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QUADERNI DEL DIPARTIMENTO
DI ECONOMIA POLITICA

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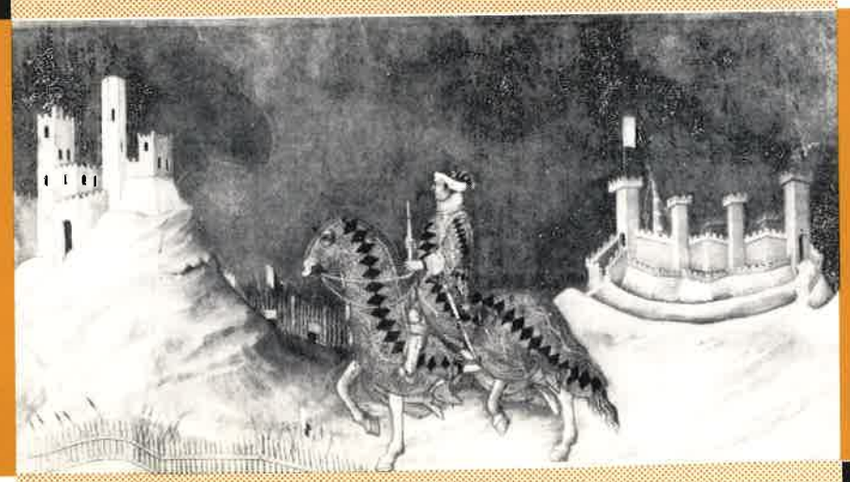

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Siena, gennaio 1990

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0. Summary

The primary objectives of this paper are to model the olive oil market in Italy and to investigate the linkages between key sectoral variables and policy instruments. In the specified model, consumption and import demands form conditional demand systems consistent with the restrictions of the microeconomic theory and the relevant policy variables are endogenous. Empirical evidence based on a three good AIDS shows that the expenditure elasticity of olive oil is elastic, that olive oil, seed oils and butter behave like net substitutes and as gross complements, and that olive oil demand is rather reactive to its own price. The dynamic multipliers support answers which are coherent with the model assumptions, but contradict common opinions. In particular, sectoral instruments, from which producers and the Commission expect so much, are not that effective in enhancing the market.

1. Introduction

Unlike the markets for other vegetable fats, the olive oil market is traditionally delimited within the Mediterranean Basin. In it Italy occupies a predominant position, accounting for 30% of world production and 65% of the EC's, and being the biggest user, with 38% of global consumption and 73% of the Community's. Spain and Greece follow, and the three taken together cover about 3/4 of the world market.

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Italy plays a major role in international trade of olive oil, too; through the years 1981 to 1985 its world import share amounted to 43%, with the following origins: 39% from Greece and France, 32% from Spain, 24% from Tunisia and a residual 5% from the rest of the world. During the same period, exports reached 15% of world exports, with 27% to the EC of 10 and 73% to the rest of the world.

Olive oil has been under Community regulation for more than twenty years now. Throughout the seventies, EC and Italian market practically coincided, though later the former has grown owing to the adhesion of Greece in 1981, and Spain and Portugal in 1986. It is apparent how events in this sector have been dominated in the past, and it will be more so in the near future, by actions taken at the EC level.

A substantial body of quantitative investigations on the Italian oils market and the CAP's influence exists at different levels of spatial aggregation: regional (De Stefano, 1982), national (Perone and Pieraccini, 1974; Rizzi, 1983) and international (Tarditi et al., 1980; Pieri et al., 1985). Recently, this product has been studied within a large econometric model of Italian agriculture (Rossi, 1984, 1988).

The purpose of the article is to evaluate the economic effects of the Community oils and fats regime on the Italian market. Two features characterize the econometric model: a) consumption and import demands form conditional demand systems of behavioral equations consistent with the restrictions of microeconomic theory; b) the relevant policy variables are endogenously determined.

The paper is organized as follows. In Sections 2 and 3 we give a brief overview of market regulations, budgetary costs and the proposal of changes by the Commission. Section 4 deals with model structure and parameter estimates. Section 5 presents validation results. Impact and sustained policy instrument multipliers, in the form of elasticities, which possibly provide some hint on structural relationships, are then reported in Section 6. In Section 7 we comment on selected policy scenarios. The paper ends with a few concluding remarks.

2. Market regime

The early oils and fats regime of the CAP is set out in Regulation No. 136/66, which came into effect at the beginning of the season 1966-67. Products under the denomination olive oil have been decoupled from that part of the regime covering other vegetable fats, on the basis of two considerations: first, the level of self-sufficiency differs very much (high for olive oil products and very low for oilseeds); second, the economic and social relevance of such a market for the South of the Community.

A variable levy system is operational at the frontier in order to protect EC producers against Third Country imports; on the contrary, there is an almost duty-free entry for all other vegetable oils.

Internal support measures parallel a deficiency payment regulation (Harris et al., 1983). Before the start of each marketing year, which runs from 1 November to 31 October, the following prices are set: production target, market target, threshold and intervention prices.

The production target price is fixed at a level that will ensure a return which is thought to be sufficient both to guarantee a fair income to growers and to sustain the volume of EC production. To ensure sales against competitive oils, the market target price is set at a lower level, taking into account the wholesale price ratio of olive oil to seed oils, which is somewhere around 2-2.5. The difference between production and market target prices is filled by production aid directly to the producers.

Finally threshold and intervention prices are derived from the market target price.

The threshold price provides protection at the EC border: in fact, the import variable levy is set at a level which bridges the gap between the border price and the best terms offered on the international market.

The intervention price represents the level at which support buying of domestic produce is available, as long as quality standards

are met. This constitutes a further stabilizing mechanism EC growers can count on as a minimum guaranteed return which, added to the the production aid, comes close to the production target price.

In 1978 the regime was revised according to Regulation No. 1562/78. The changes introduced, whose main novelty consists in the consumption aid, were based on two considerations: on the one hand, the difficulty of checking in an effective way the large number of claims for production aid coming from Community growers and crushers; on the other, the notable reduction in consumption that was taking place during the mid-seventies owing to the unfavorable trend in relative prices. Under the new regime the production target price still preserves its twofold purpose and the representative market price substitutes for the target market price. Though set at a lower level the former remains the bench-mark for the threshold price fixing. The difference between production target and representative market price is made up by the sum of production and consumption aid. Production aid, which still retains its `social and political importance', is now determined a priori, while consumption aid, distributed to the marketing channel, is derived indirectly as the difference of producer selling price and representative market price.

Finally, the intervention price is decoupled from the representative market price and it is maintained at the level reached during the original regime to be sure that the producer selling price is as close as possible to the production target price minus the production aid (Table 1).

3. Problems and perspectives of change

During the years 1978 to 1985 the FEOGA Guarantee Section expenditure to support the regime increased annually at a rate of 23.9% (20.1% olive oil, 27.3% other vegetable oils) and reached 1802.8 million ecu. According to the Commission, the budget cost rose to 2632 million ecu in 1986 and was expected to exceed 4000 in 1987 (Commission, 1987).

The 1986-87 higher expeditures were partly explained by specific circumstances like the falling of international prices and the weakening of the dollar against the ecu, after five years of continuous revaluation. To this unfavorable medium term trend, one has to add the extra cost involved in applying the present regime to Spain and Portugal. The enlargement of the Community is expected to imply an additional expense to the sector of about 2000 million ecu, of which 62% would be for olive oil and 38% for oilseeds. After 1990 total expenditure could reach 6000 million ecu, making oils and fats the most important expenditure item for the CAP. Since the support schemes based on the deficiency payments and the unlimited guarantee to the producers make the objective of keeping EC production at the present level too costly, the Commission has prepared a reform proposal which foresees both adjustments in the specific present regulation and the introduction of a stabilizing scheme addressed to consumption prices of all the products covered by the regime. In particular a co-responsibility principle is envisaged. Olive growers will have to bear some of the cost of surplus disposal: production aid will be paid fully only up to a certain amount, established every year. In addition a more flexible application of regulations is contemplated, in order to allow a decrease of origin price in the case of particularly favorable harvests.

4. Model specification

The olive oil market in Italy is described by a small econometric model comprising 11 stochastic equations and 8 identities. Four different segments of the marketing channel are identified: consumption, wholesale, farmgate or production and import; equilibria are imposed on each and all of them. The system consists of five blocks. The first two deal with the real sector: consumption and intermediate derived demands, and supplies at both producer and wholesale levels. The remaining blocks describe price formation and transmission mechanisms. First, we solve for international prices, which recursively determine EC domestic prices, which in

turn establish national prices. The analytical description of the model, variable names, parameter values and estimation method are reported in the appendix. In the following we shall comment in detail on each block structure and results.

4.1 Demand for consumption and final uses

Equations 1 to 5 of the appendix describe oils and fats consumption. Identity 6 establishes the equality between domestic supply and final demand (consumption plus exports).

Exports are exogenous, whereas consumption is determined simultaneously within a conditional demand system of oils and fats.

Under the assumption that the consumer utility function is weakly separable[1] in oils and fats, optimal demands for these goods depend only upon their prices and the preallocated budget to the group (Deaton and Muellbauer, 1980a). The associated system of demand functions is based on Deaton and Muellbauer's (1980b) Almost Ideal Demand System (AIDS):

$$S_h = a_h + a_{hT} \ln T + b_h (\ln R - \ln P) + \Sigma_k c_{hk} \ln p_k$$

$$\ln P = a_0 + \Sigma_h (a_h + a_{hT} \ln T) \ln p_h + 1/2 \Sigma_h \Sigma_k c_{hk} \ln p_h \ln p_k \qquad (1)$$

where h, k = olive oil, other vegetable fats, butter. The demand of the h-th good is expressed as a share of the minimized expenditure: $S_h = p_h q_h / R$, where p_h and q_h represent prices and quantities, and R is the minimized per head expenditure in oils and fats; P is the `true' AIDS price index for the three fats; the time trend T takes into account the gradual habit formation of a representative consumer.

AIDS elasticity coefficients are the following:

1 Direct weak separability with respect to a partition (oils and fats) of the commodity space implies that the marginal rate of substitution between any two goods within the same subset (olive oil and butter, for example) is independent of the quantities consumed from other subsets.

group expenditure elasticity: (2)

$$e_h = b_h / S_h + 1$$

compensated price elasticity:

$$e^*_{hk} = (c_{hk}/S_h) + (b_h/S_h)\, b_k\, (\ln R - \ln P) + S_k - d_{hk}$$

uncompensated price elasticity:

$$e_{hk} = (c_{hk}/S_h) - (b_h/S_h)\, (S_k - b_k\, (\ln R - \ln P)) - d_{hk}$$

where $d_{hk} = 1$ for $h = k$, and 0 otherwise.

Symmetry, homogeneity and adding-up restrictions[2] have been imposed in estimation through the following restrictions:

$$\Sigma_h a_h = 1,\ \Sigma_h a_{hT} = \Sigma_h b_h = \Sigma_h c_{hk} = 0,\ \forall k$$
$$\Sigma_k c_{hk} = 0,\ \forall h \qquad (3)$$
$$c_{hk} = c_{kh},\ \forall h, k$$

Curvature conditions have been checked for upon the estimated model, to avoid complications due to the involved inequality restrictions. These pertain to the eigenvalues of the matrix of substitution effects K which is proportional to the Slutsky's[3]. The estimated K matrix is negative semidefinite at all data points but 1974, where one of the three eigenvalues is positive. However, this failure in just one year does not appear to be very severe, the direct substitution effect being negative for the three goods.

2 Homogeneity and symmetry are imposed through simple parameter restrictions, whereas adding-up is automatically satisfied given that expenditure shares add up to one. So, in estimation one share equation (in our case butter) needs to be eliminated, being a linear combination of the others. Its parameters can be obtained from the constraint set (3).

3 The (h,k) element of the matrix K is defined as follows (Deaton and Muellbauer, 1980b, p. 316):
$k_{hk} = c_{hk} + b_h\, b_k\, (\ln R - \ln P) + S_h\, S_k - S_h\, d_{hk}$
The matrix uses estimated expenditure shares.

Given that the estimated expenditure and price elasticities are rather stable, only average coefficients[4] will be discussed (Table 2).

Olive oil behaves like a luxury good, whereas other fats are necessary. The role of habit formation on the consumption pattern, for fixed prices and expenditure, is explained by a_{1T} and a_{2T} estimates (in the appendix). Time exerts a mild negative influence both on olive oil and butter consumptions, while it works significantly in favor of seed oils.

As expected, all compensated own-price elasticities are negative, but very small. Cross elasticities show a general net substitutability, particularly between vegetable oils and between seed oils and butter. From the uncompensated matrix, olive oil demand is rather reactive to its own price (-0.84), while other oils and butter are decidedly rigid: -0.41 and -0.24, respectively.

The uncompensated cross price elasticities are negative, too, notably e_{12}, the elasticity of olive oil with respect to the (nominal) price of other oils of vegetable origin. The result, due to a strong income effect, rests upon the assumption of weak separability, which allows the use of oils and fats expenditure as a measure of disposable income. In fact, if we had a larger consumption bundle, and adopted (total) food expenditure as disposable income, e_{12} would turn out to be positive. This is apparent from Slutsky's equation in the form of elasticities: $e_{12} = e^{*}_{12} - e_1 S_2$. The larger the measure of disposable income the more negligible the income effect becomes, being dominated by the expediture share value[5].

4 The approximated standard errors are obtained with the TSP command ANALYZ. The procedure consists in linearizing the function around the estimated parameter set and then using the variance and covariance formula for linear functions of random variables (Kmenta, 1971, p. 444; Toevs, 1982). However, according to Krinsky and Robb (1986), the method is not risk-free and might produce biased information.

5 The expenditure share in other oils of vegetable origin is 28% of the group expenditure, 1.2% of food expenditure, and 0.3% of total expenditure. Assuming a food expenditure elasticity of oils and fats of 0.5 we have: a) a food expenditure clasticity of olive oil demand (Manser, 1977, p. 887) equal to 0.7; b) an income effect of -0.008; c) $e_{12} = 0.07$, which means that other vegetable oils are a gross substitute for olive oil.

These considerations clarify somewhat how the argument of oils substitution, which characterizes many sectoral policies, is based on the assumption that the consumer demands oils and fats simultaneously with many other goods and that the income effect is negligible. On the contrary, if weak separability holds, olive oil consumption can increase vis a vis a decreasing trend in prices of competitive goods, at least in Italy[6].

4.2 Intermediate demand and agricultural supply

Equations 7 to 12 in the appendix deal with the behavior of the wholesale market operators: the processing industry, which buys raw material of national and foreign origin; the national olive growers, who offer raw material to the processing industry; finally, the policy maker who balances demand and domestic supply through stock management.

If buyers minimize costs and the processing industry production function is strongly separable with respect to raw material and homogeneous of degree one, a dual representation of the processing industry technology is given by the unit cost function which depends only upon import (Pm) and production (Pp) prices. c(Pm, Pp), whose minimized value is a proxy of the wholesale price, is monotonically increasing, positively linear homogeneous, continuous and concave in prices. Moreover, assuming differentiability, the cost minimizing vector of the industry derived demands (for national and foreign raw material) satisfies the following relationships (Shephard, 1970; Burgess, 1974; Diewert, 1982):

$$C/Q = c(Pm/Pp)$$
$$\delta c(Pm/Pp)/\delta P_j = X_j = X(Pm/Pp), \text{ where } j = m, p \qquad (4)$$

6 Oils and fats weak separability hypothesis has been tested for and accepted under the conventional level of confidence (Pierani and Rizzi, 1989).

In estimation the unit cost is approximated with a translog, so that the intermediate demands are in terms of minimized cost shares. In equations 7, 8 and 10 linear homogeneity and symmetry restrictions are imposed a priori.

Physiology and adverse weather conditions heavily affect olive supply (in Italy fluctuations can reach 75%, but on average around 50%), sometimes causing rationing phenomena. This latter feature is captured through an additional explanatory variable: the lagged ratio of the main competitor offer (Spain, Greece and Tunisia) to the national one[7].

From Table 3, intermediate demand for imports is elastic with respect to prices, but rigid to quantities. On the contrary, that for raw material of domestic origin is very unresponsive with respect to both prices and quantities.

Most Italian growers operate on a small scale such that costs are largely fixed. Based on that, and recalling the large variablity[8], olive supply (equation 11) is explained by a seasonality index and the expected minimum unit revenue, given by the sum of intervention price plus production aid, both in green lira. The average guaranteed price elasticity is dramatically low, 0.032 (+/-0.018). Ceteris paribus, the intervention price should decrease between 23% and 42%, according to year, to achieve a 1% olive supply reduction.

Finally, identity 12 establishes that any difference between demand and supply is offset by means of stock adjustment, such that the market, at farmgate level, is cleared at intervention price.

7 The supply of Spain, Greece and Tunisia and that of Italy tend to be complementary. On average, the ratio between foreign and domestic production is about 1.87 for the years of good harvest in Italy and falls to 1.09 otherwise.

8 The 1967-85 average production was 521000 t, went up to 633100 t considering the good harvest years and dropped to 419200 t for the bad seasons.

4.3 Price system

The last seven equations in the appendix are concerned with the price determination mechanism. The EC support scheme is described in equations 13 to 15; national prices are explained by equations 16 to 18; finally, equation 19 establishes the clearing price on the world market.

4.3.1 EC common prices

Usually, in econometric models policy instruments are exogenous. Nevertheless, since recent works (Meilke and Griffith, 1983; Meilke and de Gorter, 1988) have proven these policy feed-backs can be successfully estimated, we thought it worth trying to replicate the exercise.

As production and consumption aids are exogenous, CAP strategic variables become the representative market price (PREP) and the intervention price (PINT).

PREP is arrived at through a notion of equilibrium price, $PREP^*$, and a partial adjustment assumption:

$$PREP^* = f(z)$$

$$PREP\,(1 - \beta L) = (1 - \beta)\,PREP^*$$

where β measures the inertia of the adjustment process, L is the lag operator and z is a vector of $PREP^*$ determinants, whose elements are: the world price in ecu and the ratio between the wholesale price of olive oil and other vegetable oils[9]. All explanatory variables enter with one period lag.

The way the exchange rate dollar/ecu (DECU) is embedded in equation 13 implies that the law of one price holds. This is a conventional statement in agricultural trade modeling (Chambers and Just, 1979) and it appears particularly suitable here, as we look

9 Olive oil wholesale price is proxied with the minimized unit cost of raw material (PWO). Assuming proportional marketing and processing margins, PCV is a proxy of other vegetable oils wholesale price.

at the behavior of a public policy maker. Anyway, we tested it by estimating the following equation (Jabara and Schwartz, 1987), over the period 1968-85:

$$DGP_t = -0.039 + 0.544\ D75 - 1.087\ GDECU_{t-1}$$
$$\qquad (0.034)\ (0.144) \qquad\quad (0.387)$$
$$R^2 = 0.61;\ DW = 2.22$$

where DGP is the growth rate differential between the representative market price and the world price, and GDECU is the growth rate of DECU. Standard errors are reported in parentheses. Given that the intercept is not significantly different from zero and the slope statistically equals unity we can maintain our assumption[10].

According to ß estimates (equation 13), it takes four years to reach 95% of PREP* after a perturbation has occurred on its determinants; furthermore, the elasticity of transmission with respect to world price (Table 4) is 0.52 (+/-0.22) in the short run, but not different from one in the longer term[11].

Although the parameters are quite small and not precisely estimated, the oils relative price negative elasticities indicate that the interdependence between the two markets might enter, to a certain extent, the price-fixing decision process.

As equation 14 indicates, threshold price is closely tied to PREP.

With the change in system in 1978, the intervention price is decided upon separately from the representative market price, and is set at a level such that, augmented by production aid, it comes close to the producer target price. As this means keeping the

10 Ardeni (1989) reaches completely different results. According to Ardeni the assumption of commodity price perfect arbitrage is counterfactual and much of the empirical evidence to support it is due to econometric shorthcomings.

11 The long run perfect flexibility of representative market price ought not to be a surprise in that in the policy maker's opinion there exists a strong substitutability between olive oil and other vegetable oils consumption.

intervention price at the level of the old market target price, equation 15 expresses PINT as a function of PREP plus consumption aid[12](CAID). In the same equation, CAID appears with one and two period lags, as well. The lagged variable parameter estimates are significantly different from zero and negative. The inverse correlation between current and past expenditures can be looked at as supporting the view of those who consider consumption aid as an indirect form of support to grower incomes.

Since 1985 the budget constraint in the Community of 12 has become more and more severe, and with respect to oils and fats has lead to the Commission's reform proposals we have briefly discussed above. Very likely a more appropriate specification of the above equations is necessary if we want to adjust the parameters to the new situation and keep up with the fast moving Community scenarios.

4.3.2 National prices

The main assumption is that the origin prices are geared to EC prices denominated in green lira[13]. It follows that import price is linked to threshold price, equation 16, and production price depends on intervention price[14], equation 17. The estimated slope coefficients of these relationships do not differ significantly from unity.

The consumption price of olive oil is determined under a proportional mark-up (constant in the long run), which implies a unitary elasticity of price with respect to cost (Heien, 1980; Wohlgenant, 1985). In addition to current and lagged raw material

12 In equation 15, PREP and CAID have the same coefficient. This assumption has been first tested for and then imposed.

13 A more detailed description of price formation at farm-gate level can be found in Rossi (1988).

14 The weighted sums of two terms in equations 16 and 17 take into account the fact that national prices are based on the calendar year, whereas EC prices are based on the marketing year.

costs[15], consumption aid is also among the regressors of equation 18, to take into account the CAP's influence.

From Table 5, the elasticity of retail price with respect to unit cost is not statistically different from one, whereas it is very rigid to consumption aid: -0.10 (+/-0.01).

4.3.3 World prices and excess supply function

The closure of the model is provided by endogenizing world prices.

The first step (Bredahl et al., 1979; Meilke and de Gorter, 1988) consists in estimating the price elasticity of Italian import excess supply. Among the trading partners we distinguish between net exporters and net importers, excluding Italy. Let $X_h = S_h - D_h$ indicate the excess supply of the h-th exporting country, and $M_k = D_k - S_k$ the excess demand of the k-th importing country, where S and D represent domestic supply and consumption (which includes stock adjustments). In equilibrium, Italian net imports equal identically the difference between the rest of world excess supply and demand:

$$M_I = \Sigma_h X_h - \Sigma_k M_k, \text{ for h, k not equal to I (Italy)} \qquad (5)$$

To arrive at the elasticity of excess supply of Italian imports we differentiate equation (5) with respect to world price:

$$\varepsilon = \Sigma_h \tau_h \sigma_h (X_h/M_I) - \Sigma_k \tau_k \delta_k (M_k/M_I) \qquad (6)$$

where τ_h and τ_k indicate the world price elasticity of domestic prices; σ_h and σ_k represent the domestic price elasticity of excess supply and excess demand, respectively. Differentiating the balance of trade

15 Costs other than domestic and imported raw material do not explain the formation of olive oil consumer price (Rossi, 1988).

with respect to domestic prices, the latter parameters can be expressed in terms of conventional supply (μ) and demand (ε) elasticities:

$$\sigma_h = (\mu_h - \varepsilon_h)(S_h/X_h) + \varepsilon_h \qquad (7)$$
$$\delta_k = (\varepsilon_k - \mu_k)(S_k / M_k) + \varepsilon_k$$

ε[16] for Italian olive oil imports turns out to be 5.44. This parameter is used to estimate the slope coefficient of equation 19, which determines the equilibrium world price, given the equality between excess supply and excess demand of Italy.

Finally, the intercept of the excess supply curve (CROW) is such that the world price always coincides with the historical values over the whole sample, if Italian imports are measured without errors.

5. Model validation

There are a large number of tests currently available for the validation and appraising the predictive ability of econometric models. The performance indicators used here are the following: mean absolute percentage error (MAPE), root mean square percentage error (RMSPE), and Theil's inequality coefficient (U). In addition, the bias (U^M), variance (U^S) and covariance (U^C) proportions of Theil's inequality coefficient are also included[17]. All these descriptive statistics do not require knowledge about the units of each variable.

16 To compute σ_h and δ_k, a supply elasticity of 0.1 is assumed for each country. τ coefficients are based on our own guesswork. The remaining data are taken from Tarditi et al. (1980) or computed from data of the International Olive Oil Council.

17 Theil's inequality coefficient is derived from the root mean square error statistics, but it is transformed in such a way that its values will always fall between zero and one. The proportion U^M measures the average tendency of simulated and actual values to deviate from each other. The variance proportion U^S measures the degree to which the simulated series can replicate the variability in the actual variable. Finally, the covariance proportion U^C gives the unsystematic error (Pindyck and Rubinfeld, 1981).

The results were obtained by solving dynamically the system over the sample period 1967-85. The simulation exercise is dynamic in that the lagged endogenous variables fed in place of actual values are those determined by the model (Table 6).

The variables we focus on are PREP, PINT, PMO, PPO, PCO, QPO, SCO, SCV (stochastic equations), PWMKT, QMO, QWO, QCO, QCV, QCB (identities). With the exception of QMO, the model did a relatively good job. The MAPE and the RMSPE, which measure the deviation between actual and simulated time paths, fall within reasonable limits. Because the latter depends on squared terms, large sample residuals are penalized more than with MAPE. Excluding imports, the RMSPE has a maximum of 15% and a minimum of 2.6%, whereas the MAPE varies between 1.9% and 13%. The model fails especially in 1975-76. The two statistics computed over a much shorter sample (1979-85) look much better. Part of the problem with the poor performance of the import equation is that the implicit assumption of static price expectation cannot detect all the variations in the levels of QMO; in addition, imports are influenced by commercial or preferential trade agreements which the model cannot take account of, such as that between Italy and Tunisia on fishery which includes the selling of Tunisian oil; finally, QMO is determined through an identity relating import share, minimized unit cost, and import price; errors in the right hand side variables might perversely interact and possibly cumulate, as well.

Theil's inequality coefficients are very small and much lower than one. Small values of the U^M proportion indicate that no amount of bias is present in the historical simulation. In fact, some values are practically nil. The results look somewhat less satisfactory as far as the ability to reproduce the historical variability is concerned. World market price, olive oil share and olive oil consumption behave below average in this respect.

In summary, the validation procedure illustrates that there are a few relations that might need to be slightly reconsidered. Nevertheless, the picture looks quite encouraging.

6. Policy instrument responses

This section reports on the implied dynamic multipliers. We distinguish between different responses. Impact and delayed multipliers give the contemporaneous and delayed expected changes in response to policy shocks and involve contemporaneous and cross-temporal feedbacks. Sustained multipliers measure the expected changes in the target at a certain moment in time after a unit perturbation in the instrument is sustained over a number of years. For linear models these responses derive directly from the reduced or final form coefficients (Goldberger, 1964); for non-linear models they can be computed by dynamic simulation, using finite differences (Evans and Klein, 1968). Given that non-linear multipliers are not constant, two alternatives were at hand as to which point in time to compute them: to obtain the most updated estimates within the sample, or to compute `equilibrium' or long run multipliers. For the latter option to be carried through a bench-mark scenario is required. This serves the purpose, among others, of empirical validation of the model stability, in that it is possible to detect anomalous values of the endogenous variables during the ex-ante dynamic simulation. We chose the second alternative.

These parameters should be looked at with some discernment, though. First, a deterministic simulation applied to non linear models generally produces inconsistent estimates of the dynamic multipliers (Howrey and Kelejian, 1971). The extent of such an inconsistency can be measured by a stochastic simulation procedure. In fact, the problem seems to be not too severe, as regards well specified models (Bianchi et al., 1981). Second, in assessing the responsiveness to specific policy tools, very often, if not always, one forgets about the degree of reliability that can be placed on results. Since they are random variables, some measure of uncertainty should be associated with them (Fair, 1980; Bianchi et al., 1985).

6.1 The reference run

To lay down the reference run the model has been dynamically solved for until 1999. The year 1986 is the last in which exogenous variables assume their historical values, afterwards they move along the following lines:

a) consumption prices of competitive products (PCV, PCB) and oils and fats expenditure (OFEX) increase at an average rate of 4.5% per year; the green rate (GRATE) devaluates at the same pace;

b) exchange rate dollar/ecu (DECU), production (PAID) and consumption aids (CAID) remain constant at their 1987 levels: 1.13, 709.5 ecu/t and 770 ecu/t, respectively;

c) both exports (QXO) and the intercept of excess supply of Italian imports (CROW) grow annually at the average rate of 3%;

d) olive supply preserves the historical variability pattern. The seasonality index (WIND) is set at 1.21 in even years and 0.71 in odd years; contemporaneously, foreign competitor offer (QPEHT) drops from 1089000 t to 711000 t;

e) between 1988 and 1992, the population in Italy decreases as much as 0.005% per year, and 0.244% subsequently.

The outcome of the reference scenario is reported in Table 7.

6.2 A general overview of the elasticities

To compare different responses all multipliers have been transformed in elasticities. All estimates refer to 1992. Lagged and sustained shocks cover a period of five years from 1988 to 1992. For the sake of conciseness we shall comment only on impact and sustained elasticities, and only the latter will be presented (Table 8). The instruments considered are: consumption and production aids, fats and oils expenditure and retail price of other vegetable oils (let us term them sectoral); green rate lira/ecu and exchange rate dollar/ecu (which belong to policy in a broader sense).

In general, the sustained values are greater than the impact values and have the same sign. The impact elasticities range between -0.449 and 1.435, the sustained ones between -0.839 and 1.142. As a

consequence of the model structure, the impact matrix looks much more sparse.

From the impact to the sustained case, the instrument rankings change somewhat, according to which target we look at. There can be some doubt, though, about the significance of the very small parameter values. In the simultaneous case the green rate lira/ecu and the expenditure level are the most effective, whereas when the shock is sustained through five years, the most relevant responses become, in order and in absolute value, those associated with the exchange rate dollar/ecu, the group expenditure, and the green rate.

As regards consumption, sectoral instruments other than R appear the least effective. For example, CAID ranks fourth in the impact case and fifth in the sustained case.

6.2.1 Production and consumption aid elasticities

Production aid explains only olive supply, consequently all impact elasticities are nil but that of QPO, which is very small. Given the extremely rigid supply function, sustained elasticities are practically nil, as well.

With regard to the meaning and the effectiveness of consumption aid granted to the marketing channel, opinions differ very much. CAID originates contrasting responses: it tends to reduce marketing and processing margins, but at the same time it contributes to sustaining the intervention price. In the impact case, the change in production price (PPO) and unit cost of raw material (PWO) offsets the reduction of marketing margins, such that the retail price (PCO) increases and consumption declines. Hence, consumption aid can be interpreted not so much as an incentive to expand final demand but as a double purpose measure to make possible an extra form of support to olive growers. In addition, because of the change in the ratio of the origin prices, imports substitute for domestic produce.

When the shock is sustained through five years the above conclusions hold as well; meanwhile other feed-backs gain

importance and emphasize the countervailing role of import price, whose change is really negligible.

In summary, CAID effects are twofold: CAID generates a reduction of olive oil consumption and an increase of grower total revenues and of CAP expenditure, both as consequence of the increase in intervention price and the reduction of demand for domestic produce. However, because of the very small elasticities we might rephrase such a conclusion in a more cautious and less committed way: a) consumption aid in the present form does not constitute an effective consumption incentive; b) if a less cumbersome solution from an administrative point of view were available, production aid would confirm a more reliable way to support grower incomes.

6.2.2 Other vegetable oils price and expenditure elasticities

Since the beginning of the eighties and the enlargements of the Community, to finance the oils and fats regime the Commission has tried to focus on a strategy which aims at stimulating final demand both through advertising and marketing campaigns as opposed to a generalized recourse to consumption aid and through the imposition of the `oilseed tax'. The latter proposal, which is still on the agenda of CAP reforms, gave momentum to the never-ending US-EC agricultural trade dispute and raised some discussion within the profession (Friedberg, 1983; de Veer, 1985; Haniotis and Ames, 1988) and expectations among producers.

An increase of other vegetable oil retail price generates impact responses mainly within the conditional demand system. The consumption of seed oils decreases and, because of gross complementarity, olive oil consumption falls as well, in contrast to butter. As already mentioned, this result rests upon the assumption of oils and fats weak separability. The drop of olive oil consumption generates a reduction of intermediate demand for raw material both of domestic and of foreign origin, which goes with an increase of public stocks.

As concerns quantities, the sustained responses are of the same sign and about the same intensity as in the impact case. The sustained shock induces recursive opposite effects on olive oil representative market price. On the one hand, PREP tends to be reduced via the falling of imports and the consequent decline of international prices; on the other, it is pushed up by a reduction of the wholesale price ratio of olive oil to other vegetable oils. Eventually, the second effect prevails, given the positive elasticity of PREP, though leaving the domestic price structure almost unchanged. This way, the `oilseed tax' would have some limited effects, which in any case go against boosting olive oil demand and in favor of butter.

Expenditure elasticities aim at describing the responses to policy measures which tend to favor consumption by leaving relative prices untouched. Impact elasticities show a more than proportional change in olive oil consumption and in the intermediate demand for raw material of both origins. In the sustained case, balancing interactions bring about at least three interesting results: a) olive oil consumption remains elastic; b) the price increase is very small; c) the demand for domestic produce substitutes for imports and reduces the level of public stocks.

6.2.3 Exchange rate elasticities

With few exceptions (Chambers and Just, 1981; Meilke and de Gorter, 1988), agricultural commodity models do not deal with the impact of a change in the relative value of money. In our case the endogenizing of EC price allows such an exercise.

A sustained devaluation of the green rate has proportional relevant inflationary effects on domestic prices: around 3/4 of a percentage point. This way producer revenues surely increase but olive oil consumption and, to a lesser extent, other vegetable oils and butter consumption shrink. Moreover, the decline of the intermediate demand makes the stocks grow.

The exchange rate dollar/ecu paradoxically reveals itself as the most effective. The sustained elasticities are among the highest and

reflect the nexus of perfect flexibility between external and representative market prices.

A devaluation of the dollar is transmitted onto the market with one period lag and in the medium term, via the reduction of EC prices, generates less than proportional responses in national prices. Such a situation hurts national growers, but brings about a relatively strong increase in consumption, which is satisfied partly by drawing from stocks and partly by increasing imports.

The high positive elasticity of oil consumption is an interesting result, because it confirms the impression about the inefficacy of consumption aid as a demand incentive. In fact, the increase of olive oil consumption at the end of the seventies took place concomitantly with a strong devaluation of the dollar.

7. The olive oil market towards 1992

Concerning the perspectives for the nineties, the policy agenda contains a general orientation to pursuing a twofold line of action: on the one hand, to obtain the approval of the stabilization scheme for consumption prices in order to drag in additional resources; on the other, to save on budgetary cost by reducing the guaranteed level of support to farmers. In this section we intend to simulate such scenarios and evaluate the effects on crucial variables as pecentage deviation from the reference run.

7.1 The tax on other vegetable oil consumption

We assume that the scheme described in Section 3 is applied through four consecutive years, from 1988 to 1991, and that a charge of 0.33 ecu/kg (about 600 lit/kg) is collected in the retail market. The tax introduced pushes other vegetable oils consumption price and the intercept of PCO up by 0.33GRATE per year. In a way, the simulation outcome (Table 9, scenario A) parallels the results obtained from PCV elasticities.

The price increase of olive oil and other vegetable oils (11.1% and 18.1%, respectively) brings the consumption down as follows: olive

oil 549446 t (-13.6%), other vegetable oils 559075 t (-9.4%), butter 138040 t (-0.7%). The lower demand induces a reduction in intermediate demand both of domestic and of foreign origin (-12%) and an increase of public stocks. On the other hand, these effects are transitory. After 1991 the scenario tends to coincide with the reference run.

The introduction of the stabilization scheme for the vegetable fats consumption price would allow 366 million ecu per year to be collected on the Italian market; one third of this sum, 119 million ecu, would go to cover the higher intervention costs. Finally, it seems obvious that the market does not transfer any advantage to the olive growers.

7.2 A more restrictive price policy

According to this scenario, termed B, the intervention price equation intercept diminishes as much as 0.1 ecu/kg per year over the period 1988-91, and stays at the last year level afterwards. Seemingly, the representative market price increases by 0.2228 ecu/kg (0.4 ecu/kg in the long run), and consumption aid decreases by the same amount such that after 1991 it becomes 0.5472 ecu/kg.

Two accounting identities were added: the olive producer gross revenues (GREVO), including production aid, and the Guarantee Section expenditure to the sector (FEOGO), defined as the sum of production aid plus 60% of consumption aid plus net support buying expenditure at the intervention price.

This intervention (Table 10) affects the terms of trade at the producer level and makes less and less costly the supply of domestic origin. As consequence, an excess demand is brought about which is satisfied on average through stocks. On the other hand, the countervailing effect on the retail price keeps the demand for consumption above the reference level. On average, growers would face a revenue loss of a little less than 5%, while budgetary costs for intervention drop by about 18%.

After 1991 the trends stabilize somewhat and the EC price structure recalls that in operation before the 1979 reform. The intervention price is systematically lower than the market price (by about 5 ecu/kg). The expenditure for intervention is approximately 40% lower than in the reference case and the gross revenue diminishes by 10%.

8. Summary and concluding comments

The model distinguishes four market segments and imposes equilibria on each and all of them. The structural form can be broken down into five sectors. The first two identify quantities, the others describe the price formation mechanism. The model solves first with respect to the olive oil world price, which recursively determines the EC prices. The national prices are driven by the common prices and constitute the base for the optimizing behavior of consumers and producers. The demand for consumption is defined within a conditional demand system (AIDS) of three goods: olive oil, other oils of vegetable origin, and butter. The parameter estimates suggest that:

- the group expenditure elasticities evaluated at the sample means of the relevant variables were elastic for olive oil (1.41), rigid for other vegetable oils (0.65) and even more unresponsive for butter (0.34);
- the three goods, especially the two vegetable fats, behave as net substitutes and as gross complements;
- olive oil demand is rather reactive to its own price (-0.84), whereas those of the other fats are unelastic and fall between -0.41 for other vegetable oils and -0.24 for butter.

Intermediate demand for raw material is derived from a translog unit cost function with one output and two input categories: national and imported raw material. On average, there exists a strong substitutability between the two factors of production: the import factor demand elasticity with respect to relative prices is -1.31.

Olive supply depends heavily upon climatic and physiological events. Its reactivity to the expected prices is dramatically low.

Ceteris paribus, the minimum guarantee support price should decrease between 23% and 42%, according to good or bad harvest year, to induce a decline of 1% of Italian olive supply.

National prices are driven by EC prices, in particular the olive oil representative market price. A result which is worth mentioning is that the policy maker price arbitrage is found to be perfect. In fact, there exists a unitary flexibility of the representative market price both with respect to the exchange rate dollar/ecu and world price.

Validation, performed through a set of descriptive indicators over the 1967-85 dynamic simulation outcome, showed that the model does not suffer from severe systematic errors, is resilient in capturing a few variables' historical variability and behaves better on the sample tails. Unfortunately, it fails somewhat between 1974 and 1976.

The simulations give answers which are coherent with the model assumptions, but contradict opinions shared by many. In particular, sectoral instruments such as consumption aid and seed oils tax, from which producers and the Commission expect so much, are not that effective. On the contrary, a consistent boost of demand could derive from an increase of the expenditure in oils and fats and from a devaluation of the dollar.

Finally, according to our estimates, the introduction of a consumption price stabilizing mechanism for vegetable fats would allow up to 366 million ecu per year to be drawn from the Italian market, though about one third of this sum would go for covering the intervention expenses.

TABLES

Table 1. EC olive oil support price structure*

	Season 1978-79, as of	
	March 31	April 1
Production target price	231.56	231.56
Production aid	52.12	52.12
Market target price	179.44	
Consumption aid	-	33.43
Representative market price	-	146.01
Threshold price	175.82	144.40
Intervention price	170.63	170.63

Note: *ecu/100kg.

Source: Commission.

Table 2. Expenditure and price elasticity estimates of oils and fats demand*

	Olive oil	Other vegetable oils	Butter
	Expenditure elasticities		
	1.407	.653	.344
	(.051)	(.083)	(.131)
	Compensated price elasticities		
Olive oil	-.088	.073	.015
	(.035)	(.029)	(.020)
Other vegetable oils	.140	-.227	.087
	(.054)	(.057)	(.033)
Butter	.044	.134	-.178
	(.051)	(.051)	(.059)
	Uncompensated price elasticities		
Olive oil	-.842	-.322	-.243
	(.046)	(.032)	(.021)
Other vegetable oils	-.210	-.411	-.323
	(.070)	(.064)	(.034)
Butter	-.140	.037	-.241
	(.089)	(.065)	(.059)

Note: *All elasticities are evaluated at the sample (1967-85) mean values of the relevant variables. Approximated standard errors in parentheses.

Table 3. Elasticities of intermediate demand for domestic and imported raw material with respect to prices and quantities*

intermediate demand for:	prices producer	prices import	lagged production foreign	lagged production domestic
import	-1.312 (.281)	1.312	.543	-.543
domestic	-.272	.272	-.113	.113

Note: * All elasticities are evaluated at the sample mean values of the relevant variables. Approximated standard errors in parentheses.

Table 4. Transmission elasticities of representative market price with respect to lagged world and oils relative prices[a]

	Short run (1 year) 1967-85	Short run (1 year) 1985	Long run (4 years) 1967-85	Long run (4 years) 1985
World price[b]	.521 (.221)	.575	.956 (.411)	1.056
Vegetable oils relative price	-.108 (.101)	-.078	-.198 (.185)	-.142

Note: [a] All elasticities are evaluated at the sample mean values of the relevant variables. Approximated standard errors in parentheses; [b] $(PWMKT/DECU)_{t-1}$; [c] $(PWO/PCV)_{t-1}$.

Table 5. Elasticities of consumption price with respect to unit cost and consumption aid [a]

	1979-85	1985
Unit cost[b]	1.027 (.068)	1.056
Consumption aid[c]	-.101 (.008)	-.086

Note: [a] All elasticities are evaluated at the sample mean values of the relevant variables. Approximated standard errors in parentheses; [b] PWO; [c] $(CAID\ GRATE)_{t-1}$.

Table 6. Selected simulation statistics for the evaluation of the olive oil model[a]

	MAPE	RMSPE	U	U^M	U^S	U^C
Prices						
PWMKT	5.71 (1.95)	7.88 (4.14)	.059	.031	.295	.675
PREP	6.21 (1.80)	7.22 (3.42)	.064	.003	.021	.976
PINT	5.87 (1.15)	7.22 (2.38)	.056	.003	.144	.853
PMO	12.74 (2.93)	15.43 (5.77)	.118	.017	.081	.903
PPO	8.11 (1.49)	10.10 (2.83)	.069	.020	.093	.887
PCO	6.84 (1.25)	8.04 (2.72)	.064	.035	.113	.852
Quantities						
QMO	21.78 (9.79)	29.11(21.6)	.231	.031	.117	.852
QWO	5.55 (1.41)	6.99 (3.09)	.068	.010	.151	.839
QPO	4.89 (2.36)	6.08 (4.51)	.054	.000	.002	.998
SCO	1.88 (0.37)	2.55 (0.77)	.026	.000	.201	.799
QCO	5.55 (1.12)	6.54 (2.39)	.064	.045	.304	.651
SCV	2.43 (0.53)	3.12 (1.01)	.031	.001	.024	.975
QCV	2.43 (0.53)	3.12 (1.01)	.031	.000	.016	.984
QCB	3.91 (0.88)	5.87 (1.81)	.057	.007	.011	.981

Note: [a] MAPE=mean absolute percent error; RMSPE=root mean square percent error; U=Theil's inequality coefficient; U^M=bias proportion; U^S=variance proportion; U^C=covariance proportion. 1967-85 dynamic simulation. In parentheses, 1979-85 statistics.

Table 7. Reference scenario results.

	- Actual values[a] -		- Reference scenario[a] -		
	1978-81	1982-85	1988-91	1992-95	1996-99
PWMKT[b]	1.597	1.387	1.686	1.824	1.970
PREP[c]	1.458	1.882	1.930	2.023	2.160
PINT[c]	1.801	2.258	2.473	2.568	2.703
PMO[d]	1636	2549	3721	584	5863
PPO[d]	1956	3048	4540	5522	6927
PCO[d]	2515	3640	5329	6515	8222
QMO[e]	95.6	157.6	176.3	168.7	156.1
QWO[e]	516.6	513.4	551.5	548.5	534.2
QPO[e]	540.0	547.7	518.0	529.6	544.3
QCO[e]	579.4	606.9	635.9	615.4	577.3
QCV[e]	589	594.8	617.0	618.3	611.1
QCB[e]	120.8	129.5	139.1	140.5	140.0

Note: [a] Four year averages; [b] dollar/kg; [c] ecu/kg; [d] lit/kg; [e] thousand tonnes.

Table 8. Implied sustained elasticities[a]

	Sustained elasticities with respect to[b]:					
	CAID	PAID	OFEX	PCV	GRATE	DECU
PWMKT	.050	-.001	.183	-.065	-.094	.152
PREP	.023	-.004	.246	.034	-.254	-.753
PTHR	.024	-.004	.247	.033	.256	-.760
PINT	.277	-.003	.180	.026	.196	-.582
PMO	.029	-.003	.245	.050	.763	-.839
PPO	.299	.002	.182	.038	.796	-.623
PCO	.128	-.003	.223	.042	.760	-.734
QMO	.197	-.004	.716	-.258	-.370	.595
QWO	-.152	.002	1.072	-.327	-.525	.446
QPO	.024	.025	.016	.002	.087	-.050
QCO	-.094	.002	1.142	-.357	-.562	.542
QCV	-.025	.001	.584	-.422	-.147	.141
QCB	-.020	.001	.313	.045	-.116	.113

Note: [a] Elasticities computed at 1992, shock sustained from 1988; [b] CAID = consumption aid, PAID = production aid, OFEX = oils and fats expenditure, PCV = other vegetable oils consumption price, GRATE = green rate lit/ecu, DECU = exchange rate dollar/ecu.

Table 9. Scenario A: tax on other oils consumption[a].

	1988	1989	1990	1991	1988-91	1992-95
PWMKT	-2.8	-3.7	-2.5	-3.5	-3.1	.1
PREP	-.0	-.1	-.9	-.5	-.4	-.3
PINT	-.0	-.1	-.7	-.4	-.3	-.2
PMO	-.0	-.0	-.3	-.8	-.3	-.4
PPO	-.0	-.0	-.2	-.6	-.2	-.3
PCO	11.5	11.0	11.2	0.8	11.1	-.4
QMO	-12.3	-11.9	-11.9	-11.5	-11.9	.5
QWO	-12.3	-11.9	-12.0	-11.8	-12.0	.3
QPO	-.0	-.0	-.1	-.0	-.0	-.0
QCO	-13.9	-13.5	-13.6	-13.4	-13.6	.4
QCV	-9.5	-9.3	-9.4	-9.4	-9.4	.1
QCB	-.8	-.7	-.7	-.7	-.7	.1

Note: [a] As percentage deviation from the relevant variables of reference scenario.

Table 10. Scenario B: a more restrictive price policy[a]

	1988	1989	1990	1991	1988-91	1992-95
PWMKT	-.3	-2.3	-3.8	-5.7	-3.0	-5.9
PREP	2.8	7.2	10.7	15.3	9.0	15.2
PINT	-3.9	-7.2	-10.0	-12.9	-8.5	-11.0
PMO	.5	3.6	7.9	11.6	5.9	15.3
PPO	-.7	-4.4	-7.5	-10.2	-5.7	-11.3
PCO	-.3	-.9	-2.7	-2.9	-1.7	-3.6
QMO	-1.4	-7.3	-17.8	-18.7	-11.3	-25.9
QWO	.6	3.6	5.9	10.2	5.1	10.7
QPO	-.4	-.4	-1.0	-.8	-.6	-1.0
QCO	.3	.7	2.3	2.4	1.4	3.0
QCV	.1	.2	.6	.6	.4	.8
QCB	-.0	.1	.5	.5	.3	.6
GREVO[b]	-.5	-3.8	-6.3	-8.9	-4.9	-9.8
FEOGO[c]	-5.2	-9.2	-33.2	-24.9	-18.1	-41.9

Note: [a] Figures indicate percentage deviation from the relevant variables of reference scenario; [b] GREVO = gross revenue of olive growers; [c] FEOGO = guarantee expenditure.

References

Amemiya, T. (1983). Non-linear Regression Models. In Z. Griliches and M.D. Intrilligator (eds.) Handbook of Econometrics. Vol. I. Amsterdam: North-Holland.

Ardeni, P.G. (1989). Does the Law of One Price Really Hold for Commodity Prices?. American Journal of Agricultural Economics 71(3): 661-669.

Bianchi, C., Calzolari, G. and Corsi, P. (1981). Estimating Asymptotic Standard Errors and Inconsistencies of Impact Multipliers in Nonlinear Econometric Models. Journal of Econometrics 16: 277-294.

Bianchi, C., Calzolari, G., Corsi, P. and Panattoni, L. (1985). Asymptotic Properties of Dynamic Multipliers in Nonlinear Econometric Models. Economic Notes 2: 97-117.

Bredahl, M.E., Meyers, W.H. and Collins, K.J. (1979). The Elasticity of Foreign Demand for US Agricultural Products: The Importance of Price Transmission. American Journal of Agricultural Economics 61(1): 58-63.

Burgess, D.F. (1974). A Cost Minimization Approach to Import Demand Equations. Review of Economics and Statistics.

Chambers, R.G. and Just, R.E. (1981). Effects of Exchange Rate Changes on US Agriculture: A Dynamic Analysis. American Journal of Agricultural Economics 63(1): 32-46.

Commission of the EC (1987). Amendment of the Community Rules Governing the Oils and Fats Sector. COM(87) 1 final, annex II. Brussels.

Deaton, A. and Muellbauer, J. (1980a). Economics and Consumer Behavior. Cambridge: Cambridge University Press.

Deaton, A. and Muellbauer, J. (1980b). An Almost Ideal Demand System. American Economic Review 70(3): 312-326.

De Stefano, F. (1982). Variazioni dei prezzi ed effetti sulle

offerte locali: il caso delle olive da olio. Rivista di Economia Agraria 4.

de Veer, J. (1984). Grain substitutes, fats tax and price distorsion. In S. Tarditi and E. Croci Angelini (eds.) The Reform of the Common Agricultural Policy and The Siena Memorandum. European Review of Agricultural Economics 11(2): 169-176.

Diewert, E. (1982). Duality Approaches to Microeconomic Theory. In K.J. Arrow and M.D. Intrilligator (eds.) Handbook of Mathematical Economics. Vol. II. Amsterdam: North-Holland.

Evans, M.K. and Klein, L.R. (1968). The Wharton Econometric Forecasting Model. Economics Research Unit. Philadelphia: University of Pennsylvania.

Fair, R.C. (1980). Estimating the Uncertainty of Policy Effects in Nonlinear Models. Econometrica 48(6): 1381-1391.

Friedberg, A.S. (1983). Olive Oil in the EC. Gift from gods or Trojan Horse. Food Policy: 13-22.

Goldberger, A.S. (1964). Econometric Theory. New York: John Wiley.

Haniotis, T. and Ames, G.C.W. (1988). The "oilseed tax" and U.S. soyabean exports to the enlarged European Community. European Review of Agricultural Economics 15: 39-54.

Harris, S., Swinbank, A. and Wilkinson, G. (1983). The Food and Farm Policies of the European Community. New York: John Wiley.

Heien, D.M. (1980). Markup Pricing in a Dynamic Model of the Food Industry. American Journal of Agricultural Economics 62(1): 10-18.

Howery, E.P. and Kelejian, H.H. (1971). Simulation vs Analitycal Solutions: the Case of Econometric Models. In T.H. Naylor (ed.) Computer Simulation Experiments with Models of Economic Systems. New York: John Wiley.

Jabara, C.L. and Schwartz, N.E. (1987). Flexible Exchange Rates and Commodity Price Changes: The Case of Japan. American Journal of Agricultural Economics 69(3): 580-590.

Kmenta, J. (1971). Elements of Econometrics. New York: Macmillan.

Krinsky, I. and Robb, A.L. (1986). On Approximating the Statistical Properties of Elasticities. The Review of Economics and Statistics 68: 715-719.

Manser, M.E. (1976-77). Elasticities of Demand for Food: An Analysis Using Non-Additive Utility Functions Allowing for Habit Formation. Southern Economic Journal 43(3): 879-891.

Meilke, D.K. and de Gorter, H. (1988). Impacts of the Common Agricultural Policy on Iternational Wheat Prices. Journal of Agricultural Economics 39: 217-29.

Meilke, D.K. and Griffith, G.R. (1983). Incorporating Policy Variables in a Model of the World Soybean/Rapeseed Market. American Journal of Agricultural Economics 65(1): 65-73.

Perone Pacifico, C. and Pieraccini, L. (1974). Un modello di funzionamento del mercato degli oli vegetali. Rivista di Economia Agraria 3.

Pierani, P. and Rizzi, P.L. (1989). Separabilitá delle preferenze e domanda al consumo di grassi vegetali e burro: 1967-85. Rivista di Economia Agraria 44(1): 65-79.

Pieri, R., Rizzi, P.L. and Tarditi, S. (1985). Il mercato internazionale dell'olio d'oliva: una simulazione di politiche alternative. Roma: INEA.

Pindyck, R.S. and Rubinfeld, D.L. (1981). Econometric models and economic forecasts. New York: MacGraw-Hill.

Rizzi, P.L. (1983). L'adesione spagnola e i problemi olivicoli. L'Italia agricola 120.

Rossi, N. (1988). MEISA: un modello econometrico del sistema agro-alimentare italiano. Milano: Franco Angeli.

Rossi, N. (1984). The Estimation of Product Supply and Input Demand by the Differential Approach. American Journal of Agricultural Economics 66(3): 368-375.

Shephard, R.W. (1970). Theory of Costs and Production Functions. Princeton: Princeton University Press.

Tarditi, S., Rizzi, P.L. and Pieri, R. (1980). Il mercato

dell'olio d'oliva. Bologna: Il Mulino.
Toevs, A.L. (1982). Approximate Variance Formulas for the Elasticities of Substitution Obtained from Translog Cost Functions. Economics Letters 10: 107-113.
Wohlgenant, M.K. (1985). Competitive Storage, Rational Expectations, and Short-Run Food Price Determination. American Journal of Agricultural Economics 67(4).

Appendix

The rule of thumb in labeling variables has been the following: the first letter indicates whether we are dealing with prices (P), quantities (Q) or shares (S); the second letter characterizes the segment of the marketing channel: consumption (C), exports (X), imports (M), wholesale (W), production (P); finally, the last letter singles out the commodity: olive oil (O), other vegetable oils (V) and butter (B). Variables not included in this set are labeled by self-explanatory acronyms.

If not specified, data sources are ISTAT (Statistical Institute) and INEA (National Institute of Agricultural Economics).

Endogenous variables

1. Demand for consumption and final uses

SCO: olive oil expenditure share
SCV: other vegetable oils expenditure share
QCO: olive oil domestic consumption (1000 tonnes)
QCV: other vegetable oils domestic consumption (1000 tonnes)
QCB: butter domestic consumption (1000 tonnes)
QCXO: olive oil final uses (1000 tonnes)

2. Intermediate demand and olive supply

PWO: unit cost of domestic and foreign raw material (1000 lire/kg)
SMO: imported raw material cost share
QMO: olive oil imports (1000 tonnes)
QWO: intermediate demand (1000 tonnes)
QPO: olive supply (1000 tonnes)
STCKO: stock variations (1000 tonnes)

3. EC prices (ecu/kg). Source: Commission

PREP: representative market price
PTHR: threshold price
PINT: intervention price

4. National prices (1000 lire/kg)

PMO: import price - c.i.f. price plus levy for non processed oil (Source: Commission)

PPO: production price - Bari market spot price for semi-processed oil (Source: Commission, International Olive Oil Council) ,

PCO: consumption price

5. World market (dollar/kg). Source: International Olive Oil Council

PWMKT: olive oil world price

Exogenous variables

OFEX: oils and fats expenditure (1000 lire per capita)

PCV: other vegetable oils consumption price (1000 lire/kg)

PCB: butter consumption price (1000 lire/kg)

POP: resident population (million)

T: time trend (1960 = 1)

QXO: olive oil exports (1000 tonnes)

QEHT: olive oil production of Spain, Greece and Tunisia (1000 tonnes)

D81: dummy variable (1981 = 1, 0 elsewhere)

WIND: seasonality index as the ratio between actual and trend yields in specialized olive groves

PAID: production aid (ecu/kg)

GRATE: green rate (1 ecu = 1000 lire)

DECU: exchange rate dollar/ecu

CAID: consumption aid (ecu/kg)

D7374: dummy variable (1973-74 = 1, 0 elsewhere)

CROW: intercept of the excess supply curve of Italian import, QMO - QXO = CROW + 391.64PWMKT (1000 tonnes)

Structural form

1. $SCO = a_1 + a_{1T}lnT + c_{11}lnPCO + c_{12}lnPCV - (c_{11} + c_{12})lnPCB + b_1(lnR - ((a_1 + a_{1T}lnT)lnPCO + (a_2 + a_{2T}lnT)lnPCV + ((1 - a_1 - a_2) - (a_{1T} + a_{2T})lnT)lnPCB + .5c_{11}lnPCO^2 + c_{12}lnPCO\ lnPCV - (c_{11} + c_{12})lnPCO\ lnPCB + .5c_{22}lnPCV^2 - (c_{12} + c_{22})lnPCV\ lnPCB + .5(c_{11} + 2c_{12} + c_{22})\ lnPCB^2))$

2. $SCV = a_2 + a_{2T}lnT + c_{12}lnPCO + c_{22}lnPCV - (c_{11} + c_{12})lnPCB + b_2(lnR - ((a_1 + a_{1T}lnT)lnPCO + (a_2 + a_{2T}lnT)lnPCV + ((1 - a_1 - a_2) - (a_{1T} + a_{2T})lnT)lnPCB + .5c_{11}lnPCO^2 + c_{12}lnPCO\ lnPCV - (c_{11} + c_{12})lnPCO\ lnPCB + .5c_{22}lnPCV^2 - (c_{12} + c_{22})lnPCV\ lnPCB + .5(c_{11} + 2c_{12} + c_{22})\ lnPCB^2))$

3. QCO = POP SCO OFEX/PCO

4. QCV = POP SCV OFEX/PCV

5. QCB = POP(1 - SCO - SCV)OFEX/PCB

6. QCXO = QCO + QXO

7. $lnPWO = d_0 + d_1lnPMO + (1 - d_1)lnPPO + (f_1(QEHT/QPO)_{-1} + f_2D81)\ ln(PMO/PPO) + .5d_{11}ln(PMO/PPO)^2$

8. $SMO = d_1 + f_1(QEHT/QPO)_{-1} + f_2D81 + d_{11}ln(PMO/PPO)$

9. QMO = PWO QCXO SMO/PMO

10. QWO = PWO QCXO (1 - SMO)/PPO

11. $QPO = g_0 + g_1WIND + g_2WIND_{-2} + g_3(PINT + CAID)GRATE$

12. STCKO = QPO - QWO

13. $PREP = h_0 + h_1(PWMKT/DECU)_{-1} + h_2(PWO/PCV)_{-1} + h_3PREP_{-1}$

14. $PTHR = l_0 + l_1PREP$

15. $PINT = m_0 + m_1(PREP + CAID) + m_2CAID_{-1} + m_3CAID_{-2}$

16. $PMO = n_0 + n_1D7374 + n_2(.17PTHR\ GRATE + .83(PTHR\ GRATE)_{-1})$

17. $PPO = p_0 + p_1 D7374 + p_2(.17PINT\ GRATE + .83(PINT\ GRATE)_{-1})$

18. $PCO = q_0 + q_1(CAID\ GRATE)_{-1} + q_2 PWO + q_3 PWO_{-1}$

19. $PWMKT = (QMO - QXO - CROW)/391.64$

Parameter estimates

Parameter estimates obtained with the non-linear three stage (NL3S) method (Amemya, 1983). Standard errors in parentheses. Sample period: 1967-85. Econometric package: TSP 4.1.

1.

a_1	0.52828 (0.00255)
c_{11}	0.20162 (0.01867)
c_{12}	-0.11138 (0.01529)
b_1	0.21787 (0.02723)
a_{1T}	-0.05122 (0.00646)
a_2	0.27888 (0.00233)
c_{22}	0.13831 (0.01616)
b_2	-0.09762 (0.02338)
a_{2T}	0.02490 (0.00595)

2.

d_0	0.71243 (0.00336)
d_1	0.09210 (0.01601)
f_1	0.06062 (0.00790)
f_2	-0.08429 (0.02364)
d_{11}	-0.08318 (0.04825)
g_0	-37.09900 (26.2500)
g_1	463.40900 (18.2310)
g_2	64.60600 (19.5160)
g_3	8.36300 (4.80500)

3.

h_0	0.19850 (0.09264)
h_1	0.67260 (0.08221)
h_2	-0.06964 (0.06503)
h_3	0.45530 (0.06162)
l_0	-0.01509 (0.00678)
l_1	0.99516 (0.00454)
m_0	-0.07464 (0.01241)
m_1	0.98952 (0.00890)
m_2	-0.02585 (0.02501)
m_3	-0.13149 (0.02329)

4.

n_0	-0.00460 (0.06725)
n_1	0.15108 (0.07235)
n_2	1.10750 (0.04288)
p_0	0.11979 (0.04220)
p_1	0.36853 (0.06801)
p_2	1.01150 (0.02306)
q_0	0.13030 (0.02149)
q_1	-0.53034 (0.04329)
q_2	0.84285 (0.04571)
q_3	0.54490 (0.04653)

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