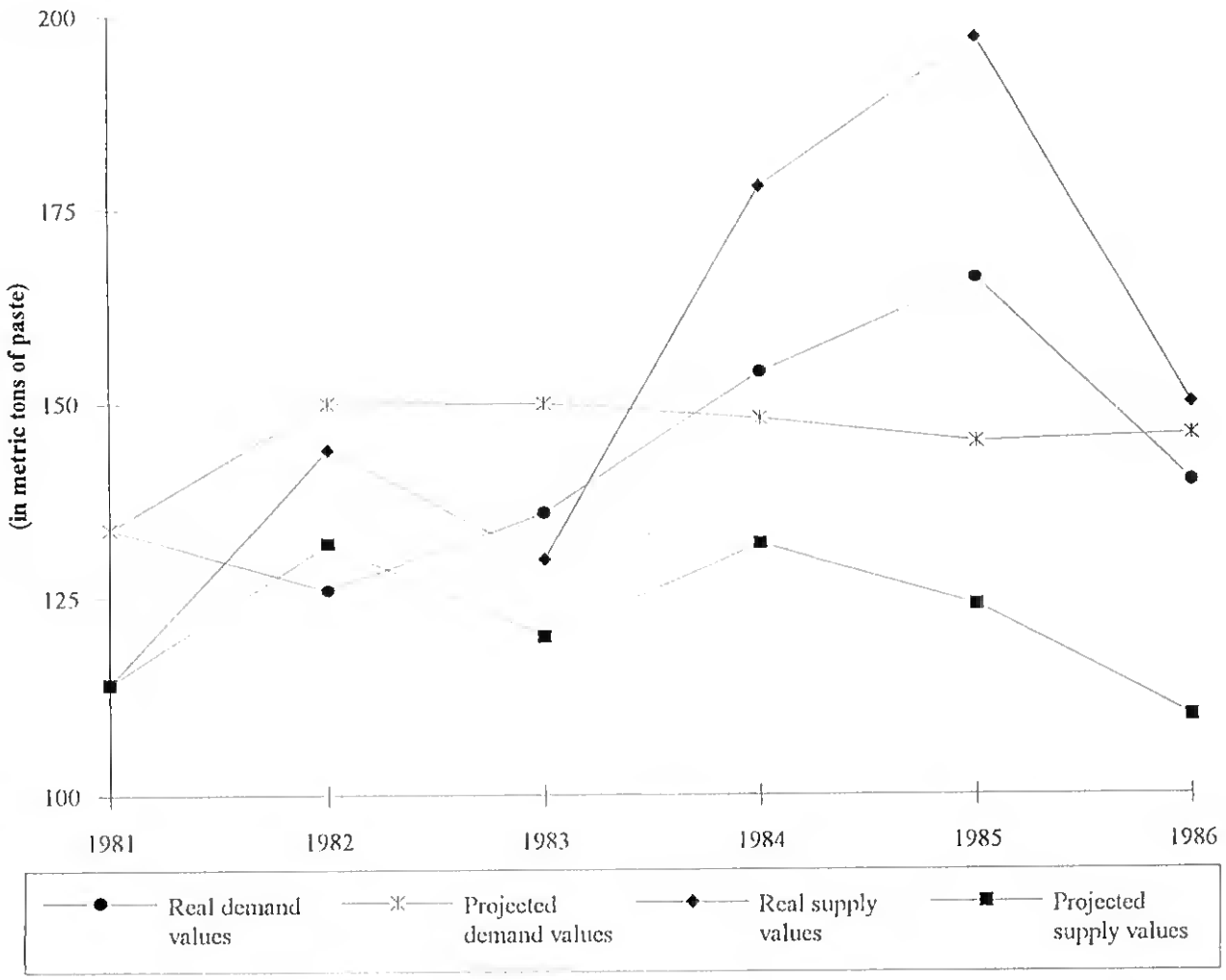


Figure 5.3
Comparison Between Ex-Post Projections and Real Supply Values of Spain and Portugal



5.3. SPECIFICATION OF THE PROPOSED SCENARIOS

To detect the result of alternative hypotheses of political variables, 24 different initial projections were prepared (see Appendix 5.3). First our concern was restricted to tomato paste and then in a sequence of other projections price changes in the peeled product were introduced to analyse possible variations in produced quantities. In all cases for several guarantee prices different evolution in subsidies and quotas were considered for Italy and France, Greece, Spain and Portugal.

For the minimum guarantee prices we specified the following situations: 1- An increase of minimum prices for the Portuguese and Spanish farmers until equalising these with the other Countries of the EC. 2- A decrease of the prices in Italy and France to reach the level of the observed prices in the recently integrated countries. 3- An intermediate situation of gradual increase of prices in Portugal and Spain and decrease in the others.

The consideration of quotas was first despised. Then, we have tried to evaluate both, the less restrictive effect of quotas (supposing an increase of about 8 to 9 % a year, in the value of the quantities to be supported by subsidies) and also a more restrictive one. This last effect being characterised by the assumption that for EC(10), the eligible quantities for subsidies would stay constant while the quotas would not be restrictive for Portugal and Spain.

Having in mind that the permanence of the existing subsidies situation or the complete dismantling of these kind of supports is the more probable political attitude to be taken by the EC the study was supplied with three alternative options, one with a radical and two with slow forms of subsidies abolishment.

SUMMARY OF CONSIDERED PARAMETER VARIATIONS

1. Producer prices:
   - a) EC(10) - keep MGP constant
   - b) EC(10) - decrease MGP
     SP - keep MGP constant
   - c) EC(10) - decrease MGP
     SP - increase MGP
2. Subsidies variations:
   - a) Decreasing subsidies for EC(10)
     Increasing subsidies for SP
   - b) Decreasing subsidies for EC(12)
   - c) Decreasing subsidies for EC(10)
     Constant subsidies for SP
3. Introduction of production quotas:
   - a) Constant quotas for EC(12)
   - b) Increasing quotas for EC(10)
     Constant for SP

4. Tariff system:

   a) SP pay normal tariffs

   b) SP benefit from integration

5. Sensitivity analyses:

   a) Price elast. of supply = + 2.0, for all countries

      Price elast. of demand = - 1.0

   b) Price elast. of supply = different for each group: [EC(10):+2.0; SP:+2.5; OMC:+2.5; USA:+2.0; RW:1.0;]

      (these elasticities are similar to the ones found for the model validation)

   Price elast. of demand = - 0.5

6. Relationship with other products:

   a) Price of peeled constant

      Cross elast = 0

   b) Decrease in price of peeled

      Cross elast = + 0.5 and + 1.5

   c) Increase in price of peeled

      Cross elast = + 0.5 and + 1.5

6. DISCUSSION OF THE RESULTS.

6.1. DISCUSSION OF THE SCENARIOS: PLAUSIBLE SCENARIOS AND SCENARIOS FOR INSTRUMENTAL ANALYSIS.

6.1.1. THE INTRODUCTION OF A SYSTEM OF TARIFFS.

One of the initial interests of this work was to investigate the eventual benefits for Portugal and Spain resulting from the utilisation of the policies of agricultural protectionism practised among the other member states of the European Community (here called the EC(10)). For these two alternative scenarios were created: One in which the two countries in question had to pay a customs duty of 20%, simultaneously not being integrated in any of the EC(10) supporting systems, the other in which the EC(10) would benefit from the supports of the CAP structured on a system that would be maintained unaltered at 1986 level. The second scenario reproduces the existent situation.

Table 6.1.1. compares the two situations described above and permits the conclusion, as might have been expected, that application of tariffs to the Iberian countries would limit their production in such a way that at the middle of the projection period the production could be reduced by about 50% relative to the quantities produced in 1986. It is of interest, however, that under these conditions and in consideration of the demands of the international market, the upcoming deficit would not be compensated by the remaining european producers as might have been expected.

TABLE 6.1.1

Percent Variation in Production

(Tariffs are kept for Spain and Portugal)

Time	EC(10)	SP	OMC	U.S.A.
1	-0.06	-0.08	-0.06	-0.05
2	-0.07	-0.21	-0.05	-0.04
3	-0.05	-0.38	0	0
4	-0.02	-0.50	+0.07	+0.08
5	0	-0.59	+0.16	+0.17
6	+0.05	-0.66	+0.25	+0.26
7	+0.08	-0.73	+0.33	+0.34
8	+0.15	-0.77	+0.52	+0.50
9	+0.20	-0.81	+0.69	+0.62
10	+0.25	-0.85	+0.88	+0.77

Note: Base year is 1986, tariffs are 20% and subsidies are maintained constant during the projection period.

These would only increase their productions by 25% at the end of the projection period. The supply on the international markets would have been covered essentially by the other Mediterranean countries and the U.S.A.

The serious situation of losses in production for Portugal and Spain did not appear in any of the other scenarios, not even in those in which the post-integration process became (hypothetically) less favourable. This statement is supported by the results shown in Figures 6.1 and 6.2.

For a more clear discussion of all the results we decided to arrange the scenarios into two groups depending upon the nature of the conclusions that can be drawn from them:

1) Plausible scenarios - which include the entire body of the present system of support of the CAP;

2) Instrumental scenarios - which permit us to reflect upon the utility of this type of models as a practical instrument for the evaluation of agricultural policies and which are based upon an evaluative and detailed analysis of the effects of variations in MGPs, subsidies and quotas upon the produced quantities of tomato paste. These scenarios will be simultaneously utilised with the intention of analysing the possibilities for the tomato-paste sector if the future reformation of the CAP happens within the terms of a liberalisation of world trade being negotiated in the Uruguay Round.

6.1.2. PLAUSIBLE SCENARIOS (SHORT TERM)

This set of scenarios includes projections 6 and 10 of the series shown in Appendix 5.3. In them we try to reproduce the conditions of the classical transition regime formulated in the Treaty of Adhesion of Portugal (Art. 238, Act of Adhesion, 1986) in which the MGPs were about 60% of those practised by the rest of the community in 1986.

We have considered an increase of about 5.7% per year in the production price of tomato for processing in Portugal and Spain so that at the end of the proposed transition period (5-7 years) these countries attain the MGPs practised by the remaining european producers. Besides this it was considered that the subsidies would suffer a slight decrease (10%) during the last five years in the EC(10) as well as an increase of the order of 42% for Portugal and Spain in the same period. These conditions were maintained unalterable in the two scenarios, the only parameters varied being the different system of quotas which, in scenario 6, present a slightly restrictive effect on production in Portugal and Spain although they are maintained constant. In the alternative scenario, quotas are not applied, which is in reality the case since in practice, the applied quotas have been very similar to the previous year's maximum production and cannot, therefore, be considered restrictive.

Scenario 10, is the one that reproduces the totality of conditions attributed by the CAP as well as a more or less constant evolution of these policies up to the end of the projection period. It suggests a more detailed

observation of the evolutive behaviour predicted by the model for the supplied, demanded quantities, and production prices.

The conclusions that can be drawn from the projections based on that scenario are:

1 - An examination of Table 6.1.2. shows that these measures create an increase in the tomato supply of a maximum of 65% for the EC(10) and 20% for Portugal and Spain, at the end of the projection period, with a protection of the price system which allows them to have positive variations, but a decrease in the equilibrium prices towards the world level.

2 - The variations noted created also some expected changes in trade patterns, as can be seen in Table 6.1.3

3 - On the other hand, we can conclude from the model results that the prices that the U.S.A. has to support have a tendency toward reduction without a protective mechanism to sustain them (without taking into account possible effects of variation in exchange rates). This situation agrees with reality. It must be noted, however, that these tendencies decrease after the sixth period of projection which means that from 1993 the U.S.A. will not have to support progressively accentuated reductions in equilibrium prices. An extension of the projection period for more than 10 years suggests that the EC would have to undertake a further strengthening of its instruments of support in order to continue increasing its production.

TABLE 6.1.2

Expected Variations in Supply and Demand of Tomato Paste (%)

Countries		EC(10)	SP	U.S.A.
Reference Quantities (Units:1,000 m.t.)		565	151	692
Supply	2nd. Period	+0.31	+0.01	-0.13
	4th. Period	+0.43	+0.05	-0.26
	6th. Period	+0.45	+0.13	-0.31
	8th. Period	+0.65	+0.15	-0.37
	10th. Period	+0.50	+0.20	-0.38
Demand	2nd. Period	+0.07	+0.26	-0.05
	4th. Period	+0.05	+0.24	-0.11
	6th. Period	+0.03	+0.19	-0.13
	8th. Period	+0.03	+0.16	-0.16
	10th. Period	+0.03	+0.14	-0.17

TABLE 6.1.3

Expected Variations of the Trade Balance of Tomato Paste

(Units: 1,000 m.t.)

Countries	EC(10)	SP	U.S.A.
Reference Quantities	-279	+6	+206
1st. Period	-101	-24	+198
2nd. Period	-29	-30	+141
3rd. Period	+24	-30	+106
4th. Period	+56	-22	+81
5th. Period	+69	-12	+65
6th. Period	+75	+2	+56
7th. Period	+80	+5	+47
8th. Period	+88	+10	+38
9th. Period	+98	+13	+31
10th. Period	+106	+16	+24

4 - Although the efficiency of the subsidy and MGP-variation measures have been enormous for the european production, as can be deduced from the marginal variations observed in Table 6.1.2., it seems that such efficiency has achieved its maximum for the group EC(10) at the 8th. projection period, after which it is to be expected that the variations begin to decrease.

5 - In the same Table the demanded quantities also show positive variations although for the groups considered these variations tend to decrease continuously.

6 - The effects of quotas on the present system of minimum prices and subsidies can be evaluated by a comparative analysis of the projections at the end of the periods for scenarios 6 and 10 (see Table 6.1.4.). The following may be concluded:

1) The scenario that considers increasing quotas for the EC(10) and constant quotas for Portugal and Spain (scenario 6) which could be considered a brake for the production of the Iberian block, permits the EC(10) an increase in production of the order of 6% more than if the quotas of these countries were maintained constant (scenario 10). However, this system would also serve to maintain lower prices on the world market (where they could get up to 18% lower). The consequent effects would not be excessively restrictive for Portugal and Spain (these countries being under protective influences) but at the same time would mean significant drops (up to about 35%) in the production of the U.S.A.

TABLE 6.1.4

Expected Variations in Production of Tomato Paste (%)

	EC(10)	SP	U.S.A.	Δ Supply Prices on World Market
Scenario 6	0.56	0.23	-0.35	-0.18
Scenario 10	0.50	0.20	-0.38	-0.22

2) The scenario 10, which reproduces the existing system, without restrictive quotas for Portugal and Spain (as discussed earlier) presents equilibrium prices on the world market with even larger breaks than the previous scenario.

6.1.3. THE INSTRUMENTAL SCENARIOS (MEDIUM TERM)

1. Influences of modification of subsidies:

These are among the most efficient of the instruments of control for the agricultural policy and it is also known that the same quantities of subsidies attributed under different conditions are capable of producing different effects.

Percent variations in production were analysed in a scenario in which subsidies were maintained constant in the EC(10) and increased in Portugal and Spain. This situation was compared with three other scenarios in which successive reductions of subsidies were considered.

The disadvantages that a policy of intense subsidies in the EC(10) would cause in the rest of the world markets is evident from a simple observation of the results presented in Figure 6.1. It is clear that the large increases in the quantities produced in the EC(10) would completely abolish the possibility of the U.S.A. and other Mediterranean countries competing in the world market. Even an increase in subsidies to the Iberian block would not be sufficient to maintain the level of production in this block at constant levels (Projection 1).

Nevertheless, as can be seen in Projection 2, even a small increase in subsidies to the Iberian block combined with a decrease in subsidies to the rest of the european producers would cause a more moderate development for the european producers with notable advantages for the Iberian block and less disadvantages for the American ones.

2. Total abolishment of the subsidies policy:

As seen above, the application of high subsidies to the EC producers has catastrophic consequences for the rest of the world markets unless the other producing countries decide in one way or another to protect their own markets too.

Scenarios which could simulate such situations were not considered by us also because we are more stimulated to observe the reactions resulting from the gradual disappearance of artificial instruments to increase agricultural growth. Thus, presupposing that this system of supports will not be able to continue in the future in its present form, but will rather have a tendency to disappear in a somewhat indeterminate period (which, for practical reasons have been considered to be equivalent to the projection period), important consequences are to be expected at the level of all the world markets as the results of two different projections shown in Figure 6.2 show.

Firstly, in a situation free of all restrictions, it is noted that the non-european producers will be able to increase their productions by 50% giving rise to a new world-market structure in which the EC(10) production will drop to 60% and production of the Iberian block to 40% of current values as shown in Projection 3.

There is, however, an intermediate position between the extreme scenarios presented so far. This would require a decrease in the subsidies within the EC(10) up to the point where these subsidies attain the constant values applied to Portugal and Spain. This scenario shows effects at medium term which are more balanced for all participants in the tomato-paste market (Projection 4).

3. Influence of modifications in the minimum prices:

Table 6.1.5. is made with the intention of analysing the influence that variation of producer prices could have upon the supply quantities of the processed product. In this Table we consider different options used for price variation in conjunction with four alternative subsidy programmes. The results of these variations in the model parameters suggested the alterations in offered quantities shown in Figure 6.3.

Possible conclusions are as follows:

- Regardless which of the alternative subsidy programmes presented is applied, for each one of them the isolated fact of increasing the minimum prices for the Portuguese and Spanish producers is not sufficient to permit the processors of these countries to significantly increase their quota of participation in the international market.

- On the other hand, these programmes could be considerably more effective for the Iberian block if combined with decreasing prices for the EC(10) as can be seen in projections 13 and 25 of Figure 6.3. Application of reduced minimum prices in the producing countries of the EC(10) would provoke a decrease in equilibrium prices on the world market whose consequences are evident in projections 13 and 25.

- As the subsidies decrease in the EC(10), the influence of the instrument " minimum prices " is progressively less.

TABLE 6.1.5

Variations of Subsidies \ Variations of MGPs	EC(10) constant, SP increase	EC(10) decrease, SP constant	EC(10) decrease, SP increase
EC(10) constant, SP increase	Projection 1	Projection 13	Projection 25
EC(10) decrease, SP increase	Projection 2	Projection 14	Projection 26
EC(10) decrease, SP decrease	Projection 3	Projection 15	Projection 27
EC(10) decrease, SP constant	Projection 4	Projection 16	Projection 28

- Also, and along the same lines of thought, it is in the projection 3, where the practice of higher minimum prices (and consequently higher equilibrium prices for the U.S.A. and other countries) as well as drastic reduction of subsidies occurs, that the U.S.A. and other countries rapidly re-establish an equilibrium situation. In this case much more accentuated percent variations in production are to be expected than if there were decreases in the MGPs (compare projections 3, 15 and 27). The consequent loss of market fraction for the european producers would be serious.

4. Modifications of subsidies in presence of quotas:

Establishment of a system of quotas predetermines that only a certain part of the production be considered for the regulations of market protection. Thus, if these policies are applied in the presence of a quota system, the market mechanisms will encounter their equilibrium at different levels of production. The combined effects of the application of subsidies, minimum prices for producers and quotas predicted by our study are shown, contrasting Figure 6.4 to Figure 6.5.

The conclusions that can be derived from the projections that relate these combined conditionings are the following:

- With quotas the reactions to changes in subsidies are slower but develop in the same direction as they would if in the absence of quotas. These serve to dampen reductions in production in the European countries from 27% to 12% for drastic reductions of subsidies.

- In the Iberian countries the effects of the same program of subsidies are radically depending upon wheter a system of restrictive quotas exists or not. In their absence reductions of subsidies in the EC(10) would be sufficient to motivate about 40% more Iberian production than if the subsidies in the EC(10) were maintained constant. On the contrary, the existence of a system of quotas for the Iberian countries would transform the effect into a negative one with possible reductions of 34% in production. This shows up to what extent a system of restrictive quotas for Portugal and Spain could decrease the stimulating effects of subsidy measures.

- The reactions of the rest of the international market show the same tendencies when subsidies are applied with or without quotas. The rapidity of market reaction is, however, more accentuated in the absence of quotas.

Figure 6.1
Expected Changes on Supplied Amounts of Tomato Paste: Considering Different Subsidies and no Quotas

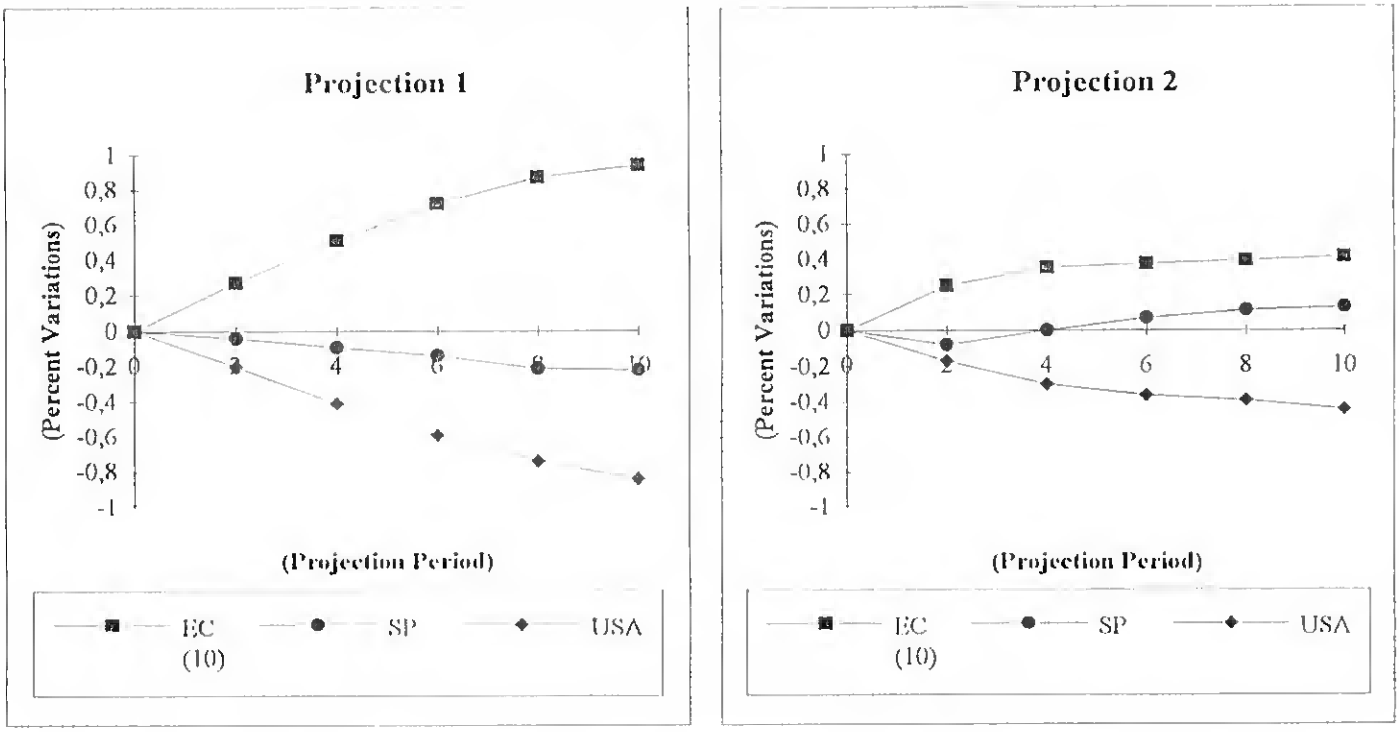


Figure 6.2
Expected Changes on Supplied Amounts of Tomato Paste: Considering Different Subsidies and no Quotas

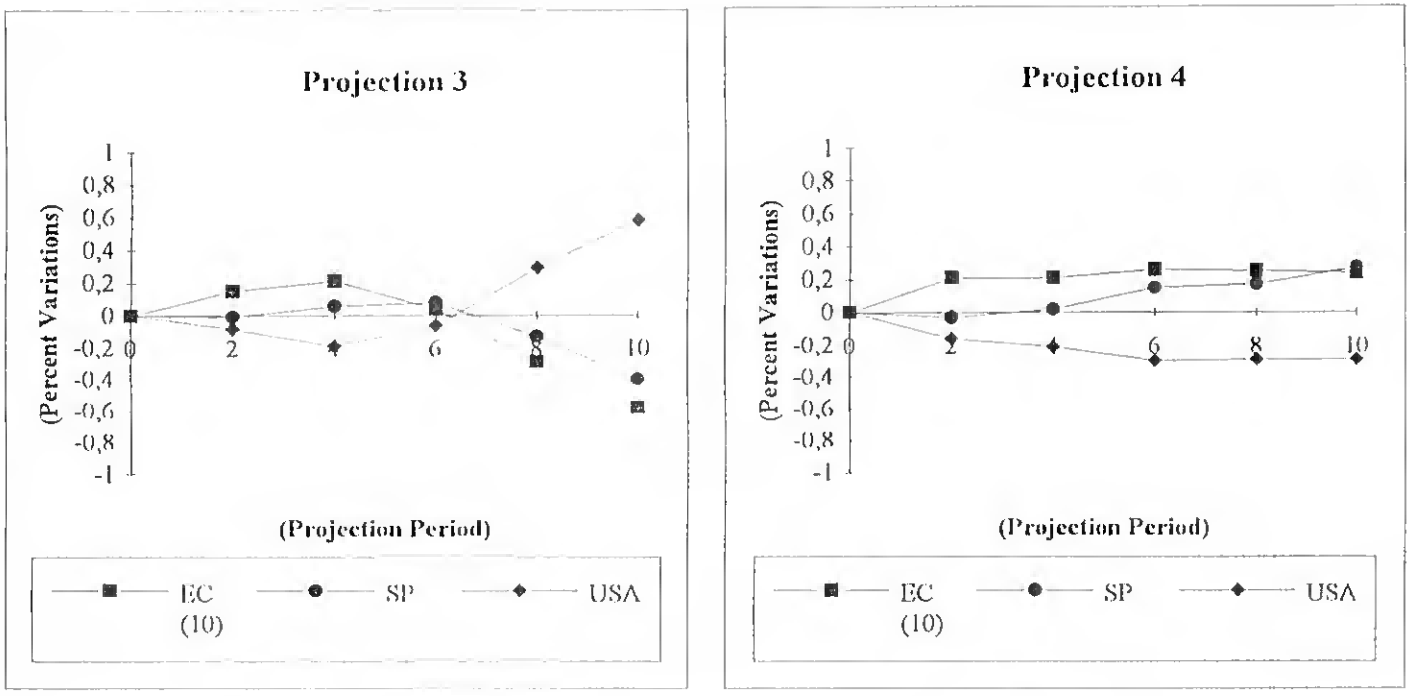


Figure 6.3 (1)
Expected Changes on Supplied Amounts of
Tomato Paste: Considering Guaranteed Price Variations

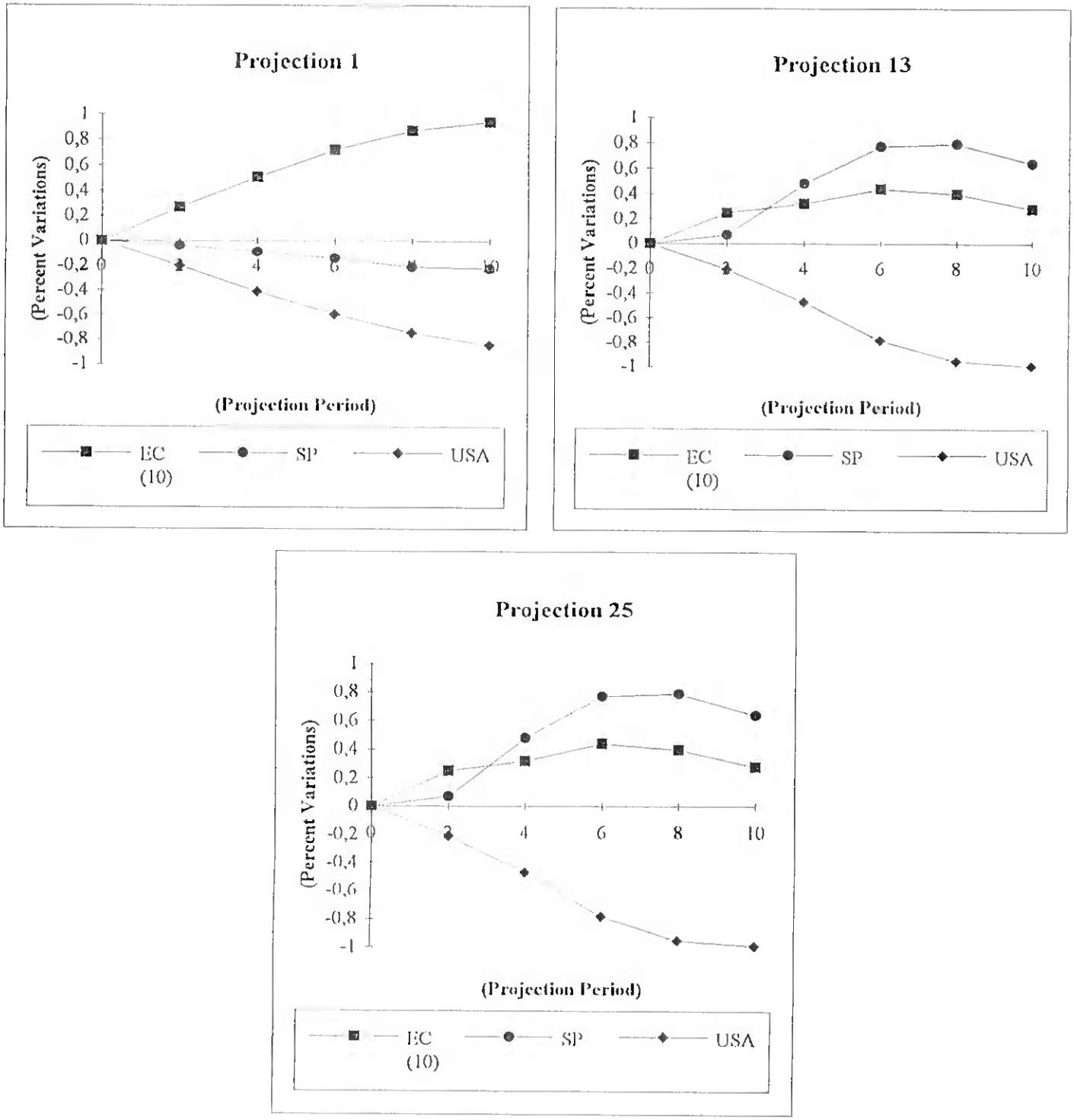


Figure 6.3 (2)
Expected Changes on Supplied Amounts of Tomato Paste:
Considering Guaranteed Price Variations

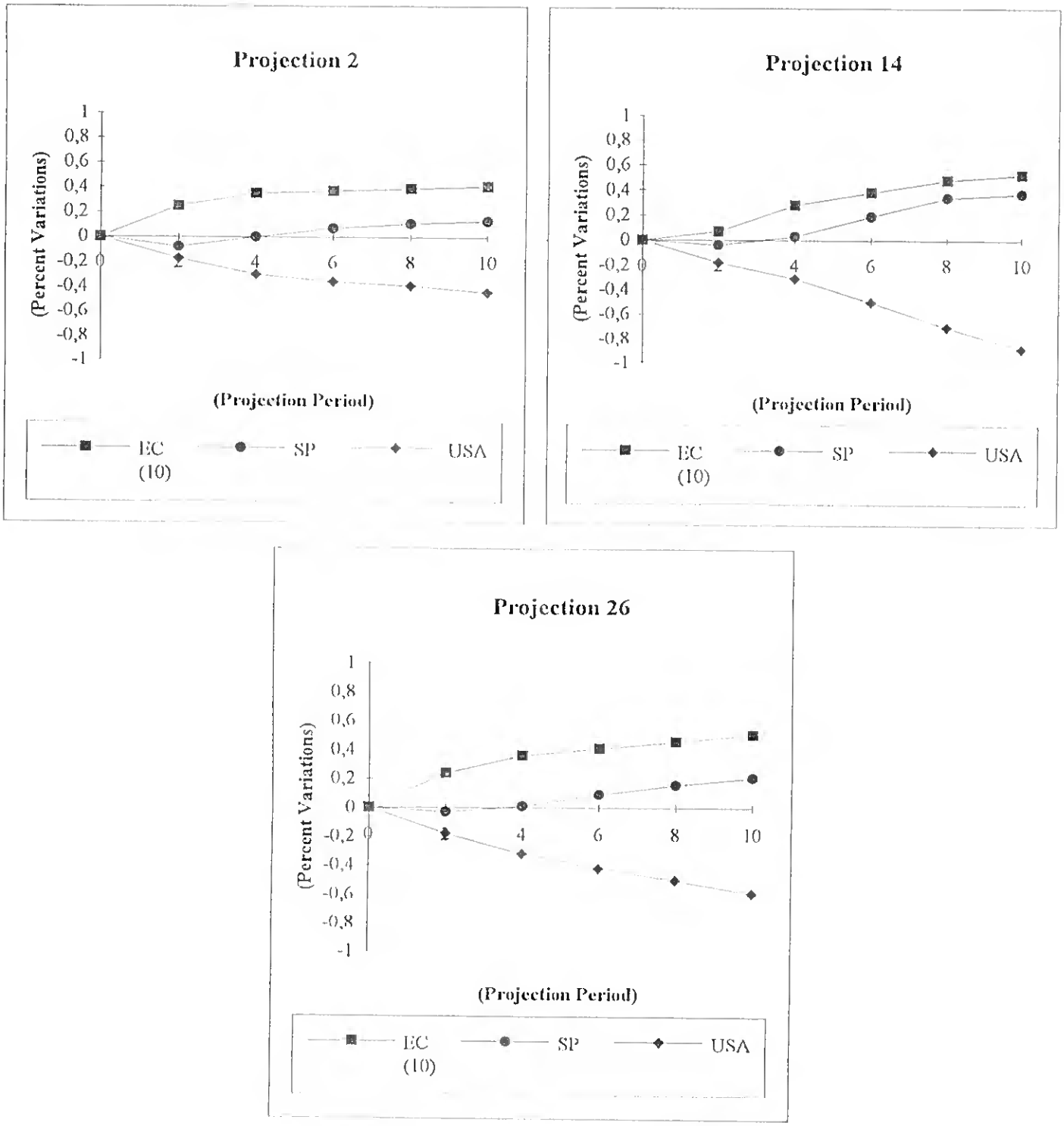
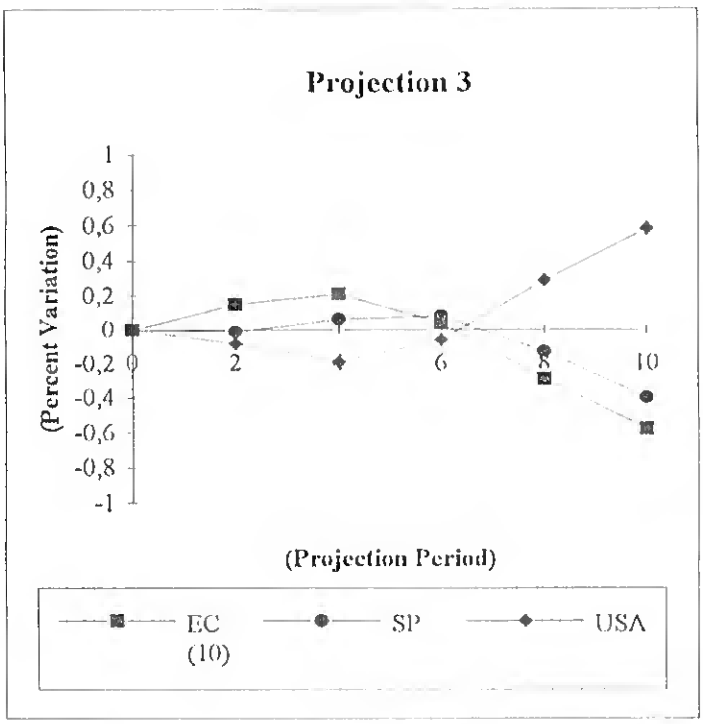
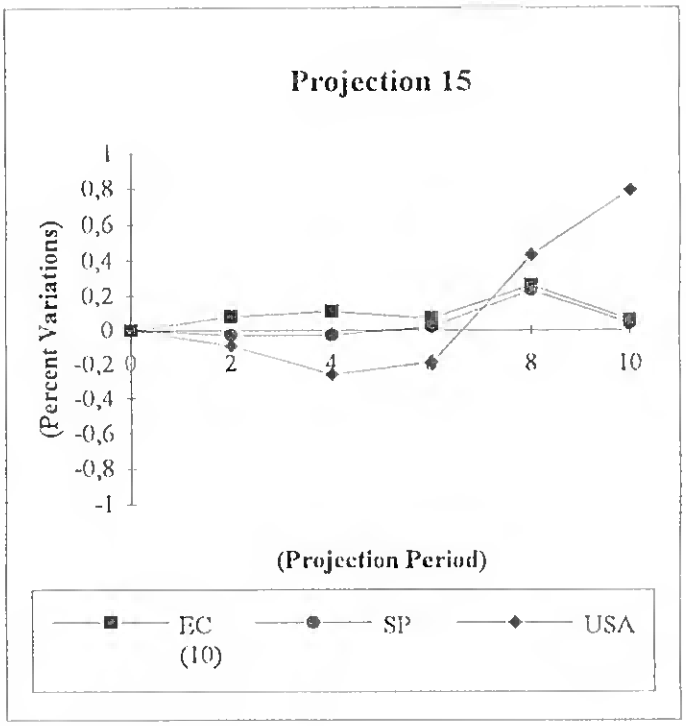


Figure 6.3 (3)
Expected Changes on Supplied Amounts of Tomato Paste:
Considering Guaranteed Price Variations





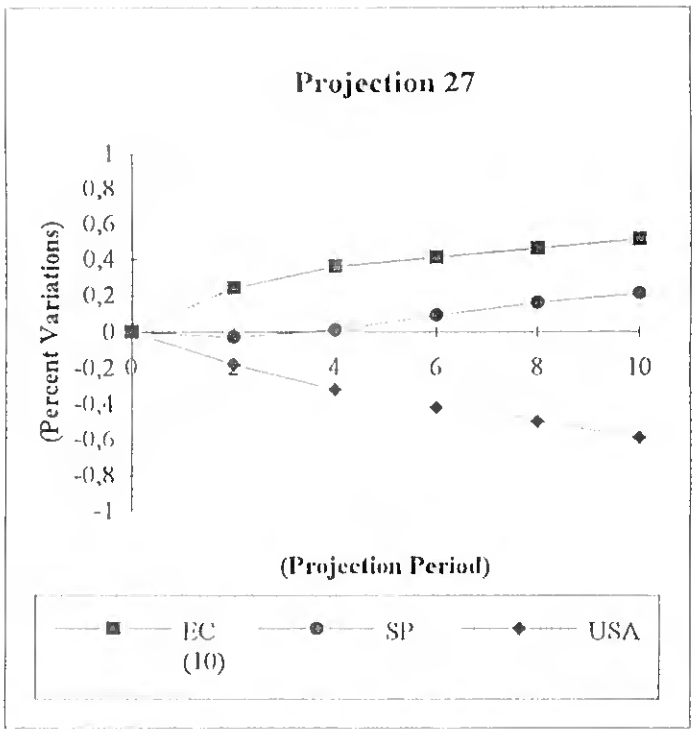
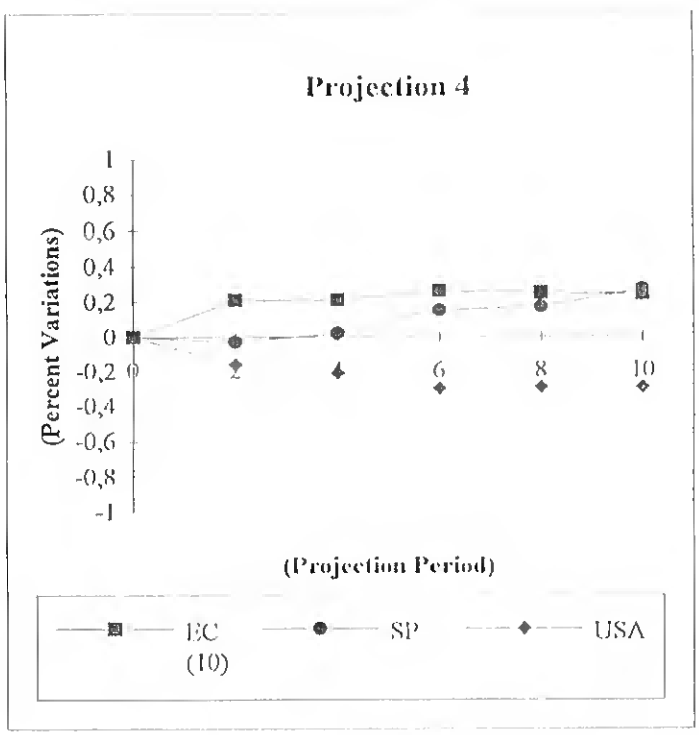
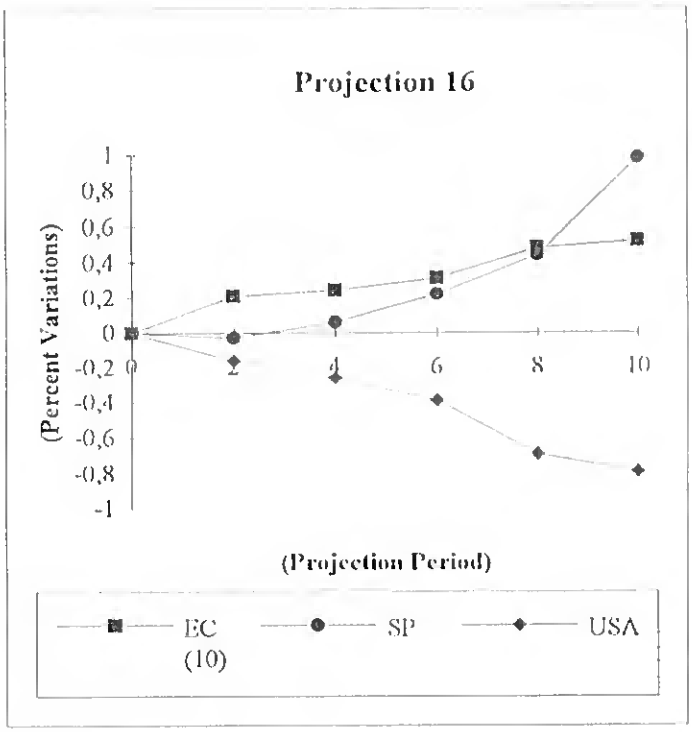


Figure 6.3 (4)
Expected Changes on Supplied Amounts of Tomato Paste:





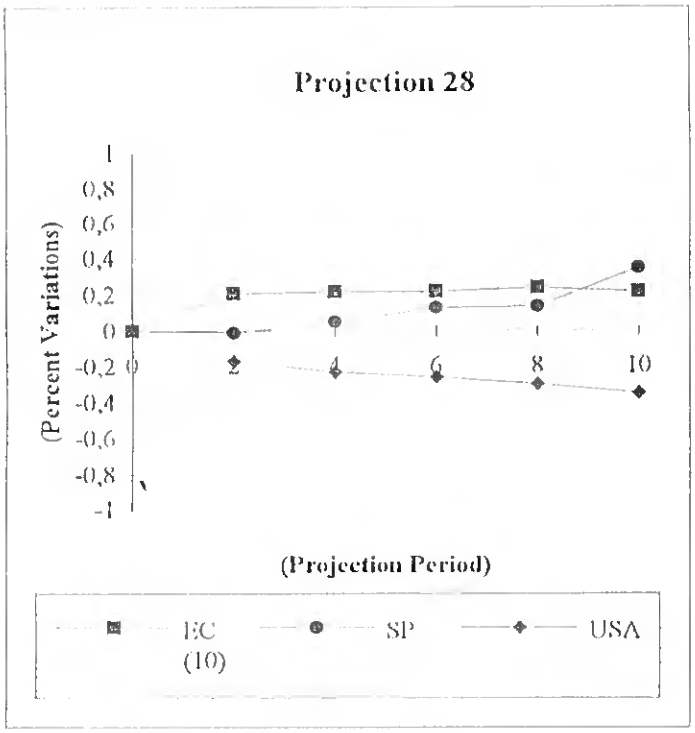


Figure 6.4
Changes Considering Increasing Amounts
For Quotas

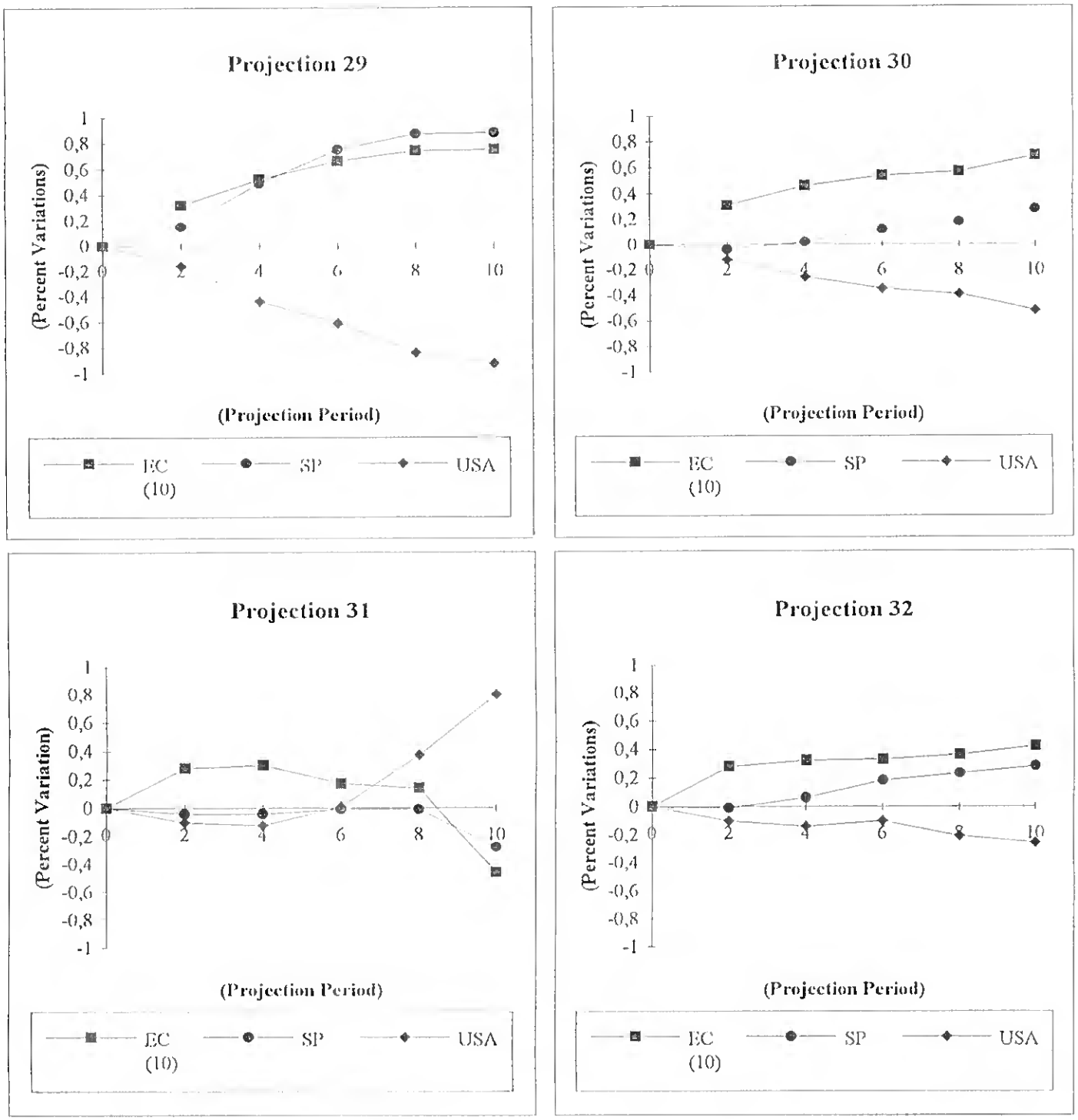
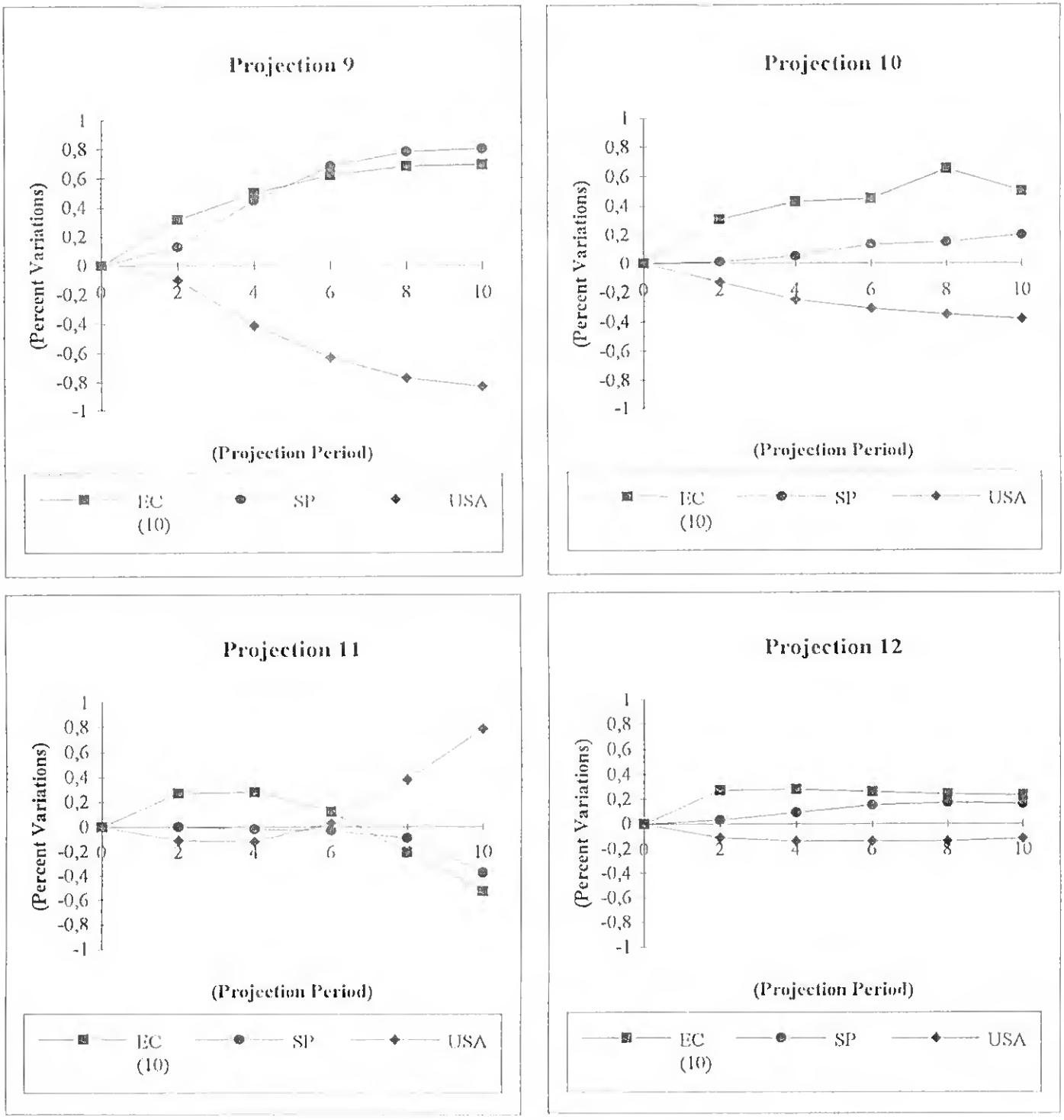


Figure 6.5
Changes Considering Constant Amounts
For Quotas



6.2. SENSITIVITY ANALYSIS

Sensitivity analyses are essencial for the modelistic studies undertaken here. It is known that the advantage of the simplistic aspect of simulation models does not include an estimation of the elasticity parameters. These must be chosen on the basis of previous econometric studies or empirical analyses of the "data-validation" type which can serve as a justification for the used values.

The usefulness of sensitivity analyses is a consequence of the easy comparison of the results obtained using different elasticities in the modelling procedure. This allows the correct appreciation of the amplitude between the different equilibrium points if extreme plausible values for the elasticities are considered. As a result, it becomes possible to judge the relative interest of econometric calculations for the situations that are being reproduced.

This section discusses the alterations in the equilibrium situation resulting from the variations in the demand and supply price elasticities. Since the demand and supply functions are logarithmic, the elasticities have been considered to be constant over the whole projection period. The methodology compares the plausuible situation referred to in section 6.1 of the preceeding chapter in which the supply and demand price elasticities were considered to be respectively 2.0 and -1.0, with a situation derived from elasticities equivalent to those verified in our study of the year 1985. In this case the values of the derived parameters had different supply price elasticities for each group of countries examined: EC(10) and U.S.A., +2.0;

SP and OMC, +2.5, and RW, +1.0. On the other hand, the demand price elasticities were similar for all the countries having the value of -0.4.

Considering that the demand price elasticity presents a different value from the one used in the previous projections, i.e. El(d) = -1.0, it is to be expected that for the same price variations there will be smaller changes in the demanded quantities. This theoretical assumption can be confirmed in results of sensitivity analises reported in Table 6.2.1.

TABLE 6.2.1

Sensitivity Analysis (Variations in Total Demand)

Period (starting year is 1986)	Price Elasticity of Demand = -1	Price Elasticity of Demand = -0.4
0	1801	1801
1	1792	1789
2	1742	1775
3	1701	1778
4	1666	1661
5	1641	1657
6	1624	1653
7	1611	1651
8	1600	1649
9	1593	1647
10	1587	1645

Note: Price Elasticity of Supply = 2.0

Unities: m.tonnes

For the product tomato paste, we can conclude that in case demand price elasticities are -1.0 the expected variations of demanded quantities as a result of alterations in political parameters (reduction in subsidies for EC(10) and

increase in MGP in Spain and Portugal) will result in a decrease in about 22%. On the other hand, in case this elasticity is considered to to be -0.4 (possibly a more realistic value considering the model validation results), the reduction expected in demand quantities will be less, i.e. about 9.7%.

It must be pointed out that in order to obtain a more transparent evaluation of the reactions to different political measures, the model considers a rate of increase in demand as an exogenous factor coupled, for example, to population increases or to changes in consumer tastes.

If the supply price elasticity differs for each country and if we suppose the values of these parameters to be El(s) = +2.0 for EC(10), El(s) =+2.5 for OMC and El(s) = +1.0 for the rest of the world, it is to be expected that different reactions in the equilibrium quantities appear. Specifically, in the countries in which the supply becomes more elastic the reactions in the supplied amounts to the same price variations will be more accentuated as illustrated in Table 6.2.2. In fact, on the world market the quantities of these offered products, will be greater by about 6% under these conditions. This situation would be justified by essentially two distinct reasons which would have a considerably greater significance for Portugal and Spain than for the rest of the world: 1) The reaction of Portugal and Spain to increases in the MGP would be greater, thus creating greater increases in production; 2) The rest of the world, encountering systematically equilibrium prices as a result of the european protectionist policy, would have, in view of the new scenario (i.e., a greater inelasticity of supply in these countries), more delayed reactions which would permit that the expected reductions in produced quantities should be less.

TABLE 6.2.2

Sensitivity Analysis (Variations in Supply)

Period (Starting year is 1986)	El(s) = 2.0 (Spain and Portugal)	El(s) = 2.5 (Spain and Portugal)	El(s) = 2.0 (Rest of the World)	El(s) = 1.0 (Rest of the World)
0	151	151	187	187
1	156	159	184	183
2	156	162	175	170
3	162	163	169	159
4	164	175	164	132
5	171	181	162	128
6	178	191	160	125
7	183	201	156	122
8	188	209	153	119
9	190	215	151	116
10	192	219	149	113

Note: Price Elasticity of Demand = -0.4

Price Elasticity of Supply = El(s)

Unities: m.tonnes

6.3. THE RELATIONSHIP BETWEEN TOMATO PASTE AND PEEELED TOMATOES

Acording to Ravara (1992), the future exports of processed tomatoes to the U.S.A. will tend to face an increasing competitivity on the basis of strategies for the functional integration of production, processing and marketing, and a decreasing importance of conventional strategies of price and quality controls.

Up to what point this conclusion could directly affect the portuguese industry is questionable since our exports to the U.S.A. represent only about 6.6% of the total exports in 1990 and, on the other hand, we have to consider that most of the countries to which portuguese concentrate is destined still base their options on price strategies as is the case of Algeria, Irak or the eastern european countries. The conclusions of Ravara(1992) should, however, be considered as a cautionary signal.

The tendency towards an increasing consumption of peeled tomatoes and other derivatives on the world market as well as the possibility that countries, other than the U.S.A., may develop marketing circuits for the product, have stimulated us to evaluate the substitutability of the product paste with the product peeeled. It is known that those enterprises which produce peeled tomatoes can easily integrate other products of second or third processing order in their productive processes.

In the modelling procedure the use of simulation techniques, allowed the evaluation of the effects that price changes of peeled could produce in

equilibrium quantities of paste. In the model, a new exogenous variable has to be introduced to represent prices of the related product. The calculation of crossed effects will follow the values atributed to cross-elasticities, itself a result of the knowledge about the previous relation between these two products.

In Appendix 6.3. the calculations done to obtain cross-elasticities have been outlined in detail. The product paste was classified as being "distantly substitutable" with respect to the product peeled, since the calculated values for the cross-elasticities for different years and countries presented the following variation: El(i,j) = +0.5 to El(i,j) = +1.5 (very occasionally).

The results from model simulations are as follows:

1) If the practised prices for peeled tomatoes decrease, the industry related to this product tends to lose interest and transfers its attention to paste. The increase in production is, in this case, directly proportional to the substitutability of both products. Table 6.3.1. reports the possible reactions in supplied amounts of paste for the two extreme values of El(i,j).

2) Increase in prices of peeled will discourage production of paste because producers will feel more motivated to reestructure their enterprises and produce the more expensive product. It is then to be expected that the possibilities for change in production of paste will be more accentuated the greater the substitutability of the products is. Table 6.3.1, also illustrates this fact.

3) Supposing that at medium term the quality expectations of the main paste consumer countries change, forcing an explosive increase of demanded quantities for peeled or other second and third processing level products, price would be higher until market equilibrium. Also in this case, consequent decreases in paste production would not be much more then 2 - 4% for the european block and not much different for the U.S.A.

TABLE 6.3.1

Effects of Price Variations of Peeled Tomatoes

(One Projection Period)

El(i,j)	_ Price of Peeled	Variations in Demand of Paste			
		EC(10)	SP	U.S.A.	OMC
0.5 (Low Subst.)	+10%	-2%	-2%	-1%	-1%
1.5 (High Subst.)	+10%	-4%	-4%	-3%	-3%
0.5 (Low Subst.)	-10%	+2%	+2%	+1%	+1%
1.5 (High Subst.)	-10%	+10%	+21%	+43%	+43%

7. THE PORTUGUESE TOMATO PROCESSING SECTOR

7.1. PORTUGUESE AGRICULTURE AND THE SIGNIFICANCE OF TOMATO PRODUCTION

The problems of the portuguese agricultural sector have been detected and defined in recent years and its structural crisis is a well diagnosed phenomenon. In the past few decades the evolution of the sector has been different from that of the general economic situation. The latter has shown some periods of rapid growth whereas the agricultural sector has shown allow and irregular participation in the economic activity. A comparison between the average rates of growth of the total GDP and the one of the several sectors from 1986 to 1989 is presented in Table 7.1.1.

Behind this low contribution of the agrarian sector one also encounters a low agricultural productivity. As can be seen in Table 7.1.2 productivity in this sector has a decreasing tendency until 1981 which was compensated by institutional efforts during the pre- and post-integration period.

Compared to other countries, the productivity rates are low and two distinct symptoms are to be noted: 1) The characteristics of the population employed in the sector, that can be observed from the Table 7.1.3, show that a large percentage of the active portuguese population is occupied in the primary sector. From this segment 72% of the farmers are subsistence farmers, selling less then 50% of their total production, 45% of them are

older then 55 years of age and 44% are illiterate; and 2) Slow structural change (Pearson, Avillez and Tangermann, 1987). Different causes considered as physical and technical constraints may explain the referred phenomena as well as the continued persistence of the precarious agricultural situation in Portugal. Besides the poorness of the soil in many regions, we could suggest also the existent agrarian structure in what concerns land division (see Table 7.1.4), areas (see Table 7.1.5) and systems of cultivation as well as very rudimentary marketing structures.

TABLE 7.1.1.

Some Indicators of Global Growth

(Rate of Increase per Volume in m.t.)

	1986	1987	1988	1989
Gross Domestic Product	4648,0	+5,1%	+4,0%	+5,4%
Agriculture & Fisheries	342,3	+4,1%	-12,0%	+10,6%
Industry	1270,8	+2,8%	+2,4%	+4,9%
Services	2360,0	+7,5%	+4,4%	+4,7%

Source: Banco de Portugal (1989) Relatório do Conselho de Administração

Tabela 7.1.2.

Relative Labour Productivity in Portugal (1950-1980)

	1950	1960	1970	1980
Agriculture	0.79	0.59	0.56	0.41
Industry	1.20	1.25	1.17	1.34
Manufacturing	1.28	1.38	1.28	1.45
Services	1.10	1.39	1.24	1.19

Note: Labour productivity of the total economy equals unity.

Source: J.B. Donges et al. (1982) "The Second Enlargement of the European Community", Kieler Studien, Tübingen.

TABLE 7.1.3.

Percentage Employment by Sectors

Sectors	1987	1988	1989
Agriculture & Fisheries	22.1	20.6	18.9
Industry & Manufacture	34.7	35.9	35.2
Services	43.2	44.5	46.0

Source: Banco de Portugal (1989) Relatório do Conselho de Administração

TABLE 7.1.4.

Land Division as Percentage of Total District Area (Areas in ha)

(Region) District	I	II	III	IV	Total Area	Agro-Forest
(1) Viana do Castelo	0.34	0.15	0.51	---	118	87
(1) Braga	0.40	0.49	0.11	---	120	113
(1) Porto	0.35	0.49	0.16	---	114	109
(2) Vila Real	0.15	0.29	0.50	0.06	272	206
(2) Bragança	0.10	0.52	0.38	0.08	275	224
(3) Aveiro	0.38	0.35	0.17	0.10	142	135
(3) Viseu	0.34	0.34	0.30	0.02	228	189
(3) Coimbra	0.33	0.26	0.18	0.23	201	184
(4) Guarda	0.21	0.48	0.31	---	199	148
(4) Castelo Branco	0.12	0.25	0.56	0.07	297	265
(5) Leiria	0.36	0.35	0.22	0.07	159	151
(5) Lisboa	0.22	0.38	0.40	---	162	154
(5) Santarem	0.13	0.22	0.56	0.09	440	423
(5) Setúbal	0.03	0.08	0.63	0.26	386	369
(6) Portalegre	0.02	0.08	0.63	0.27	461	438
(6) Évora	0.01	0.05	0.53	0.41	573	554
(6) Beja	0.01	0.08	0.75	0.16	817	772
(7) Faro	0.16	0.47	0.37	---	215	160

Source: Own calculations based on "Recenseamento Agricola do Continente, 1979, INE, Lisboa.

Note: The farming enterprises have the following total areas: I = <3 ha ;

II = 3 to <20 ha; III = 20 to <2500 ha ; and IV = >2500 ha

TABLE 7.1.5.

Cultivated Areas (ha)

Region	Cereals	Rice	Potatoes	Oil Crops	Open Air Horti-culture	Open Air Hortofruti-culture	Flowers	Meadows & Pastures
1	25.391	----	45.092	21	11.502	186	78	109.514
2	79.001	----	44.269	5	3.392	239	7	19.371
3	53.315	8.747	59.664	31	10.459	257	43	85.332
4	70.184	----	37.162	11	5.351	393	5	85.452
5	141.204	19.583	26.755	1.636	28.117	5.137	183	37.461
6	404.943	6.996	6.983	30.825	8.935	4.042	21	83.143
7	30.905	87	4.200	172	4.016	626	7	3.858

Source: Own calculation from data in "Recenseamento Agrícola do Continente, 1979", INE, Lisboa

The significance of tomatoes for processing in the portuguese agriculture and particularly in the production of vegetables is very high. There is a total of 87000 ha dedicated to the growth of vegetables om which about 1.76 million tonnes are produced (not considering dried vegetables) (International Fruit World, 1-1981). In 1989 tomatoes for processing covered an area of about 16950 ha reaching an average production of 0.83 million tonnes and representing the second highest production soon after cabbages.

In the campaign for 1992 the preliminary contracts showed that the production area was about 13000 ha, 683000 tonnes of fresh tomato being expected to be produced (not published information from INGA, 1992).

7.1.1. AGRARIAN STRUCTURE RELATED WITH TOMATOES FOR PROCESSING

The production area concentrates in the centre of the country and the industry is located along the Tejo until about 100 Km northeast from Lisbon, in the Sorraia valley, Southeast from the Tejo and in the Sado valley. The land in these regions is flat to facilitate irrigation; the average yield per hectare differs from 25 to 70 tons, mainly as a consequence of the size of farms. Very little of the tomato harvest is mechanised. Typically, the harvest starts in the beginning of August, being over by September. For a more detailed technical reference about the existing growing conditions for tomatoes for processing, please see Acta Horticulturae, 277.

TABLE 7.1.6.

Production and Rentability of Tomatoes for Processing

Districts	1985 m.t.	Rentability m.t. / ha	1986 m.t.	Rentability m.t. / ha	1987 m.t.	Rentability m.t. / ha	1988 m.t.	Rentability m.t./ha	1989 m.t.
Beja	77,980	22.0	57.428	20.7	34.068	20.0	39,870	21.3	44.44
C. Branco	15.327	30.0	13,040	30.2	8.185	22.7	5,442	17.0	7,560
vora	57.667	36.0	55,280	35.0	40.636	32.2	30,089	22.5	33,44
Faro	179	35.8	191	30.0	2	28.7	—	—	—
Leiria	6.483	37.5	3,193	34.8	1.606	27.7	2,934	28.2	4,517
Lisboa	105.627	36.8	122,036	38.7	87.226	37.7	69,153	35.8	92,29
Portalegre	64.163	34.1	51,043	33.8	38.782	30.0	39,519	29.1	44,07
Santarem	297.277	40.0	276,128	41.3	188,853	40.2	198,876	39.0	298,62
Set bal	110,810	41.3	77,686	36.7	63.956	33.6	70,381	32.0	94,92

Source: Estatísticas Agrícolas 1985 - 1989, INE, Lisboa

Table 7.1.6 shows the evolution of produced amounts and the rentability of tomato production by district from 1985 to 1988.

The income of about 4000 farmers working with this product is dependent not only on the production capacity but also on minimal prices offered by the processors. The Table 7.1.7 reports the evolution of minimal guaranteed prices from 1976 until 1991.

These prices have developed in different ways in the EC and in Portugal, first decreasing and then staying constant for the european producers and increasing for the portuguese. Also, the industry received better subsidies and the national quota varied from 662,945 mt in 1989 to 747,945 in 1990 and to 832,945 in 1991. These increases originated an interesting rentability of the culture attracting more farmers to this product. Tomatoes have alternative cultures such as: corn, sunflower, melon and water-melon.

Table 7.1.8 relates some of these cultures considering the produced amounts and the production requirements related. Because melon and water-melon very easily reach levels of market saturation and have consequently price falls, sunflower and corn have been the preferred alternatives. Corn, no longer represents actually not any more such an attractive choice since its price was superior in Portugal to the prices offered in the EC. The introduction of the reformed CAP, offering a financial help based on

produced hectare and possible contention on subsidies for tomato industry may create however expectations that the sun flower will benefit from a growing interest, consequently competing more with tomatoes then before.

TABLE 7.1.7.

Evolution of Minimal Guarantee Prices in Portugal (PTE / metric tonne)

Finished Product	86/87	87/88		88/89		89/90		90/91		91/92	
			%		%		%		%		%
Concentrate	8826	10580	19.9	12617	19.3	13941	10.5	16134	15.7	17418	7.9
Peeled	9374	11775	25.6	14580	23.8	16616	14.0	19730	18.7	21771	10.3
Juice	8826	10580	19.9	12617	19.3	13941	10.5	16134	15.8	17418	8.0

Source: INGA (1992) unpublished data.

TABLE 7.1.8.

Compared Characteristics of Alternative Crops

Cultures	Production	Seeds	Water	Labour	Machinery
	m.t. / ha	kg / ha	m^3 / ha	Hours / ha	Hours / ha
Tomatoes	50	45	7,000	874	29
Sunflower	2.7	5.5	2,000	32	19
Maize (Corn)	8.5	22	6,250	68	28
Rice	5.5	200	18,000	141	28
Wheat	4	210	---	21	18

Source: Banco Pinto e Sottomayor (1992) Work in progress on the agriculture in the Tejo valley in the context of the C.A.P., obtained through INGA.

7.1.2 PROCESSING INDUSTRY

The tomato processing industry has been modernising in the last years. There are about 25 factories with producing capacities that may oscillate between 18000 mt and 125000 mt fresh tomato (not published information from Associação dos Industriais de Tomate, 1992). All of them produce concentrate and very few (Idal, Compal and Ecril) are able to produce peeled too. Other products like pulp and dehydrated product are obtained in almost insignificant amounts by not more then 10 factories. One of the problems of the industry is the package, characterised by 5 kg cans mainly used in exports to the ex-USSR.

Financial help in terms of subsidies from the EC to the processing industry has been increasing significantly even if irregularly. The amounts that as a consequence are being produced are reported in Table 7.1.9.

It was not possible to obtain data relative to cost structure for these firms. But from talks with those responsible for two factories and with the president of the AIT we concluded that about 60% of the costs are originated by raw material and include the costs of growing the small plants. The processors supply the farmers with the "pés de viveiro" to be more sure about the quality of the product. The remaining financial and energetic costs correspond to about 20% each. As it seems, the financial cost of renewing the processing methods was very expensive considering the high credit rates existent in the last decades in the country. This is one of the reasons why the

TABLE 7.1.9

Production and Processing in Portugal (1000 metric tonnes)

Products	1986/1987		1987/1988		1988/1989		1989/1990		1990/1991		1991/1992	
	Raw	Fin.	Raw	Fin.	Raw	Fin.	Raw	Fin.	Raw	Fin.	Raw	Fin.
Concentrate	540.8	97.5	417.1	77.7	450.4	85.7	610.9	110.6	817.8	143.9	700.9	121.8
Peeled	3.7	2.9	4.2	3.0	6.0	4.4	5.4	3.4	4.5	2.1	4.7	2.3
Other Products	0.01	0.01	0.08	0.06	0.02	0.02	0.09	0.08	0.09	0.06	0.08	0.06

Source: Unpublished data. INGA (1990)

industry is having such a difficulty to get along with the situation created in the last two years by the external markets.

7.1.3. EXPORT MARKETS FOR THE PRODUCT CONCENTRATE

From the conclusions that we have arrived at in chapter 6. of this work and also from Appendix 6.1 we can realise the fragility of the Portuguese and Spanish export market towards the political decisions of markets liberalisation became evident. This fragility constitutes the real problem of the sector in Portugal.

From Table 7.1.10 we can observe the expansion of exports and the significance of some non-European countries like ex-USSR, Japan, Canada, Korea and some Arab countries, for our markets. In the last two years political modifications in USSR and Iraq have allowed countries like the USA and Italy to reinforce their commercial relations with these countries.

Given the small size of Portugal, and contrary to whal occurs with Spain, the levels of production of concentrate depend absolutely upon exports resulting in the fact that slight international market alterations have serious reflexes upon stock creation and stability of the portuguese industry. As a consequence, in 1989/1990 a stock of 20,000 mt stayed in the factories (Revista do Agricultor Jan/Fev, 1992) representing about 18% of the production of that year.

TABLE 7.1.10

Portuguese Exports of Concentrate (metric tonnes)

Importing Countries	1985	1986	1987	1988	1989
European Community:	15.599	17.018	19.982	23.246	26.708
United Kingdom	10.740	8.830	10.360	6.591	10.727
The Netherlands	3.225	4.758	3.044	2.733	3.620
Denmark	1.147	2.012	2.161	2.674	4.099
Other European Countries:	30.046	29.292	29.149	25.445	na
Ex-USSR	21.934	21.137	18.222	17.242	31.954
Norway	3.602	3.380	4.639	3.772	4.457
Rest of the World:	36.723	40.580	44.566	40.283	na
Canada	8.307	6.919	9.076	5.684	6.882
Japan	4.865	6.360	8.785	10.077	10.059
U.S.A.	11.440	11.980	4.182	6.162	5.939

Source: INGA (1990) unpublished data

Food News (6.4.90)

At the moment stock creation is increasing and AIT evaluates it at about 132,000 m.t., a part of which has been compromised but that is not yet effectively sold. In the meantime 5 factories have stopped working and two of them decreased their production to minimum levels, with the obvious repercussions that this will have in the usual number of contracts with the farmers.

7.2. THE APPLICATION OF PLAUSIBLE CAP POLICIES AND CONSEQUENCES FOR THE SECTOR

For the transition period, probably until 1993, prices of tomato processed products have to be embraced by the classical transition regimen foreseen in the Treaty of Adhesion of Portugal and Spain. This regimen considers the regular and progressive introduction of the communitary rules to obtain a slow price harmonisation. In our case, since MGP's are inferior to the ones practised in the EC, the prices will increase 1/7 of the difference between the two situations for each year of the 7 year period and the subsides will be introduced using this same plan (Art.238, Acto de Adesão).

The data shows us that these agreements have been having the following effects:

The portuguese MGP's for the sector were about 60% of the ones practised in the rest of EC. This will mean an increase of about 5.7% a year for the MGP's in Portugal if the EC MGP's were kept constant. As for the

subsidies they have decreased in the last five years about 10% and will probably keep decreasing until they reach an equilibrium with the subsidies paid in Spain and Portugal. These have suffered increases of about 42% during this same period.

In the first part of our study we have applied a multi-country equilibrium model to a series of scenarios. From those, a very few have conditions that match almost perfectly with the ones we have referred to above. We intend to consider the new equilibrium prices as well as the variations in supplied and demanded quantities of these scenarios as instruments to be applied to regional data (Production by district or rentability by hectare) allowing us to conclude about possible alterations in regional supply of tomatoes for processing and consequent possible income changes for regions or farmers.

Scenarios and projections 5,6,9,10 were chosen as the most plausible ones, but only the projection 10 contains the effective developments of the CAP. For more detailed information see Appendix 5.3.

Before entering into a more detailed development of this theme we need to clarify a few necessary presuppositions:

1) We are presuming in our calculations that variations in produced quantities of the final product create the same oscillations in produced quantities of tomatoes for processing. This is the case unless non-expected or

quantifiable restrictions (for example, unavailable areas or existence of new products which may eventually present better market chances or higher income) appear preventing the fluidity of the normal procedure.

2) The expectations for production variations were found in the projections for both Portugal and Spain and therefore it is presumed that both countries will keep the same market behaviour as before.

3) In Portugal the pattern of regional distribution of the industry is kept as it has been until now, so that production by district increases at the same expected rate. We consider this to be the strongest limitation of the results obtained. This is due to the fact that in Portugal there are factories that have a much higher probability to develop than others, promoting as a result the decision of the farmers to grow tomatoes.

Considering the points referred to above, we have applied expected supply and grower price variations to national data (regional production, rentability per hectar in the different districts) which lead to conclusions regarding possible changes in values for production areas.

Table 7.2.1 show the maximal expected increases in production by regions (districts) and Table 7.2.2 presents the corresponding variations in cultivated areas resulting from calculations based on increases in rentability per hectare of about 1% a year. From the results presented in the Tables we may conclude that the maximal production of the country would achieve

values of not much more than 780,000 m.t under the conditions of scenario 10 and of about 1,150,000 m.t under conditions of scenario 9, or an advantageous subsidy program.

As far as areas are concerned the resulting increases depend on the changes of rentability during the period. We have considered an improvement in rentability of about 1% per year which has been the average increase in the last 10 years. Thus we have obtained a maximal cultivated area for tomatoes for concentrate of not more then 19,500 ha which represents an increase of about 8% in the case of projection 10, the plausible one. In case quotas are kept constant for Portugal and Spain, increasing simultaneously for EC(10), Portugal would take a slight advantage out of it; the country could increase total production up to 800,000 m.t. with correspondingly higher cultivated area.

These results are not conclusive since the possible increases may be delayed or stopped due to market constraints that could not be quantified in the simplified multi-country equilibrium model. They could be, for instance, unexpected and temporary export difficulties, marketing insufficiencies or reduction of competitiveness of portuguese enterprises.

TABLE 7.2.1.

Expected Increase in Production of Tomatoes for Processing (m.tonnes)

Subsidies have Small Decreases in EC10 and Reduced Increases in Portugal and Spain				
District	Increasing Quotas for EC(10)		Constant Quotas for EC(10)	
	1992 (-0.03)	1996 (+0.23)	1992 (+0.13)	1996 (+0.20)
Beja	55,705	70,636	64,894	68,914
Castelo Branco	12,649	16,039	14,735	15,648
Évora	53,622	67,994	62,466	66,336
Lisboa	11,375	150,104	137,901	146,443
Portalegre	49,510	62,783	57,679	61,252
Santarem	267,844	339,637	312,024	331,354
Setúbal	75,355	95,554	87,785	93,223
Totals	633,060	802,747	737,484	783,170

TABLE 7.2.1. cont.

Subsidies are kept Constant in EC10 and have Permanent Increases in Portugal and Spain				
District	Increasing Quotas for EC(10)		Constant Quotas for EC(10)	
	1992 (+0.70)	1996 (+0.90)	1992 (+0.70)	1996 (+0.80)
Beja	97,628	109,113	97,628	103,370
Castelo Branco	22,168	24,776	22,168	23,472
Évora	93,976	105,032	93,976	99,504
Lisboa	207,461	231,868	207,461	219,665
Portalegre	86,773	96,982	86,773	91,877
Santarem	469,418	524,643	469,418	497,030
Setúbal	132,066	147,603	132,066	139,835
Totals	1,109,490	1,240,017	1,109,490	1,174,753

TABLE 7.2.2.

Expected Increases in Cultivated Areas

Districts	1986		1992		1996	
	Areas (ha)	Rentability (m.t. / ha)	Areas (ha)	Rentability (m.t. / ha)	Areas (ha)	Rentability (m.t. / ha)
			Proj 6 Proj 10		Proj 6 Proj 10	
Beja	2,771	21	2,498 2,910	22.3	3,045 2,970	23.2
Castelo Branco	435	30	398 463	31.8	504 473	33.1
vora	1,579	35	1,445 1,684	37.1	1,832 1,719	38.6
Lisboa	3,151	39	2,859 3,331	41.4	3,626 3,398	43.1
Portalegre	1,506	34	1,371 1,598	36.1	1,739 1,633	37.5
Santarem	6,688	41	6,157 7,173	43.5	7,807 7,315	45.3
Set_bal	2,118	37	1,917 2,234	39.3	2,431 2,279	40.9
Total	18,248		16,645 19,393		20,984 19,787	

7.3. EVOLUTION IN FARMERS' INCOMES

To have an idea of the expected changes in real regional/farmers' incomes we have observed, from the projected data, that simultaneously to very mild variations of the final price in Portugal and Spain, the increases in EC10 diminish while the other countries will have price decreases that tend to disappear. This suggests a situation tending to a price equilibrium towards the end of the period.

We have reported the expected changes in cultivated areas, but the fact is that the evolution of the incomes will not depend only on these changes but also on other factors such as the applied green rate or the inflation rate.

In case MGP's are kept constant at 89.1 ecu's /m.t. after 1993, our calculations foresee a very little variation of real income for farmers of the different regions. The incomes were deflated and a constant green rate of 206 ecu's/m.t. was applied. The results for projected real incomes between 1990 and 1996 is shown in Table 7.3.1.

Alternatively, we have calculated real incomes in case the green rate increases, to follow an inflation rate of expected variable values. Due to the latest development of the green rate values, however, we consider such a situation as beeing improbable. The consequent values for the regions are reported in Table 7.3.2. Upto a certain point we could express and evaluate the impact of different agricultural policies in socio-economic indicators.

TABLE 7.3.1

Values Used to Calculate Real Incomes

Year	MGPs ECU/m.t	Green Rate $ / ECU	Production m.t.	Income 10^9 PTE	Real Income 10^9 PTE	Inflation
1986/87	61.6	152	656	6.1	6.1	---
1988	67.1	172	689	8.4	7.7	9.7%
1989	70.4	188	---	---	---	12.6%
1990	74.6	192	689	9.9	7.1	13.4%
1991	83.0	206	---	---	---	11.4%
1992	84.0	208	738	12.9	7.6	8.9%
1994	89.0	206 250	754	13.8 16.8	7.0 8.6	7%
1996	89.0	206 275	787	14.4 19.3	6.6 8.8	5%

Note: Inflation values were taken from the "Relatório do Conselho de Administração do Banco de Portugal, 1991"

TABLE 7.3.2

Projected Regional Incomes

(units: 10^9 PTE)

Districts	1986	1996 Green Rate = 206	1996 Green Rate = 275
Beja	531	575	772
Cast. Branco	127	130	175
_vora	526	557	743
Lisboa	1,100	1,230	1,640
Portalegre	502	510	686
Santarem	2,567	2,780	3,712
Set_bal	727	924	1,044
Total	6,080	6,706	8,772

Previously, we had concluded that portuguese tomatoes processing industry is very sensitive to international market changes. At a second stage, on using an optimistic set of scenarios that include the benefits derived from the recent integration in the EC, we have concluded that: such policy instruments may promote in Portugal some changes in supplied quantities for tomatoes for processing, particularly the protective subsidy policies since the influence of changes in minimal grower prices is small. However, alterations in cultivated areas are not significant especially considering the plausible scenarios; consequent changes in real farmer incomes are so dependent on the conjugation of inflation and green rates as on the studied policy instruments.

8. CONCLUSION

The integration of Portugal and Spain in the European Community increased the number of active participants in the farm sector and also the percentage of less favoured agricultural areas to about 55% of the USA. Therefore this southward enlargement had to take place with specific supports to development of the agricultural sectors of these countries, this happening at a time where european markets in general begin to achieve levels of excesses in production.

In the years to come agricultural systems in Europe will develop on the bases of a reformed Common Agricultural Policy that foresees the future of farmers incomes depending on supports to cultivated areas and that is also accompanied by a number of measures to release farmers and land. Basin (1992) tried to analyse the perspectives of such policy for the european less favoured areas, as it is the case of Portugal, but his conclusions could not extend beyond the cereal and meat sectors due to the unexpected decrease in farm prices and the practical transfers between regions and producers.

The GATT (General Agreement on Tarrifs and Trade) and the future international tendencies defend trade liberalisation, which will take away the protection system that farmers of those regions were expecting to have for a longer period of time. For Portugal and Spain, in a very short period (1986 - 1996), instruments were applied reflecting what seem to be antagonic policy interests: first, the development of the agricultural sector and second, an almost immediate exposure of it to the hard rules of international trade liberalisation. The CAP reform might have contradictory effects: while some

proposals tend to accelerate the re-modification of the farming systems and diversify land use, others will tend to slow down these processes. Most of how the whole phenomenon will develop depends on the products considered, regional potential capacity for competitiveness and national political will.

This is a situation of change in agriculture in Europe and its complexity is such that, in our opinion, the effects of these changing conditions are more efficiently analysed if the observations are restricted to specific sectors.

The reason for using tomatoes for processing to analyse at least a part of these effects is related with the importance that this sector has for the agricultural sector at both phases of the portuguese "filiére": production and agro-industry; Therefore, sustaining the idea that the country could eventually offer some comparative advantages in the processed tomatoes sector.

The use of a quantitative model, even with all the restrictions that it contains (reduced number of variables and simplicity), allowed us to measure not only the advantages arising from the integration of Portugal and Spain in the European Community, but also the consequences of different policies for the sector. We could quantify the production price and trade variations for EC(10), Portugal and Spain or the United States of America, resulting from an immediate trade liberalisation. Further, we could demonstrate also, that much of the international trade equilibrium depends on the alternative use made of the policy instruments during the intermediate period if an international trade liberalization is not immediately taken. Besides this, what

became evident from the modelling work was that the time period to take when applying the instruments is a factor of major importance when dealing with this kind of policy instruments. This was the important conclusion arrived at from continuos static projections over 10 periods with an evaluation every second period.

From the theoretical neo-classical analysis it is known that the combination of several instruments used is important, but the degree of efficiency in presence of international trade could also be quantified for the production of tomatoes.

The financial future of the portuguese processing industry and consequently of the farmers too, is at present a question of great concern. This is why we have decided to extend our analyses of the results obtained in the most plausible scenarios to the production structures of the country. With such a methodology we concluded that much of the future incomes of those farmers producing tomatoes for processing is dependent mainly on the perspectives for inflation and green rate evolution, in agreement with Noéme, (1993). But also if the CAP, in agreement with the GATT, finds a way to maintain the present prices and slowly decrease subsidies, the perspectives for our industry and farmers, although not brilliant, is not of a terrible concern. The farmers' incomes tend to stay constant or increase a little and the canners will be able to mantain their market share. The only serious situation is the one resulting from a sudden decrease in subsidies - but that would represent a greater problem for the EC(10) than for Portugal and Spain, countries that until very recently were used to produce at very low prices. Yet the real reflexes of such a situation would depend not only on the

variables that we have considered in our model but also on the capacity of the US industry to develop that quickly (Durham and Sexton, 1992).

Not including technical change in this study may have been a strong restriction. Very recent studies (Guyomard et al., 1991) explain how technical change may alter the trade off between farm income and budgetary expenditures, how its impact is different according to each of the policy instruments to be used and how it may even reverse the sign of the cross effects in case of large price-support reductions. In spite of the fact that innovation and improvement in production technologies occurred in the sector of processing tomatoes mainly during the 1960's and the 1970's, we feel compelled to agree that this study is restrictive and the results are only meaningful if technical change does not occur.

We make the following suggestions for a further development of this work:

1) From the policy analysis point of view we suggest scenarios able to report a situation in which other countries besides EC(12) could protect their agricultural and trade system, the model would permit it and more information about perspectives for future policies would be achieved.

2) From the point of view of the modelling system of equations, a parallel evaluation with lower elasticities for all countries would improve the quality of the sensitivity analysis. Of course, further research to help in a better specification of the processing coefficient as an important instrument able to reflect the industrial capacity of the different countries would be very

interesting and would allow evaluations of the interdependencies between these capacities in different countries and the international policy instruments.

3) For the evaluation of future farmer incomes in Portugal alternative production of other crops could have been considered, after due evaluation of cross price effects of these products.

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SUPPLY

DEMAND

PRICES

COUNTRY:	FR/IT	unities	1985	1986	1987
1.1		ton	4,200.000		
1.2		met.ton.			
	1.2.1		375.309	301.686	
	1.2.2		713.150	512.500	
	1.2.3		... ...	... ...	
	1.2.4		... ...	... ...	
1.3	150000	(frish equivalent)			
2.1					
	2.1.1	hand harvesting			
	2.1.2				
	2.1.3				
2.2					
2.3					
3.1		met.ton.			
	3.1.1	I	192.300		
		F	101.100		
	3.1.2	I	706.300		
		F	...		
	3.1.3	I	30.600		
		F	...		
	3.1.4	I	200.000		
3.2		met.ton.			
	3.2.1	I	306.400	241.800	
		F	7.000		
	3.2.2	I	477.000		
		F	...		
	3.2.3	I	13.600		
		F	...		
	3.2.4	I	69.000		
		ecu's / met.ton.			
4.1		ecu's / met.ton.			
	4.1.1				
	4.1.2	paste	97.2	92.1	
		peeled max.	162.6	154.5	145.5
		min.	123.8	117.7	113.5
4.2					
	4.2.1.1				
	2				
	3				
	4				
	4.2.2				
	4.2.3				
5.1					
6.1		ecu's / met.ton.			
	6.1.1		270.0	282.6	297.0
	6.1.2	max.	124.1	117.5	115.8
		min.	98.8	86.4	82.3
	6.1.3		47.9	39.9	37.0
	6.1.4		... ...	... ...	... ...
6.2		met.ton.fr.equi.			
	6.2.1			1,882.144	
	6.2.2			1,362.294	
6.2.3				387.195	
6.2.4					

COUNTRY:	GREECE	unities	1985	1986	1987
1.1		ton	1.390.000	1.250.000	1.250.000
1.2		met.ton.			
	1.2.1		240.000	100.900	
	1.2.2		14.500	14.500	
	1.2.3		...	...	
	1.2.4		...	...	
1.3	1250.000 frish equivalent				
2.1					
	2.1.1 hand harvesting				
	2.1.2 mais or cotton				
	2.1.3 ton/acre		23.0	17.0	26.0
2.2					
2.3					
3.1		met.ton.			
	3.1.1		23.000	24.000	
	3.1.2		13.600	14.000	
	3.1.3		...	...	
	3.1.4		...	...	
3.2		met.ton.			
	3.2.1		174.450	165.000	
	3.2.2		0.755	2.000	
	3.2.3		...	...	
	3.2.4		...	...	
4.1	ecus / met.ton.				
	4.1.1		5.5($/ton)		
	4.1.2 paste		...	87.1	89.1
	peeled	max.	147.1	147.5	
		min.	111.3	113.5	
	others		88.0	89.0	
4.2	$/met.ton.				
	4.2.1.1				
	2				
	3				
	4				
	4.2.2			655.0	545.0
	4.2.3			543.4	
5.1	exports mainly to european markets				
6.1	ecu's/met.ton.fr.equi.				
	6.1.1		338.8	259.8	297.3
	6.1.2	max.	83.1	87.3	115.8
		min.	63.2	68.1	82.3
	6.1.3		33.2	30.7	37.0
	6.1.4		...	...	...
6.2	met.ton.fr.equi.				
	6.2.1			1.082.730	
	6.2.2			14.201	
	6.2.3			20.558	
	6.2.4				

COUNTRY:	SPAIN	unities	1985	1986	1987
1.1		ton	829.000		
1.2		met.ton.			
	1.2.1		84.800	56.923	
	1.2.2		150.000	139.333	
	1.2.3		...	...	
	1.2.4		...	...	
1.3	100.000 finished product				
2.1					
	2.1.1 hand harvesting				
	2.1.2 mais ,cereals,sugar beet				
	2.1.3 ton/acre		24.0		
2.2					
2.3					
3.1		met.ton.			
	3.1.1		30.500		
	3.1.2		125.000	142.000	
	3.1.3		...	...	
	3.1.4		...	...	
3.2		met.ton.			
	3.2.1		50.000	16.500	
	3.2.2		75.000	60.000	
	3.2.3		...	...	
	3.2.4		...	...	
4.1		ecus/met.ton.			
	4.1.1		31.0($ton)	38.7($ton)	
	4.1.2 paste		47.0($ton)	53.6	57.9
		peeled max.	79.4	87.8	
		min.	74.1	78.5	
		others	60.0	65.0	
4.2		$/met.ton.			
	4.2.1.1				
	2				
	3				
	4				
	4.2.2 (powder)		809.0		
	4.2.3				
5.1					
6.1		ecu's/met.ton.fr.equi.			
	6.1.1			157.3	172.7
	6.1.2			39.2	35.7
	6.1.3			25.0	25.0
	6.1.4			59.0	65.0
6.2		met.ton.fr.equi.			
	6.2.1			370.000	
	6.2.2			209.000	
	6.2.3			88.000	
	6.2.4				

COUNTRY:	PORTUGAL	unities	1985	1986	1987
1.1		ton	735.700	656.461	463.310
1.2		met.ton.			
	1.2.1		101.085	94.463	77.743
	1.2.2		4.887	2.929	3.034
	1.2.3		...	...	
	1.2.4		...	0.012	0.061
1.3	150.000 (finished product)				
2.1					
	2.1.1 hand harvesting				
	2.1.2 corn, sunflower, reis, melon				
	2.1.3 ton/acre		30.0		
2.2					
2.3					
3.1		met.ton.			
	3.1.1		8.000	8.000	10.000
	3.1.2		3.400	3.500	
	3.1.3		...	...	
	3.1.4		...	...	
3.2		met.ton.			
3.2.1			82.400	87.900	93.697
	3.2.2		1.500	...	
	3.2.3		7.200	...	
	3.2.4		...	...	
4.1		ecus/met.ton.			
	4.1.1				
	4.1.2 paste		58.14	61.61	
	peeled		61.80	68.60	
	others		57.00	60.00	
4.2		$/met.ton.			
	4.2.1.1				
	2				
	3				
	4				
	4.2.2			85.51	85.41
	4.2.3				
5.1					
6.1		ecu's/met.ton.fr.equi.			
	6.1.1			184.3	194.4
	6.1.2				
	6.1.3				
	6.1.4				
6.2		met.ton.fr.equi.			
	6.2.1			685.000	
	6.2.2			9.600	
	6.2.3			.137	
	6.2.4				

COUNTRY:	USA	unities	1985	1986	1987
1.1		ton	7200.000		
1.2		met.ton.			
	1.2.1		626.000	632.400	690.700
	1.2.2		398.000	413.500	473.700
	1.2.3		213.000	221.000	255.900
	1.2.4			...	...
1.3					
2.1					
	2.1.1	mechanical harvesting, large scale operation			
	2.1.2				
	2.1.3	ton/acre		20.9 - 28.4	
2.2					
2.3		met.ton.			
	2.3.1			59.160	
	2.3.2			90.350	
	2.3.3			18.769	
	2.3.4			...	
3.1		met.ton.			
	3.1.1			483.081	
	3.1.2			799.363	
	3.1.3				
	3.1.4				
3.2		met.ton.			
	3.2.1			7.208	
	3.2.2			7.399	
	3.2.3				
	3.2.4				
4.1		$/met.ton.			
	4.1.1				
	4.1.2		72.9	70.8	
4.2		$/met.ton.			
	4.2.1.1				
	2				
	3				
	4				
	4.2.2				
	4.2.3				

COUNTRY:	TURKEY	unities	1985	1986	1987
1.1		ton	1127.000	1800.000	
1.2		met.ton.			
	1.2.1			145.000	110.000
	1.2.2			150.000	139.333
	1.2.3			...	...
	1.2.4			...	...
1.3	250.000 finished product				
2.1					
	2.1.1	hand harvesting, because of sheep labor costs			
	2.1.2				
	2.1.3	ton/acre		24.0/34.0	
2.2					
2.3					
3.1		met.ton.			
	3.1.1			...	48.600
	3.1.2				
	3.1.3			insignif.val.	
	3.1.4				
3.2		met.ton.			
	3.2.1			76.900	90.000
	3.2.2				
	3.2.3				
	3.2.4				
4.1		$/ton			
	4.1.1			18.4	
	4.1.2	paste		27.0	
		peeled max.		34.0	
4.2		$/met.ton.			
	4.2.1.1			536.0	
	2				
	3				
	4				
	4.2.2			600.0	
	4.2.3	$/met.ton. paste		90.0	
5.1				0.167	
6.1		$/met.ton.of frish eq.			
	6.1.1			19.0	30.0
	6.1.2				
	6.1.3				
	6.1.4				
6.2		met.ton.fr.equi.			
	6.2.1				
	6.2.2				
	6.2.3				
	6.2.4				

COUNTRY:	ISRAEL	unities	1985	1986	1987
1.1		ton	248.200	187.600	178.183
1.2		met.ton.			
	1.2.1		101.800	95.700	85.800
	1.2.2		34.800	22.500	22.800
	1.2.3		19.900	13.100	14.000
	1.2.4		91.800	56.300	50.800
1.3	500.000	finished product			
2.1					
	2.1.1	30% mechanical harvesting			
	2.1.2				
	2.1.3	ton/acre		24.0 - 30.0	
2.2		$/max yield	74.96		
2.3		met.ton.			
	2.3.1				
	2.3.2				
	2.3.3				
	2.3.4				
3.1		met.ton.			
	3.1.1		11.000	10.000	10.000
	3.1.2		8.000	10.000	
	3.1.3				
	3.1.4				
3.2		met.ton.			
	3.2.1		18.381	5.934	
	3.2.2		20.423	13.734	
	3.2.3		5.853	4.793	
	3.2.4		22.305	20.140	
4.1		$/ton			
	4.1.1				68.0
	4.1.2				62.0(77.3)
4.2		$/met.ton.			
	4.2.1.1			550.0/650.0	
	2				
	3				
	4				
	4.2.2			550.0/704.0	
	4.2.3			154.0	
5.1					
		USA		14.5	
		EUR		18.0	

APPENDIX 5.1: QUANTITIES OF PRODUCED AND CONSUMED PROCESSED TOMATOES

QUANTITIES
OF TOMATO CONCENTRATE FOR 1981
Metric Tonne of Finished Product

SUPPLY		EC		SP		MC	USA	TW
PROD	I, F	359,0	S	51,0	T	65.2	336,3	58,2
	G	200,0	P	65,0	I	16,8		
IMP							40,0	
TOTAL		559,0		116,0		82,0	376,3	58,2
DEMAND								
EXP	I, F	288,0	S	31,0	T	25,9	8,0	42,3
	G	117,0	P	80,5	I	8,0		
I.C.	I, F	94,0	S	20,0	T	35,4	372,0	0,5
	G	20,0	P	3,0	I	8,0		
TOTAL		519,0		134,5		87,3	380,0	43,0

QUANTITIES
OF TOMATO CONCENTRATE FOR 1982
Metric Tonne of Finished Product

SUPPLY		EC		SP		MC	USA	TW
PROD	I,F	310,0	S	68,0	T	93,9	406,6	44,0
	G	200,0	P	77,0	I	21,5		
IMP						69,0		
TOTAL		510,0		145,0		114,4	475,6	44,0
DEMAND								
EXP	I,F	263,0	S	44,0	T	41,0	11,0	42,8
	G	128,0	P	58,0	I	8,0		
I.C.	I,F	96,0	S	21,0	T	35,0	?,0	0,5
	G	21,0	P	3,0	I	8,0		
TOTAL		508,0		126,0		92,0	450,0	43,3

QUANTITIES
OF TOMATO CONCENTRATE FOR 1983
Metric Tonne of Finished Product

SUPPLY		EC		SP		MC	USA	TW
PROD	I,F	363,8	S	74,5	T	90,0	376,0	39,7
	G	162,0	P	55,4	I	17,2		
IMP							81,4	
TOTAL		525,8		129,9		107,2	457,4	39,7
DEMAND								
EXP	I,F	264,2	S	47,0	T	53,4	10,0	57.8
	G	160,0	P	59,3	I	10,0		
I.C.	I,F	106,2	S	28,0	T	36,9	420,8	0,5
	G	23,0	P	3,0	I	8,0		
TOTAL		553,4		137,3		108,3	430,8	58,3

QUANTITIES
OF TOMATO CONCENTRATE FOR 1984
Metric Tonne of Finished Product

SUPPLY		EC		SP		MC	USA	TW
PROD	I,F	420,2	S	91,2	T	164,2	381,3	59,0
	G	177,5	P	88,2	I	18,4		
IMP							42,8	
TOTAL		597,7		179,4		182,6	424,1	59,0
DEMAND								
EXP	I,F	116,6	S	50,9	T	69,7	10,5	41,0
	G	172,6	P	80,9	I	12,0		
I.C.	I,F	115,0	S	30,0	T	37,7	443,1	0,5
	G	23,1	P	3,0	I	8,0		
TOTAL		427,3		164,8		127,4	453,6	41,3

QUANTITIES
OF TOMATO CONCENTRATE FOR 1985
Metric Tonne of Finished Product

SUPPLY		EC		SP		MC	USA	TW
PROD	I,F	455,8	S	84,8	T	136,6	447,2	47,5
	G	283,8	P	115,0	I	15,6		
IMP							63,1	
TOTAL		739,6		199,8		152,2	510,3	47,5
DEMAND								
EXP	I,F	223,2	S	50,0	T	76,9	9,3	45,5
	G	173,7	P	82,4	I	18,4		
I.C.	I,F	115,0	S	30,5	T	45,0	470,0	0,6
	G	23,5	P	3,0	I	8,0		
TOTAL		535,4		165,9		148,3	479,3	46,1

QUANTITIES
OF TOMATO CONCENTRATE FOR 1986
Metric Tonne of Finished Product

SUPPLY		EC		SP		MC	USA	TW
PROD	I,F	301,7	S	56,9	T	110,0	632,4	56,0
	G	240,0	P	94,5	I	95,7		
IMP		23,0					59,2	
TOTAL		564,7		151,4		205,7	691,6	56,0
DEMAND								
EXP	I,F	241,8	S	17.5	T	90.0	10,1	44,0
	G	165,0	P	87.9	I	6,0		
I.C.	I,F	293,4	S	33,0	T	48,6	470,0	4,0
	G	24,0	P	7,0	I	10,0		
TOTAL		724,2		145,4		156,0	490,0	48,0

QUANTITIES
OF PEELED TOMATO FOR 1981
Metric Tonne of Finished Product

SUPPLY		EC		SP		MC	USA	TW
PROD	I,F	1109,7	S	87,9	T	0,0	482,0	8,3
	G	11,0	P	5,0	I	23,0		
IMP							44,1	
TOTAL		1170,7		92,9		23,0	526,1	8,3
DEMAND								
EXP	I,F	326,4	S	37,3	T	0,0	14,7	9,3
	G	3,9	P	0,5	I	21,0		
I.C.	I,F	625,4	S	55,2	T	5,0	600,0	0,1
	G	7,7	P	0,1	I	0,2		
TOTAL		963,4		093,2		26,2	614,7	9,4

QUANTITIES
OF PEELED TOMATO FOR 1982
Metric Tonne of Finished Product

SUPPLY		EC		SP		MC	USA	TW
PROD	I,F	892,5	S	201,0	T	0,0	526,0	12,2
	G	9,5	P	6,6	I	27,6		
IMP		40,0					75,8	
TOTAL		942,0		207,6		27,6	601,8	16,2
DEMAND								
EXP	I,F	407,0	S	45,1	T	0,0	11,7	8,1
	G	4,6	P	0,5	I	22,0		
I.C.	I,F	651,9	S	155,5	T	5,0	600,0	0,1
	G	4,7	P	0,1	I	0,2		
TOTAL		1068,2		201,2		27,2	611,7	8,2

QUANTITIES
OF PEELED TOMATO FOR 1983
Metric Tonne of Finished Product

SUPPLY		EC		SP		MC	USA	TW
PROD	I,F	1239,8	S	191,0	T	0,0	683,6	13,5
	G	9,9	P	0,0	I	24,0		
IMP		56,8					84,7	4,0
TOTAL		1306,5		191,0		24,0	768,3	17,5
DEMAND								
EXP	I,F	414,3	S	86,3	T	0,0	7,5	14,5
	G	3,9	P	0,0	I	17,3		
I.C.	I,F	847,4	S	106,3	T	5,0	684,3	0,1
	G	6,9	P	0,1	I	0,2		
TOTAL		1272,5		192,7		22,5	691,8	14,6

QUANTITIES
OF PEELED TOMATO FOR 1984
Metric Tonne of Finished Product

		EC		SP		MC	USA	TW
SUPPLY								
PROD	I,F	1480,9	S	238,0	T	0,0	670,9	19,0
	G	8,9	P	0,0	I	27,0		
IMP		100,6					105,9	
TOTAL		1590,4		238,0		27,0	776,8	19,0
DEMAND								
EXP	I,F	511,2	S	57,9	T	0,0	6,3	18,7
	G	1,6	P	0,0	I	22,9		
I.C.	I,F	894,4	S	123,0	T	0,0	768,7	0,1
	G	9,0	P	0,1	I	7,6		
TOTAL		1416,2		181,0		30,5	774,0	18,8

QUANTITIES
OF PEELED TOMATO FOR 1985
Metric Tonne of Finished Product

		EC		SP		MC	USA	TW
SUPPLY								
PROD	I,F	1034,4	S	225,0	T	0,0	764,8	24,7
	G	12,6	P	4,9	I	24,3		
IMP		56,4					99,8	
TOTAL		1103,4		229,9		24,3	864,6	24,7
DEMAND								
EXP	I,F	370,0	S	75,0	T	0,0	7,5	25,2
	G	2,2	P	1,5	I	20,7		
I.C.	I,F	726,0	S	125,0	T	0,0	846,0	0,1
	G	10,2	P	3,5	I	5,0		
TOTAL		1108,4		205,0		25,7	853,5	25,3

QUANTITIES
OF PEELED TOMATO FOR 1986
Metric Tonne of Finished Product

		EC		SP		MC	USA	TW
SUPPLY								
PROD	I,F	945,2	S	200,0	T	0,0	413,5	7,2
	G	16,0	P	2,9	I	28,0		
IMP		45,0					?	
TOTAL		1006,2		202,9		28,0	?	7,2
DEMAND								
EXP	I,F	479,4	S	60,3	T	0,0	0,0	6,9
	G	0,8	P	0,0	I	13,7		
I.C.	I,F	533,2	S	142,0	T	5,0	900,0	0,1
	G	13,6	P	0,1	I	10,0		
TOTAL		1027,0		202,4		28,7	900,0	7,0

APPENDIX 5.2: LINEAR REGRESSIONS

PROJECTED QUANTITIES
OF TOMATO CONCENTRATE FOR 1996
Metric Tonne of Finished Product

SUPPLY	EC		SP		MC		USA	TW
PROD	I,F	619.2	S	156,9	T	216,1	740,6	37,1
	G	367,7	P	104,1	I	34,1		
IMP							- 17,9	
TOTAL		986.9		261,0		250,2	722,7	37,1
DEMAND								
EXP	I,F	370,2	S	97,0	T	159,3	- 0,4	72,7
	G	240,2	P	101,3	I	8,0		
I.C.	I,F	181,0	S	58,8	T	60,0	739,8	0,9
	G	30,1	P	4,5	I	15,0		
TOTAL		821,5		261,6		242,3	739,4	73,6

PROJECTED QUANTITIES
OF PEELED TOMATO FOR 1996
Metric Tonne of Finished Product

SUPPLY	EC		SP		MC		USA	TW
PROD	I,F	1422,3	S	206,7	T	0,0	646,4	29,9
	G	65,2	P	0,0	I	37,4		
IMP								
TOTAL		1487,5		206,7		37,4	636,6	29,9
DEMAND								
EXP	I,F	623,1	S	64,9	T	0,0	13.4	
	G		P		I			
I.C.	I,F	413,0	S	198,0	T	5,0	1000,0	0,1
	G	25,7	P	0,1	I	12,1		
TOTAL		1059,3		263,0		37,1	1000,0	13,5

APPENDIX 5.4: COMPUTATIONAL PROCEDURE

```
Program SIMUTEST;
Uses CRT, Printer;
Const
    toleranz = 0.1;
    sicherung = 0.1;
    proccoef1 = 10;
    proccoef2 = 10;
    proccoef3 = 10;
    proccoef4 = 10;
    proccoef5 = 10;
    proccoef6 = 10;


    Group_a: array[1..6] of string[13]= ('   Eur. Comm.',
    '   Int.Count ',' Med.Count   ',' U.S.A.  ',
     '      Taiwan ', '   Rest World');

    Group_b: array[1..6] of string[12]=('Country 1 ','Country 2 ',
     'Country 3 ','Country 4 ','Country 5 ','Country 6 ');

    Text='Please give the number of your choice:    ';

    Option1: array[1..4] of string[40]=
     ('END OF PROGRAM: (1)',
      'CHANGE INITIAL VALUES: (2)',
      'CHANGE ELASTICITIES: (3)',
      'BEGINING OF SIMULATION: (4)');

    Option2: array[1..4] of string[75]=
        ('Return to Distribution                              : (0)',
         'European Com. Enlargement _ production quotas: (1)',
         'European Com. Enlargement _ quotas,subsidies : (2)',
         'Commercial Arrangements with O.Med.Countries : (3)');
     text2: array[1..3] of string[75]=
        ('Eur.Com.Enlargement:Production Quotas!',
        'Eur.Com.Enlrgement:Quotas and Susbsidies!',
        'Commercial Arrangements with O.Med.countries!');


Type

    Politiktyp = array[1..2] of real;
    Landmenge = array[1..6] of Politiktyp;
    Konst_typ = array[1..6] of real;

Var
    Supply, Demand, Intervention, Netto_ImEx, Price,
    Zoll, Demandprice, Subsidies, MGP, Prp :  Landmenge;
    Sup_Konst,  Int_Konst, Dem_Konst, Sup_elast, Int_elast, CP_elast,
    Dem_elast, Pricecha, Pricechb, proccoef : Konst_typ;
    i, j, x, m, s:                                          integer;
    value, error, Totalsup, Totaldem, Totalint, Diff_Abl,
                                                              real;
    Autonom:                                               Boolean;
    Comm_Arrang:


    Countrygroup:   array[1..6] of string[20];

  Procedure Default_wert;
  var i,j:integer;

   Begin
   Autonom:= 0;
   Comm_Arrang:=false;
```

```
 Price[1,1]:= MGP[1,1] * proccoef1;
   for j:=1 to 2 do
   begin
    for i:=1 to 6 do
    begin
    Subsidies[i,j]:= 0;
    Subsidies[1,1]:= 19;
    Subsidies[2,1]:= 19;

    end;
   end;
 End;



Function Hoch ( L, T: real):real;
 Begin
 If L<=0 then Hoch:=0
 Else
  begin
  If L=1 then Hoch:=1
  Else
   begin
   If T=0 then Hoch:=1
   Else
    begin
    If T=1 then Hoch:=L

    Else Hoch:= Exp(ln(L)* T);
   end;
  end;
 End;
End;


Function Hyper_A( N, O, P, R, W: real):real;
 Begin
 Hyper_A:= N * Hoch( O,(-P)) * Hoch( R, (-W));
 End;

Function Hyper (N, O, P: real):real;
 Begin
 Hyper:= N * Hoch( O,(-P)) ;
 End;

Procedure Change_elasticities;
 var i: integer;
 Begin
 writeln('Please new values of Supply elasticities are required!');
 for i:=1 to 6 do
  begin
  write(Group_a[i]);
  readln(Sup_elast[i]);
  end;
 writeln('Please new values of Demand elasticities are required!');
 for i:=1 to 6 do
  begin
  write(Group_a[i]);
  readln(Dem_elast[i]);
  end;
 writeln('Please give the new values of Intervention elasticities!');
 for i:=1 to 6 do
```

```
    begin
    write(Group_a[i]);
    readln(Int_elast[i]);
    end;
   writeln('Please give the new values of Minimal Grower Prices!');
   for i:=1 to 6 do
    begin
    write(Group_a[i]);
    readln(MGP[i,1]);
    end;
   End;

Procedure Change_values;
 var i: integer;
 Begin
 writeln('Please new Supply Values are required!');
 for i:=1 to 6 do
  begin
  write(Group_a[i]);
  readln(Supply[i,1]);
  end;
 writeln('Please new Demand Values are required!');
 for i:=1 to 6 do
  begin
  write(Group_a[i]);
  readln(Demand[i,1]);
  end;
 writeln('Please give the new values of Intervention Quantities!');
 for i:=1 to 6 do
  begin
  write(Group_a[i]);
  readln(Intervention[i,1]);
  end;
 writeln('Please give the new Custom Amounts!');
 for i:=1 to 6 do
  begin
  write(Group_a[i]);
  readln(Zoll[i,1]);
  end;
 End;

Procedure Readinginicial_values;
 var i:integer;
 Begin
 writeln('Please give the Supply Values!');
 for i:=1 to 6 do
  begin
  write(Group_a[i]);
  readln(Supply[i,1]);
  end;
 writeln('Please give the Demand Values!');
 for i:=1 to 6 do
  begin
  write (Group_a[i]);
  readln(Demand[i,1]);
  end;
 writeln('Please give the values of Intervention Quantities');
 for i:=1 to 6 do
  begin
  write(Group_a[i]);
  readln(Intervention[i,1]);
  end;
 writeln('Please give the Custom Amounts!');
 for i:=1 to 6 do
  begin
  write(Group_a[i]);
```

```
  readln(Zoll[i,1]);
  Zoll[i,2]:= Zoll[i,1];
  end;
 writeln('Please give the Minimum Grower prices!');
 for i:=1 to 6 do
  begin
  write(Group_a[i]);
  readln(MGP[i,1]);
  end;
 writeln('Please give the Prices of Related Products');
 for i:=1 to 6 do
 begin
 write(Group_a[i]);
 readln(Prp[i,1]);
 end;

 End;

Procedure Trade_Situation;
 var i:integer;
 Begin
 for i:=1 to 6 do
 Netto_ImEx[i,1]:= Supply[i,1] - Demand[i,1] -Intervention[i,1];
 End;


Procedure Introducing_subsidies;
 var i: integer;

 Begin
 Writeln('Please give the values of the presumed subsidies');
 for i:=1 to 6 do
  begin
  write(Group_a[i]);
  readln(Subsidies[i,2]);
  end
 End;

Procedure Reading_elasticities;
 var i:integer;
 Begin
 writeln('Please give the values of Supply Elasticities!');
 for i:=1 to 6 do
  begin
  write(Group_a[i]);
  readln(Sup_elast[i]);
  end;
 writeln('Please give the values of Demand Elasticities!');
 for i:=1 to 6 do
  begin
  write(Group_a[i]);
  readln(Dem_elast[i]);
  end;
 writeln('Please give the values of Intervension Elasticities!');
 for i:=1 to 6 do
  begin
  write(Group_a[i]);
  readln(Int_elast[i]);
  end;
 writeln('Please give the values of Cross-Price Elasticities!');
 for i:=1 to 6 do
    begin
    write(Group_a[i]);
    readln(CP_elast[i]);
    end;
 End;
```

```
 Procedure A_Reading_Prices;
 var i: integer;
 Begin
  Price[1,1]:= MGP[1,1] * proccoef1;
     for i:=2 to 6 do
     begin
  Price[i,1]:= (Price[1,1]+MGP[i,1])/(1+Zoll[i,1]);
  end;
 End;

Procedure B_Reading_Prices;
var i:integer;
Begin

            Price[1,1]:=MGP[1,1] * proccoef1;
            for i:=2 to 6 do
            begin
            Price[i,1]:=(Price[1,1]+MGP[i,1]) / (1+ Zoll[i,1]);

            end;
End;

Procedure C_Reading_Prices;
var i:integer;
   Begin

            Price[2,1]:= MGP[2,1] * proccoef2;
            Price[1,1]:= (Price[2,1]+MGP[i,1]) / (1+Zoll[i,1]);
            for i:=3 to 6 do
             begin
             Price[i,1]:= (Price[2,1]+MGP[i,1]) / (i+Zoll[i,1]);
             end;
   End;

 Procedure D_Reading_Prices;
 var i:integer;
   Begin

            Price[3,1]:=MGP[3,1] * proccoef3;
            for i:=1 to 2 do
            begin
            Price[i,1]:= (Price[3,1]+MGP[i,1]) / (1+Zoll[i,1]);
            end;
            for i:=4 to 6 do
            begin
            Price[i,1]:= (Price[3,1]+MGP[i,1]) / (1+Zoll[i,1]);
            end;
   End;

 Procedure Demand_Prices;
 var i:integer;
 Begin
   for i:=1 to 6 do
   begin
   Demandprice[i,1]:= Price[i,1] - Subsidies[i,1];
   end;
 End;


Procedure Konstanten;
 var i:integer;
 Begin
 for i:=1 to 6 do
  begin
```

```
 Sup_Konst[i]:= Hyper_A(Supply[i,1],Price[i,1],Sup_elast[i],
                        Prp[i,1],CP_elast[i]);
 end;
for i:=1 to 6 do
 begin
 Dem_Konst[i]:= Hyper(Demand[i,1],Demandprice[i,1],Dem_elast[i]);
 end;
for i:=1 to 6 do
 begin
 Int_Konst[i]:= Hyper(Intervention[i,1],Price[i,1],Int_elast[i]);
 end;
End;

Procedure Zollweg;
var i:integer;
Begin
for i:=1 to 6 do
Countrygroup[i]:=Group_a[i];
for i:=1 to 2 do Zoll[i,2]:=0;
if (Comm_arrang =true) then Zoll[3,2]:=0;
End;

Procedure Sup_Dem_Curves;
 var i : integer;
     Diff_Abl : real;

 Begin
 Diff_Abl:=0;
 for i:=1 to 6 do
  begin
  Diff_Abl:= Diff_Abl + Sup_Konst[i] * Sup_elast[i] *
         Hoch(Price[i,2],(Sup_elast[i]-1));
  end;
 for i:=1 to 6 do
  begin
  Diff_Abl:= Diff_Abl - Dem_Konst[i] * Dem_elast[i] *
         Hoch(Demandprice[i,2],(Dem_elast[i]-1));
  end;
 for i:=1 to 6 do
  begin
  Diff_Abl:= Diff_Abl - Int_Konst[i] * Int_elast[i] *
         Hoch(Price[i,2],(Int_elast[i]-1));
  end;

  Demandprice[1,2]:= Demandprice[1,2] - (error / Diff_Abl);
  if Demandprice[1,2]<Sicherung then Price[1,2]:=Sicherung;
 End;

Procedure Equilibrium_Situation;
var i:integer;
Begin
Demandprice[1,2]:=Price[1,1];

     X:=0;
repeat
     X:=X +1;
     error:=0;
     totalsup:=0;
     totaldem:=0;
     totalint:=0;
     Price[1,2]:= Demandprice[1,2] + Subsidies[1,2];
   for i:=2 to 6 do
    begin
    Price[i,2]:= Demandprice[1,2] / 1+Zoll[i,2] + Subsidies[i,2];
    Demandprice [i,2]:= Price[i,2] - Subsidies[i,2];
    end;
```

```
    for i:=1 to 6 do
     begin
      Supply[i,2]:= Sup_Konst[i] * Hoch(Price[i,2],Sup_elast[i]);
      totalsup := totalsup + Supply[i,2];
      end;
      totalsup:= totalsup+Autonom;
   for i:=1 to 6 do
    begin
    Demand[i,2]:= Dem_konst[i] * Hoch(Demandprice[i,2],Dem_elast[i]);
    totaldem:= totaldem + Demand[i,2];
    end;
   for i:=1 to 6 do
    begin
    Intervention[i,2]:= Int_Konst[i] * Hoch(Price[i,2],Int_elast[i]);
    totalint:= totalint + Intervention[i,2];
    end;
    error:= totalsup - totaldem - totalint ;
    if Abs(error)> Toleranz then Sup_dem_curves;
    if X>15 then
     begin
     writeln('A reasonable result is not possible');
     halt;
     end;
    until (Abs(error)<= Toleranz);
    End;

Procedure Price_Variations;
 var i,j: integer;
 Begin
 for j:=1 to 2 do
  begin
  for i:=1 to 6 do
   begin
   if (j=1) and (i=2) then
   Netto_ImEx[i,j]:= Supply[i,j] - Demand[i,j]
   else
   Netto_ImEx[i,j]:= Supply[i,j] -Demand[i,j] - Intervention[i,j];
   end;
   end;
   Netto_ImEx[1,2]:=Netto_ImEx[1,2] +Autonom;
  for i:=1 to 6 do
   begin

   Pricecha[i]:=(Price[i,2] / Price[i,1] - 1) * 100 ;
   Pricechb[i]:=(Demandprice[i,2] / Demandprice[i,1] -1) * 100 ;
   end;
 End;

 Procedure Political_Choice;
 var i:integer;
 begin
 clrscr;
 writeln(text2[m]);
 writeln;DELAY(1000);
 End;


Procedure Final_Values;
 var i:integer;
 begin
 writeln;
 for i:=1 to 6 do
 write (Countrygroup[i]);
 Writeln('.... Elasticities  Values....');
 writeln;
 begin
```

```
 for i:=1 to 6 do
 writeln (Sup_elast[i]:12:4);
 writeln;
 end;
 begin
 for i:=1 to 6 do
 writeln (Dem_elast[i]:12:4);
 writeln;
 end;
 begin
 for i:=1 to 6 do
 writeln (Int_elast[i]:12:4);
 writeln;
 end;
 begin
 for i:=1 to 6 do
 writeln (MGP[i,1]:12:4);
 writeln;
 end;
 DELAY(1000);
 End;


Procedure Big_Egg;
var i: integer;
 Begin
 clrscr;
 writeln(lst);
 writeln(lst,'" PREVIOUS SITUATION AND NEW MARKET EQUILIBRIUM "') ;
 writeln(lst);

 writeln(lst,'    PREVIOUS SITUATION           ');
 writeln(lst);

 For i:=1 to 6 do
 write (lst,Countrygroup [i]);
 writeln(lst);

 writeln(lst,'......Supply Values.......');
 for i:=1 to 6 do
 write(lst,Supply[i,1]:12:3);
 writeln(lst);

 writeln(lst,'.......Demand Values.......');
 for i:=1 to 6 do
 write(lst,Demand[i,1]:12:3);
 writeln(lst);

 writeln(lst,'....Intervention Amounts....');
 for i:=1 to 6 do
  begin
  write (lst,Intervention[i,1]:12:3);
  end;
 writeln(lst);

 writeln(lst,'....Net Imports....');
 for i:=1 to 6 do
 write (lst,Netto_ImEx[i,1]:12:3);
 writeln(lst);

 writeln(lst,'.....Zoll Amounts.....');
 for i:=1 to 6 do
 write(lst,(Zoll[i,1] * 100):12:3);
 writeln(lst);
```

```
writeln(lst,'.....Prices of Supply.....');
for i:=1 to 6 do
write(lst,Price[i,1]:12:3);
writeln(lst);

writeln(lst,'.....Prices of Demand.....');
for i:=1 to 6 do
write(lst,Demandprice[i,1]:12:3);
writeln(lst);

writeln(lst,'.....Sudsidies Amouts.....');
for i:=1 to 6 do
write(lst,Subsidies[i,1]:12:3);
writeln(lst);
writeln(lst);

writeln(lst,'    NEW MARKET EQUILIBRIUM          ');
writeln(lst);

for i:=1 to 6 do
write(lst,Countrygroup[i]);
writeln(lst);

writeln(lst,'.....New Supply Values.....');
for i:=1 to 6 do
write(lst,Supply[i,2]:12:3);
writeln(lst);

writeln(lst,'.....New Demand Values.....');
for i:=1 to 6 do
write(lst,Demand[i,2]:12:3);
writeln(lst);

writeln(lst,'...New Intervention Amounts...');
for i:=1 to 6 do
  begin
   if (i=2)  and (m<>4) then Intervention[i,1]:=0;
   write(lst,Intervention[i,2]:12:3);
  end;
writeln(lst);

writeln(lst,'.....New Net Imports....');
for i:=1 to 6 do
write(lst,Netto_ImEx[i,2]:12:3);
writeln(lst);

writeln(lst,'.....New Zoll Amounts.....');
for i:=1 to 6 do
write(lst,(Zoll[i,2] * 100):12:3);
writeln(lst);

writeln(lst,'....New Prices of Supply....');
for i:=1 to 6 do
write(lst,Price[i,2]:12:3);
writeln(lst);

writeln(lst,'....New Prices of Demand....');
for i:=1 to 6 do
write(lst,Demandprice[i,2]:12:3);
writeln(lst);

writeln(lst,'....New Subsidies Amounts....');
for i:=1 to 6 do
write(lst,Subsidies[i,2]:12:3);
writeln(lst);
writeln(lst);
```

```
 writeln(lst,'    CONSEQUENT PRICE VARIATIONS (%)     ');
 writeln(lst);

 for i:=1 to 6 do
 write(lst,Countrygroup[i]);
 writeln(lst);

 Writeln(lst,'...Variations on Supply Prices...');
 for i:=1 to 6 do
 write(lst,Pricecha[i]:12:3);
 writeln(lst);

 writeln(lst,'...Variations on Demand Prices...');
 for i:=1 to 6 do
 write(lst,Pricechb[i]:12:3);
 writeln(lst);

 End;

Procedure Price_decision;
  begin
  Trade_situation;

  if Netto_ImEx[1,1]<0 then A_Reading_Prices;
  Price[1,1]:= MGP[1,1]+Price[1,1];
  if (Netto_ImEx[1,1]>0) and (Netto_ImEx[1,1]>Netto_ImEx[2,1])
      and (Netto_ImEx[1,1]>Netto_ImEx[3,1])
  then B_Reading_Prices;
  if (Netto_ImEx[1,1]>0) and (Netto_ImEx[2,1]>Netto_ImEx[1,1])
      and (Netto_ImEx[2,1]>Netto_ImEx[3,1])
  then C_Reading_Prices;
  if (Netto_ImEx[1,1]>0) and (Netto_ImEx[3,1]>Netto_ImEx[1,1])
      and (Netto_ImEx[3,1]>Netto_ImEx[2,1])
  then D_Reading_Prices;
  end;

Procedure Simulation;
Begin;
Readinginicial_values;
Reading_elasticities;
Price_decision;
Demand_Prices;
Konstanten;
  if (m=1) or (m=2) or (m=3) then Zollweg ;
Equilibrium_Situation;
Price_Variations;
Political_choice;
Final_values;
Big_Egg;
End;

Procedure Optative_policies;
var i:integer;
Begin
repeat
  Default_wert;
  for i:=1 to 4 do
  begin
  writeln (Option2[i]);
  end;
  writeln(Text);
  readln(m);
  if (m=1) then Simulation;
  if (m=2) then
           begin
```

```
            Introducing_Subsidies;
            Simulation;
            end;
    if(m=3) then
            begin
            Comm_arrang:= true;
            Simulation;
            end;
     until (m=0);
   End;

Procedure Distribution;
var i: integer;
 Begin
 repeat
   for i:=1 to 4 do
   begin
   writeln(Option1[i]);
   end;
  write(text);
  readln(i);
  if (i=2) Then Change_Values;
  if (i=3) Then Change_elasticities;
  if (i=4) Then Optative_Policies;
 until(i=1);
 end;


 Begin
 clrscr;
 Gotoxy(5,4);

Write(lst,'A SIMULATION MODEL ON INTERNATIONAL TRADE OF TOMATO PRODUCTS');
 writeln(lst);
 for i:=2 to 79 do
  write(lst,char(205));
  writeln(lst);

  Distribution;

END.
```

APPENDIX 5.3: PROPOSED SCENARIOS

Projection 1

1 a) MGP are constant during 10 years for EC(10):

9.0 9.0 9.0 9.0 9.0
9.0 9.0 9.0 9.0 9.0

MGP are increasing during the same period PORT/SPAIN:

5.5 5.5 6.0 6.5 7.0
7.5 8.0 8.5 9.0 9.0

others indifferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs

Other countries pay normal tarrifs

4 a) Using no quotas

5 a) Using constant subsidies for 10 years in EC(10):

28 28 28 28 28
28 28 28 28 28

and increasing subsidies for 10 years in PORT/SPAIN:

17 18 19 20 21
22 23 24 26 28

Projection 2

1 a) MGP are constant during 10 years forEC(10):

9.0 9.0 9.0 9.0 9.0
9.0 9.0 9.0 9.0 9.0

MGP are increasing during the same period in PORT/SPAIN:

5.5 5.5 6.0 6.5 7.0
7.5 8.0 8.5 9.0 9.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs

Other countries pay normal tarrifs

4 a) Using no quotas

5 b) Using decreasing subsidies for EC(10):

28 26 24 22 20
20 19 19 19 19

and increasing subsidies for 10 years in PORT/SPAIN:

17 17 19 19 19
19 19 19 19 19

Projection 3

1 a) MGP are constant during 10 years for EC(10):

9.0 9.0 9.0 9.0 9.0
9.0 9.0 9.0 9.0 9.0

MGP are increasing during the same period in PORT/SPAIN:

5.5 5.5 6.0 6.5 7.0
7.5 8.0 8.5 9.0 9.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs

Other countries pay normal tarrifs

4 a) Using no quotas

5 c) Using decreasing subsidies for 10 years in EC(10):

28 24 20 16 12
10 6 0 0 0

and decreasing subsidies for 10 years PORT/SPAIN:

17 16 15 14 13
12 10 8 6 0

Projection 4

1 a) MGP are constant during 10 years for EC(10):

9.0 9.0 9.0 9.0 9.0
9.0 9.0 9.0 9.0 9.0

MGP are increasing during the same period in PORT/SPAIN:

5.5 5.5 6.0 6.5 7.0
7.5 8.0 8.5 9.0 9.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = as above
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs

Other countries pay normal tarrifs

4 a) Using no quotas

5 d) Using decreasing subsidies for 10 years in EC(10):

28 24 20 17 17
17 17 17 17 17

and constant for the same period in PORT/SPAIN:

17 17 17 17 17
17 17 17 17 17

Projection 5

1 a) MGP are constant during 10 years for EC(10):

9.0 9.0 9.0 9.0 9.0
9.0 9.0 9.0 9.0 9.0

MGP are increasing during the same period in PORT/SPAIN:

5.5 5.5 6.0 6.5 7.0
7.5 8.0 8.5 9.0 9.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = as above
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 b) Using increasing quotas for 10 years in EC(10):

100 110 120 130 140
150 160 170 180 190

and constant for the same period in PORT/SPAIN:

10 10 10 10 10
10 10 10 10 10

5 a) Using constant subsidies for 10 years in EC(10):

28 28 28 28 28
28 28 28 28 28

and increasing subsidies for 10 years in PORT/SPAIN:

17 18 19 20 21
22 23 24 26 28

Projection 6

1 a) MGP are constant during 10 years for EC(10):

9.0 9.0 9.0 9.0 9.0
9.0 9.0 9.0 9.0 9.0

MGP are increasing during the same period in PORT/SPAIN:

5.5 5.5 6.0 6.5 7.0
7.5 8.0 8.5 9.0 9.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = as above
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 b) Using increasing quotas for 10 years in EC(10):

100 110 120 130 140
150 160 170 180 190

and constant for the same period in PORT/SPAIN:

10 10 10 10 10
10 10 10 10 10

5 b) Using decreasing subsidies for 10 years in EC(10):

28 26 24 22 20
19 19 19 19 19

and increasing subsidies for 10 years in PORT/SPAIN:

17 17 19 19 19
19 19 19 19 19

Projection 7

1 a) MGP are constant during 10 years for EC(10):

9.0 9.0 9.0 9.0 9.0
9.0 9.0 9.0 9.0 9.0

MGP are increasing during the same period PORT/SPAIN:

5.5 5.5 6.0 6.5 7.0
7.5 8.0 8.5 9.0 9.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = as above
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 b) Using increasing quotas for 10 years in EC(10):

100 110 120 130 140
150 160 170 180 190

and constant for the same period in PORT/SPAIN :

10 10 10 10 10
10 10 10 10 10

5 c) Using decreasing subsidies for 10 years in EC(10):

28 24 20 16 12
12 6 0 0 0

and decreasing subsidies for 10 years PORT/SPAIN:

17 16 15 14 13
12 10 8 6 0

Projection 8

1 a) MGP are constant during 10 years for EC(10):

9.0 9.0 9.0 9.0 9.0
9.0 9.0 9.0 9.0 9.0

MGP are increasing during the same period for PORT/SPAIN:

5.5 5.5 6.0 6.5 7.0
7.5 8.0 8.5 9.0 9.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = as above
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 b) Using increasing quotas for 10 years in EC(10):

100 110 120 130 140
150 160 170 180 190

and constant for the same period in PORT/SPAIN:

10 10 10 10 10
10 10 10 10 10

5 d) Using decreasing subsidies for 10 years in EC(10):

28 24 20 17 17
17 17 17 17 17

and constant for the same period in PORT/SPAIN:

17 17 17 17 17
17 17 17 17 17

Projection 9

1 a) MGP are constant during 10 years for EC(10):

9.0 9.0 9.0 9.0 9.0
9.0 9.0 9.0 9.0 9.0

MGP are increasing during the same period for PORT/SPAIN:

5.5 5.5 6.0 6.5 7.0
7.5 8.0 8.5 9.0 9.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = as above
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 c) Using constant quotas for 10 years in EC(10):

120 120 120 120 120
120 120 120 120 120

and no quotas for PORT/SPAIN

5 a) Using constant subsidies for 10 years in EC(10):

28 28 28 28 28
28 28 28 28 28

and increasing subsidies for 10 years in PORT/SPAIN:

17 18 19 20 21
22 23 24 26 28

Projection 10

1 a) MGP are constant during 10 years for EC(10):

9.0 9.0 9.0 9.0 9.0
9.0 9.0 9.0 9.0 9.0

MGP are increasing during the same period PORT/SPAIN:

5.5 5.5 6.0 6.5 7.0
7.5 8.0 8.5 9.0 9.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = as above
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 c) Using constant quotas for 10 years in EC(10):

120 120 120 120 120
120 120 120 120 120

and no quotas for PORT/SPain

5 b) Using decreasing subsidies for 10 years in EC(10):

28 26 24 22 20
19 19 19 19 19

and increasing for the same period in PORT/SPAIN:

17 17 19 19 19
19 19 19 19 19

Projection 11

1 a) MGP are constant during 10 years for EC(10):

9.0 9.0 9.0 9.0 9.0
9.0 9.0 9.0 9.0 9.0

MGP are increasing during the same period PORT/SPAIN:

5.5 5.5 6.0 6.5 7.0
7.5 8.0 8.5 9.0 9.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = as above
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 c) Using constant quotas for 10 years in EC(10):

120 120 120 120 120
120 120 120 120 120

and no quotas in PORT/SPAIN

5 c) Using decreasing subsidies for 10 years in EC(10):

28 24 20 16 12
10 6 0 0 0

and decreasing subsidies for 10 years in PORT/SPAIN:

17 16 15 14 13
12 10 8 6 0

Projection 12

1 a) MGP are constant during 10 years for EC(10):

9.0 9.0 9.0 9.0 9.0
9.0 9.0 9.0 9.0 9.0

MGP are increasing during the same period in PORT/SPAIN:

5.5 5.5 6.0 6.5 7.0
7.5 8.0 8.5 9.0 9.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 c) Using constant quotas for 10 years in EC(10):

120 120 120 120 120
120 120 120 120 120

and none PORT/SPAIN

5 d) Using decreasing subsidies for 10 years in EC(10):

28 24 20 17 17
17 17 17 17 17

and constant subsidies for 10 years in PORT/SPAIN:

17 17 17 17 17
17 17 17 17 17

Projection 13

1 b) MGP are:
decreasing during the next 10 years for EC(10):
9.0 9.0 8.5 8.0 7.5
7.0 6.5 6.0 5.5 5.5
constant during the next 10 years for PORT/SPAIN:
5.5 5.5 5.5 5.5 5.5
5.5 5.5 5.5 5.5 5.5
others indiferent
2 c) Following elasticities were chosen:
El.S(i,k) = 2.0
El.D(i,k) = as above
El.I(i,k) = -5
El.Cr(i,j,k) = ...
3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs
4 a) Using no quotas for 10 years
5 a) Using constant subsidies for 10 years in EC(10):
28 28 28 28 28
28 28 28 28 28
and increasing subsidies for 10 years in PORT/SPAIN:
17 24 28 28 28
28 28 28 28 28

Projection 14

1 b) MGP are:
decreasing during the next 10 years for EC(10):
9.0 9.0 8.5 8.0 7.5
7.0 6.5 6.0 5.5 5.5
constant during the next 10 years for PORT/SPAIN:
5.5 5.5 5.5 5.5 5.5
5.5 5.5 5.5 5.5 5.5
others indiferent
2 c) Following elasticities were chosen:
El.S(i,k) = 2.0
El.D(i,k) = as above
El.I(i,k) = -5
El.Cr(i,j,k) = ...
3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs
4 a) Using no quotas for 10 years
5 b) Using decreasing subsidies for 10 years in EC(10):
28 26 24 22 20
20 19 19 19 19
and increasing subsidies for 10 years in PORT/SPAIN:
17 17 19 19 19
19 19 19 19 19

Projection 15

1 b) MGP are:
decreasing during the next 10 years for EC(10):
9.0 9.0 8.5 8.0 7.5
7.0 6.5 6.0 5.5 5.5
constant during the next 10 years for PORT/SPAIN:
5.5 5.5 5.5 5.5 5.5
5.5 5.5 5.5 5.5 5.5
others indiferent
2 c) Following elasticities were chosen:
El.S(i,k) = 2.0
El.D(i,k) = as above
El.I(i,k) = -5
El.Cr(i,j,k) = ...
3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs
4 a) Using no quotas for 10 years
5 c) Using decreasing subsidies for 10 years in EC(10):
28 24 20 16 13
12 10 8 6 0
and decreasing subsidies for PORT/SPAIN:
17 16 15 14 13
12 10 8 6 0

Projection 16

1 b) MGP are:
decreasing during the next 10 years for EC(10):
9.0 9.0 8.5 8.0 7.5
7.0 6.5 6.0 5.5 5.5
constant during the next 10 years for PORT/SPAIN:
5.5 5.5 5.5 5.5 5.5
5.5 5.5 5.5 5.5 5.5
others indiferent
2 c) Following elasticities were chosen:
El.S(i,k) = 2.0
El.D(i,k) = as above
El.I(i,k) = -5
El.Cr(i,j,k) = ...
3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs
4 a) Using no quotas for 10 years
5 d) Using decreasing subsidies for 10 years in EC(10):
28 24 20 17 17
17 17 17 17 17
and constant for the same period in PORT/SPAIN:
17 17 17 17 17
17 17 17 17 17

Projection 17

1 b) MGP are:
decreasing during the next 10 years for EC(10):
9.0 9.0 8.5 8.0 7.5
7.0 6.5 6.0 5.5 5.5
constant during the next 10 years for PORT/SPAIN:
5.5 5.5 5.5 5.5 5.5
5.5 5.5 5.5 5.5 5.5
others indiferent
2 c) Following elasticities were chosen:
El.S(i,k) = 2.0
El.D(i,k) = as above
El.I(i,k) = -5
El.Cr(i,j,k) = ...
3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs
4 b) Using increasing quotas for 10 years in EC(10):
100 110 120 130 140
150 160 170 180 190
and constant for the same period in PORT/SPAIN:
10 10 10 10 10
10 10 10 10 10
5 a) Using constant subsidies for 10 years in EC(10):
28 28 28 28 28
28 28 28 28 28
and increasing subsidies for 10 years in PORT/SPAIN:
17 24 28 28 28
28 28 28 28 28

Projection 18

1 b) MGP are:
decreasing during the next 10 years for EC(10):
9.0 9.0 8.5 8.0 7.5
7.0 6.5 6.0 5.5 5.5
constant during the next 10 years forPORT/SPAIN:
5.5 5.5 5.5 5.5 5.5
5.5 5.5 5.5 5.5 5.5
others indiferent
2 c) Following elasticities were chosen:
El.S(i,k) = 2.0
El.D(i,k) = as above
El.I(i,k) = -5
El.Cr(i,j,k) = ...
3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs
4 b) Using increasing quotas for 10 years in EC(10):
100 110 120 130 140
150 160 170 180 190
and constant for the same period in PORT/SPAIN:
10 10 10 10 10
10 10 10 10 10
5 b) Using decreasing subsidies for 10 years in EC(10):
28 26 24 22 20
19 19 19 19 19
and increasing subsidies for 10 years in PORT/SPAIN:
17 17 19 19 19
19 19 19 19 19

Projection 19

1 b) MGP are:
decreasing during the next 10 years for EC(10):
9.0 9.0 8.5 8.0 7.5
7.0 6.5 6.0 5.5 5.5
constant during the next 10 years for PORT/SPAIN:
5.5 5.5 5.5 5.5 5.5
5.5 5.5 5.5 5.5 5.5
others indiferent
2 c) Following elasticities were chosen:
El.S(i,k) = 2.0
El.D(i,k) = as above
El.I(i,k) = -5
El.Cr(i,j,k) = ...
3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs
4 b) Using increasing quotas for 10 years in EC(10):
100 110 120 130 140
150 160 170 180 190
and constant for the same period in PORT/SPAIN:
10 10 10 10 10
10 10 10 10 10
5 c) Using decreasing subsidies for 10 years in EC(10):
28 24 20 16 12
10 6 0 0 0
and decreasing subsidies for 10 years PORT/SPAIN:
17 16 15 14 13
12 10 8 6 0

Projection 20

1 b) MGP are:
decreasing during the next 10 years for EC(10):
9.0 9.0 8.5 8.0 7.5
7.0 6.5 6.0 5.5 5.5
constant during the next 10 years for PORT/SPAIN:
5.5 5.5 5.5 5.5 5.5
5.5 5.5 5.5 5.5 5.5
others indiferent
2 c) Following elasticities were chosen:
El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...
3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs
4 b) Using increasing quotas for 10 years in EC(10):
100 110 120 130 140
150 160 170 180 190
and constant for the same period in PORT/SPAIN:
10 10 10 10 10
10 10 10 10 10
5 d) Using decreasing subsidies for 10 years in EC(10):
28 24 20 17 17
17 17 17 17 17
and constant for the same period in PORT/SPAIN:
17 17 17 17 17
17 17 17 17 17

Projection 21

1 b) MGP are:
decreasing during the next 10 years for EC(10):
9.0 9.0 8.5 8.0 7.5
7.0 6.5 6.0 5.5 5.5
constant during the next 10 years for PORT/SPAIN:
5.5 5.5 5.5 5.5 5.5
5.5 5.5 5.5 5.5 5.5
others indiferent
2 c) Following elasticities were chosen:
El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...
3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs
4 c) Using constant quotas for 10 years in EC(10e):
120 120 120 120 120
120 120 120 120 120
and no quotas for PORT/SPAIN
5 a) Using constant subsidies for 10 years in EC(10):
28 28 28 28 28
28 28 28 28 28
and increasing subsidies for 10 years in PORT/SPAIN:
17 18 19 20 21
22 23 24 26 28

Projection 22

1 b) MGP are:
decreasing during the next 10 years for EC(10):
9.0 9.0 8.5 8.0 7.5
7.0 6.5 6.0 5.5 5.5
constant during the next 10 years for PORT/SPAIN:
5.5 5.5 5.5 5.5 5.5
5.5 5.5 5.5 5.5 5.5
others indiferent
2 c) Following elasticities were chosen:
El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...
3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs
4 c) Using constant quotas for 10 years in EC(10):
120 120 120 120 120
120 120 120 120 120
and no quotas for the same period in PORT/SPAIN
5 b) Using decreasing subsidies for 10 years in EC(10):
28 26 24 22 20
20 19 19 19 19
and increasing subsidies for 10 years in PORT/SPAIN:
17 17 19 19 19
19 19 19 19 19

Projection 23

1 b) MGP are:
decreasing during the next 10 years for EC(10):
9.0 9.0 8.5 8.0 7.5
7.0 6.5 6.0 5.5 5.5
constant during the next 10 years for PORT/SPAIN:
5.5 5.5 5.5 5.5 5.5
5.5 5.5 5.5 5.5 5.5
others indiferent
2 c) Following elasticities were chosen:
El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...
3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs
4 c) Using constant quotas for 10 years in EC(10):
120 120 120 120 120
120 120 120 120 120
and no quotas for the same period in PORT/SPAIN
5 c) Using decreasing subsidies for 10 years in EC(10):
28 24 20 16 12
10 6 0 0 0
and slowly decreasing subsidies for PORT/SPAIN:
17 16 15 14 13
12 10 8 6 0

Projection 24

1 b) MGP are:
decreasing during the next 10 years for EC(10):
9.0 9.0 8.5 8.0 7.5
7.0 6.5 6.0 5.5 5.5
constant during the next 10 years for PORT/SPAIN:
5.5 5.5 5.5 5.5 5.5
5.5 5.5 5.5 5.5 5.5
others indiferent
2 c) Following elasticities were chosen:
El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...
3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs
4 c) Using constant quotas for 10 years in EC(10):
120 120 120 120 120
120 120 120 120 120
and no quotas for the same period in PORT/SPAIN
5 d) Using decreasing subsidies for 10 years in EC(10):
28 24 20 17 17
17 17 17 17 17
and constant for the same period in PORT/SPAIN:
17 17 17 17 17
17 17 17 17 17

Projection 25

1 c) MGP are decreasing slowly during 10 years for EC(10):

9.0 9.0 9.0 8.5 8.5
8.5 8.5 8.0 8.0 8.0

MGP are increasing during the same period for PORT/SPAIN:

5.0 5.4 5.8 6.2 6.6
7.0 7.3 7.6 7.9 8.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = as above
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 a) Using no quotas in EC(10)

5 a) Using constant subsidies for 10 years in EC(10):

28 28 28 28 28
28 28 28 28 28

and increasing subsidies for 10 years in PORT/SPAIN:

17 18 19 20 21
22 23 24 26 28

Projection 26

1 c) MGP are decreasing slowly during 10 years for EC(10):

9.0 9.0 9.0 8.5 8.5
8.5 8.5 8.0 8.0 8.0

MGP are increasing during the same period in PORT/SPAIN:

5.0 5.4 5.8 6.2 6.6
7.0 7.3 7.6 7.9 8.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 a) Using no quotas

5 b) Using decreasing subsidies for 10 years in EC(10):

28 26 24 22 20
20 19 19 19 19

and increasing subsidies for 10 years in PORT/SPAIN:

17 17 19 19 19
19 19 19 19 19

Projection 27

1 c) MGP are decreasing slowly during 10 years for EC(10):

9.0 9.0 9.0 8.5 8.5
8.5 8.5 8.0 8.0 8.0

MGP are increasing during the same period for PORT/SPAIN:

5.0 5.4 5.8 6.2 6.6
7.0 7.3 7.6 7.9 8.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 a) Using no quotas

5 c) Using decreasing subsidies for 10 years in EC(10):

28 24 20 16 12
10 6 0 0 0

and slowly decreasing subsidies for PORT/SPAIN:

17 16 15 14 13
12 10 8 6 0

Projection 28

1 c) MGP are decreasing slowly for EC(10):

9.0 9.0 9.0 8.5 8.5
8.5 8.5 8.0 8.0 8.0

MGP are increasing during the same period in PORT/SPAIN:

5.0 5.4 5.8 6.2 6.6
7.0 7.3 7.6 7.9 8.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 a) Using no quotas

5 d) Using decreasing subsidies for 10 years in EC(10):

28 24 20 17 17
17 17 17 17 17

and constant for the same period in PORT/SPAIN:

17 17 17 17 17
17 17 17 17 17

Projection 29

1 c) MGP are decreasing slowly during 10 years for EC(10):

9.0 9.0 9.0 8.5 8.5
8.5 8.5 8.0 8.0 8.0

MGP are increasing during the same period in PORT/SPAIN:

5.0 5.4 5.8 6.2 6.6
7.0 7.3 7.6 7.9 8.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 b) Using increasing quotas for 10 years in EC(10):

100 110 120 130 140
150 160 170 180 190

and constant for the same period in PORT/SPAIN:

10 10 10 10 10
10 10 10 10 10

5 a) Using constant subsidies for 10 years in EC(10):

28 28 28 28 28
28 28 28 28 28

and increasing subsidies for 10 years in PORT/SPAIN:

17 24 28 28 28
28 28 28 28 28

Projection 30

1 c) MGP are decreasing slowly during 10 years for EC(10):

9.0 9.0 9.0 8.5 8.5
8.5 8.5 8.0 8.0 8.0

MGP are increasing during the same period in PORT/SPAIN:

5.0 5.4 5.8 6.2 6.6
7.0 7.3 7.6 7.9 8.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 b) Using increasing quotas for 10 years in EC(10):

100 110 120 130 140
150 160 170 180 190

and constant for the same period in PORT/SPAIN:

10 10 10 10 10
10 10 10 10 10

5 b) Using decreasing subsidies for 10 years in EC(10):

28 26 24 22 20
20 19 19 19 19

and increasing subsidies for 10 years in PORT/SPAIN:

17 17 19 19 19
19 19 19 19 19

Projection 31

1 c) MGP are decreasing slowly during 10 years for EC(10):

9.0 9.0 9.0 8.5 8.5
8.5 8.5 8.0 8.0 8.0

MGP are increasing during the same period in PORT/SPAIN:

5.0 5.4 5.8 6.2 6.6
7.0 7.3 7.6 7.9 8.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 b) Using increasing quotas for 10 years in EC(10):

100 110 120 130 140
150 160 170 180 190

and constant for the same period in PORT/SPAIN:

10 10 10 10 10
10 10 10 10 10

5 c) Using decreasing subsidies for 10 years in EC(10):

28 24 20 16 12
10 6 0 0 0

and slowly decreasing subsidies for 10 years in PORT/SPAIN:

17 16 15 14 13
12 10 8 6 0

Projection 32

1 c) MGP are decreasing slowly during 10 years for EC(10):

9.0 9.0 9.0 8.5 8.5
8.5 8.5 8.0 8.0 8.0

MGP are increasing during the same period in PORT/SPAIN:

5.0 5.4 5.8 6.2 6.6
7.0 7.3 7.6 7.9 8.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 b) Using increasing quotas for 10 years in EC(10):

100 110 120 130 140
150 160 170 180 190

and constant for the same period in PORT/SPAIN:

10 10 10 10 10
10 10 10 10 10

5 d) Using decreasing subsidies for 10 years in EC(10):

28 24 20 17 17
17 17 17 17 17

and constant for the same period in PORT/SPAIN:

17 17 17 17 17
17 17 17 17 17

Projection 33

1 c) MGP are decreasing slowly during 10 years for EC(10):

9.0 9.0 9.0 8.5 8.5
8.5 8.5 8.0 8.0 8.0

MGP are increasing during the same period in PORT/SPAIN:

5.0 5.4 5.8 6.2 6.6
7.0 7.3 7.6 7.9 8.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 c) Using constant quotas for 10 years in EC(10):

120 120 120 120 120
120 120 120 120 120

and none for the same period in PORT/SPAIN

5 a) Using constant subsidies for 10 years in EC(10):

28 28 28 28 28
28 28 28 28 28

and increasing subsidies for 10 years in PORT/SPAIN:

17 24 28 28 28
28 28 28 28 28

Projection 34

1 c) MGP are decreasing slowly during 10 years for EC(10):

9.0 9.0 9.0 8.5 8.5
8.5 8.5 8.0 8.0 8.0

MGP are increasing during the same period in PORT/SPAIN:

5.0 5.4 5.8 6.2 6.6
7.0 7.3 7.6 7.9 8.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 c) Using constant quotas for 10 years in EC(10):

120 120 120 120 120
120 120 120 120 120

and none PORT/SPAIN

5 b) Using decreasing subsidies for 10 years in EC(10):

28 26 24 22 20
20 19 19 19 19

and increasing subsidies for 10 years in PORT/SPAIN:

17 17 19 19 19
19 19 19 19 19

Projection 35

1 c) MGP are decreasing slowly during 10 years for EC(10):

9.0 9.0 9.0 8.5 8.5
8.5 8.5 8.0 8.0 8.0

MGP are increasing during the same period in PORT/SPAIN:

5.0 5.4 5.8 6.2 6.6
7.0 7.3 7.6 7.9 8.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = ® -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 c) Using constant quotas for 10 years in EC(10):

120 120 120 120 120
120 120 120 120 120

and none for PORT/SPAIN

5 c) Using decreasing subsidies for 10 years in EC(10):

28 24 20 16 12
10 6 0 0 0

and decreasing subsidies in PORT/SPAIN:

17 16 15 14 13
12 10 8 6 0

Projection 36

1 c) MGP are decreasing slowly during 10 years for EC(10):

9.0 9.0 9.0 8.5 8.5
8.5 8.5 8.0 8.0 8.0

MGP are increasing during the same period in PORT/SPAIN:

5.0 5.4 5.8 6.2 6.6
7.0 7.3 7.6 7.9 8.0

others indiferent

2 c) Following elasticities were chosen:

El.S(i,k) = 2.0
El.D(i,k) = -1.0
El.I(i,k) = -5
El.Cr(i,j,k) = ...

3 b) Portugal and Spain pay no tariffs
Other countries pay normal tarrifs

4 c) Using constant quotas for 10 years in EC(10):

120 120 120 120 120
120 120 120 120 120

and none for PORT/SPAIN

5 d) Using decreasing subsidies for 10 years in EC(10):

28 24 20 17 17
17 17 17 17 17

and constant for the same period in PORT/SPAIN:

17 17 17 17 17
17 17 17 17 17

APPENDIX 6.1: EXPECTED VARIATIONS ON SUPPLIED TOMATOES FOR CONCENTRATE

TIME (2 YEARS)	EC (10)	S.P.	U.S.A.
REFERENCE AMOUNTS	565	151	692
PROJECTION			
1	+0.27	-0.04	-0.20
2	+0.25	-0.08	-0.17
3	+0.15	-0.01	-0.08
4	+0.21	-0.03	-0.16
5	+0.32	+0.13	-0.16
6	+0.30	+0.01	-0.12
7	+0.28	+0.01	-0.11
8	+0.27	+0.03	-0.11
9	+0.32	+0.13	-0.16
10	+0.31	+0.01	-0.13
11	+0.27	0.00	-0.11
12	+0.27	+0.03	-0.11
13	+0.25	+0.07	-0.21
14	+0.07	-0.04	-0.18
15	+0.08	-0.03	-0.09
16	+0.21	-0.03	-0.16
17	+0.32	+0.13	-0.16
18	+0.30	0.00	-0.12
19	+0.28	+0.01	-0.11
20	+0.27	+0.03	-0.11
21	+0.32	+0.01	-0.12
22	+0.31	+0.01	-0.12
23	+0.27	0.00	-0.11
24	+0.27	+0.03	-0.11
25	+0.26	+0.09	-0.21
26	+0.24	-0.03	-0.18
27	+0.22	-0.03	-0.16
28	+0.21	-0.01	-0.17
29	+0.32	+0.15	-0.16
30	+0.31	-0.04	-0.12
31	+0.28	-0.04	-0.10
32	+0.28	-0.01	-0.10
33	+0.32	+0.15	-0.16
34	+0.30	+0.02	-0.13
35	+0.27	+0.02	-0.11
36	+0.27	+0.04	-0.11

TIME (4 YEARS)	EC (10)	S.P.	U.S.A.
REFERENCE AMOUNTS	os 565	151	692
PROJECTION			
1	+0.51	-0.09	-0.41
2	+0.35	0.00	-0.31
3	+0.21	+0.06	-0.18
4	+0.21	+0.02	-0.20
5	+0.51	+0.45	-0.41
6	+0.44	+0.07	-0.25
7	+0.25	+0.05	0.00
8	+0.30	+0.10	-0.13
9	+0.50	+0.45	-0.41
10	+0.43	+0.05	-0.26
11	+0.28	-0.02	-0.12
12	+0.28	+0.09	-0.14
13	+0.32	+0.47	-0.47
14	+0.28	+0.03	-0.31
15	+0.11	-0.03	-0.17
16	+0.24	+0.06	-0.26
17	+0.55	+0.50	-0.49
18	+0.48	+0.10	-0.31
19	+0.32	+0.03	-0.17
20	+0.33	+0.14	-0.19
21	+0.54	+0.50	-0.49
22	+0.48	+0.27	-0.32
23	+0.32	+0.02	-0.17
24	+0.32	+0.13	-0.20
25	+0.43	+0.40	-0.48
26	+0.36	+0.01	-0.32
27	+0.22	-0.05	-0.20
28	+0.22	+0.05	-0.23
29	+0.52	+0.49	-0.44
30	+0.46	+0.02	-0.27
31	+0.30	-0.04	-0.12
32	+0.31	+0.06	-0.15
33	+0.51	+0.48	-0.44
34	+0.44	+0.08	-0.28
35	+0.29	+0.01	-0.14
36	+0.29	+0.12	-0.16

TIME (6 YEARS)	EC (10)	S.P.	U.S.A.
REFERENCE AMOUNTS	565	151	692
PROJECTION			
1	+0.72	-0.14	-0.59
2	+0.37	+0.07	-0.36
3	+0.04	-0.08	-0.06
4	+0.26	+0.15	-0.22
5	+0.64	+0.70	-0.62
6	+0.48	-0.03	-0.29
7	+0.12	+0.03	+0.14
8	+0.28	+0.17	-0.12
9	+0.62	+0.68	-0.63
10	+0.45	+0.13	-0.31
11	+0.12	-0.03	+0.03
12	+0.26	+0.15	-0.14
13	+0.44	+0.77	-0.79
14	+0.38	+0.19	-0.49
15	+0.07	-0.02	-0.19
16	+0.31	+0.22	-0.39
17	+0.70	+0.81	-0.78
18	+0.61	+0.27	-0.50
19	+0.27	+0.14	-0.14
20	+0.16	+0.09	-0.13
21	+0.64	+0.73	-0.82
22	+0.60	+0.23	-0.51
23	+0.24	+0.12	-0.15
24	+0.39	+0.30	-0.34
25	+0.53	+0.61	-0.70
26	+0.41	+0.09	-0.42
27	+0.08	-0.05	-0.10
28	+0.22	+0.13	-0.26
29	+0.66	+0.75	-0.67
30	+0.54	+0.12	-0.35
31	+0.17	-0.01	+0.02
32	+0.33	+0.18	-0.17
33	+0.66	+0.81	-0.93
34	+0.37	+0.07	-0.44
35	+0.15	+0.03	-0.02
36	+0.29	+0.21	-0.20

TIME (8 YEARS)	EC (10)	S.P.	U.S.A.
REFERENCE AMOUNTS	565	151	692
PROJECTION			
1	+0.87	-0.21	-0.74
2	+0.39	+0.11	-0.41
3	-0.29	-0.13	+0.29
4	+0.25	+0.17	-0.29
5	+0.73	+0.83	-0.76
6	+0.52	+0.22	-0.32
7	-0.21	-0.03	+0.54
8	+0.27	+0.21	-0.08
9	+0.68	+0.78	-0.77
10	+0.65	+0.15	-0.35
11	-0.21	-0.09	+0.37
12	+0.24	+0.17	-0.13
13	+0.40	+0.79	-0.95
14	+0.48	+0.34	-0.70
15	+0.26	+0.23	+0.43
16	+0.48	+0.44	-0.69
17	+0.69	+0.88	-0.95
18	+0.75	+0.44	-0.71
19	+0.04	+0.34	+0.08
20	+0.33	+0.30	-0.37
21	+0.60	+0.75	-0.96
22	+0.72	+0.34	-0.73
23	-0.04	+0.30	+0.04
24	+0.52	+0.49	-0.56
25	+0.55	+0.68	-0.85
26	+0.46	+0.16	-0.51
27	-0.25	-0.08	+0.15
28	+0.24	+0.19	-0.30
29	+0.74	+0.87	-0.84
30	+0.57	+0.18	-0.39
31	+0.14	-0.01	+0.37
32	+0.36	+0.23	-0.21
33	+0.67	+0.83	-0.84
34	+0.40	+0.12	-0.52
35	-0.17	+0.01	+0.29
36	+0.31	+0.26	-0.24

TIME (10 YEARS)	EC (10)	S.P.	U.S.A.
REFERENCE AMOUNTS	565	151	692
PROJECTION			
1	+0.94	-0.22	-0.84
2	+0.41	+0.13	-0.44
3	-0.58	-0.40	+0.58
4	+0.24	+0.27	-0.29
5	+0.77	+0.89	-0.86
6	+0.56	+0.23	-0.35
7	-0.51	-0.31	+1.08
8	+0.28	+0.28	-0.07
9	+0.69	+0.80	-0.84
10	+0.50	+0.20	-0.38
11	-0.53	-0.38	+0.78
12	+0.23	+0.16	-0.12
13	+0.28	+0.64	-0.99
14	+0.52	+0.37	-0.88
15	+0.06	+0.04	+0.79
16	+0.52	+0.48	-0.78
17	+0.60	+0.78	-0.99
18	+0.82	+0.50	-0.87
19	-0.28	+0.19	+0.38
20	+0.53	+0.50	-0.63
21	+0.49	+0.63	-0.99
22	+0.74	+0.45	-0.84
23	-0.20	+0.12	+0.31
24	+0.64	+0.60	-0.75
25	+0.52	+0.65	-0.93
26	+0.51	+0.21	-0.59
27	-0.53	-0.34	+0.49
28	+0.22	+0.35	-0.35
29	+0.75	+0.88	-0.92
30	+0.69	+0.28	-0.52
31	-0.46	-0.28	+0.80
32	+0.42	+0.28	-0.26
33	+0.66	+0.81	-0.93
34	+0.46	+0.17	-0.61
35	-0.49	-0.27	+0.67
36	+0.36	+0.29	-0.39

APPENDIX 6.3: CALCULATION FOR CROSS ELASTICITIES

EXPORT PRICES FOR PEELED TOMATOES

Period		Italy	France	Greece	U.S.A.
1981	extra EC	324	534	369	n.a.
	intra EC	274	417	290	n.a.
1982	extra EC	370	598	345	n.a.
	intra EC	324	407	291	n.a.
1983	extra EC	462	663	434	639
	intra EC	451	598	434	
1984	extra EC	534	841	607	583
	intra EC	501	773	332	
1985	extra EC	475	815	602	332
	intra EC	389	549	725	

CALCULATED VALUES FOR THE CROSS ELASTICITIES

Period		Italy	Greece	U.S.A.
1981	extra EC	+0.42	-0.76	
	intra EC	+0.33		
1982	extra EC	+0.22	+0.31	
	intra EC	+0.17	+0.21	
1983	extra EC	+0.34	+0.21	+1.04
	intra EC	+0.17	-0.34	
1984	extra EC	-0.31		+0.19
	intra EC	-0.14	+0.06	