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The Economic Impact of the Cap Reform on the Greek Economy: Quantifying the Effects of Inflexible Agricultural Structures

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ABSTRACT

We employ an Applied General equilibrium (AGE) model for Greece to examine the impact of CAP reform on the main economic variables; sectoral output, employment, and export levels, as well as overall output and welfare. The model attempts to quantify the effects of various policy scenarios, including the 1992 reform, under alternative assumptions regarding labour and capital mobility in the agricultural sector. In the context of full employment full mobility set-up the major implication of CAP reform is the reallocation of activities towards non-agricultural sectors, as welfare effects are rather insignificant. When actual market rigidities are taken into account both sectoral and overall effects of reform are substantially altered. With regard to the impact on the labour market, we compute a significant reduction in employment especially if the reform is extended to fruit and vegetables.

1. INTRODUCTION

The Common Agricultural Policy (CAP) has often been at the centre of the economic and political debate in the EU. The recent CAP reform, implemented during the 1993-95 period, represents a radical policy change aiming to tackle the problem of food surpluses and to restrain demands on the EU budget. The adopted changes consisted of movements in the direction of an improved market orientation, as intervention prices were reduced and part of the support is currently provided through direct payments to farmers. Nevertheless the debate on the future of the CAP is continuing. The need to facilitate the planned enlargement of the EU with the integration of Central and Eastern European countries, as well as the constraints set by the Uruguay Round, especially on export subsidies, point towards further extensive revision of the CAP in the long-run (EC, 1996b; Mahe and Roe, 1996; Thomson, 1998). In the medium term, however, any adjustments will most likely take the form of widening the MacSharry reform with the main policy questions evolving avound the extent and pace of further cuts in administered prices as well as the extent of further de-linkage of support from production

The policy issues related to CAP assume a particular significance in Greece due to the relative importance of the agricultural sector. The share of the agricultural sector in GDP and total employment is quite high in Greece as compared to the EU average. Currently agricultural value added represents 7.5 per cent of GDP whereas agricultural employment is 20 per cent of total employment, about four times the EU average (EC, 1996a). Moreover, policy makers are faced with many challenges relating to the particular characteristics of agricultural structures. More specifically, the limited degree of flexibility of agricultural markets and the high percentage of self-employment.

Over the last few years the Greek agricultural sector has been the centre of much heated disputes taking often the form of major social unrest. Although some of these disputes stem from transitory causes, it is apparent that farmers are increasingly dissatisfied with the price levels and incomes they enjoy at present. At the same time one has to point out that the level of funds flowing from the EU budget under the CAP

is well beyond the fiscal options open to the Greek government, if a national support regime had to replace the CAP. These funds induce, in addition, a positive effect on the current account balance. Not surprisingly, questions about the implications of possible CAP reforms bear a broad economic significance. In the present circumstances of record unemployment levels and declining agriculture, the most topical and pressing questions relate to employment prospects.

The recent CAP reform has prompted a broad body of literature dealing with the rational, and the implications of the reform as well as the future prospects of CAP.[1] However, the number of studies attempting to quantify the economic impact of the MacSharry reform on particular economies is rather limited and studies referring to the Greek economy are even scarcer. Folmer, *et al.* (1995) present a very detailed examination on the implications of the recent as well as potential CAP reforms, generating country specific results on the basis of an Applied General Equilibrium (AGE) model. However, they do not allow for the structural characteristics of individual countries and they do not include Greece. Meyers, *et al.* (1998) employ a structural econometric model disaggregated into major countries and regions to study the impact of the CAP reform on world-wide agriculture. But the EU is considered as an aggregate region. Balfoussias and De Santis (1998) is the first study, attempting to examine the impact of the 1992 CAP reform on the Greek economy by means of an AGE model. The model distinguishes 22 sectors, 13 of which related to agribusiness activities, and therefore is capable of capturing sectoral interdependencies of interest. It incorporates two trade flows, one with the EU and the other with the Rest of the World (RoW) and all trade is assumed to be of the intraindustry type. The simulations show that the 1992 CAP reform results in a significant reallocation of resources towards the non-agricultural sectors but also towards agricultural sectors non subject to reform. Also agricultural production and export subsidies decrease by a considerable amount. These results are however obtained within a full employment, full mobility framework.

In this study, we attempt to evaluate the effects of alternative CAP reform

[1] Gardner, 1996; Fennel, 1997) and economists (i.e. Folmer *et. al.*, 1995; Ingersent *et al.*, 1998),Also the European Commission (EC) published several studies of independent agricultural economists on this hot issue (EC, 1994a and 1994b).

policies using a modelling framework that allows for the effects of several of the actual complexities and rigidities of Greek agricultural sector. The purpose is to explore the implications of more radical reform employing a model structure that captures the specific characteristics and rigidities of Greek agricultural market. In particular, agricultural employment is distinguished in employees and self-employed labour. Both self-employed labour and agricultural capital are not perfectly mobile in a number of scenarios in order to assess the effects of reform under more realistic assumptions. We, further relax the full employment assumption in order to study the impact of the 1992 CAP reform and its possible extensions on agricultural employment.

The significance of economic implications of possible CAP reforms depends of course predominantly on the extent of assumed changes. Thus, alternative reform scenarios have been simulated, including the 1992 reform. Broadly, the results indicate that the more radical the reform the larger the reallocation of resources towards non-affected sectors. Under conditions of full flexibility, overall impact on the agricultural sector may extent from 0.3 per cent expansion up to 7 per cent contraction depending on the scale of the reform. Similarly the non-agricultural sector may remain unaffected or expand up to nearly 5 per cent. The impact of the simulated CAP reforms on sectoral variables is largely modified when factor immobility is introduced, but the overall effects on GDP and welfare are not substantially different. When wage rigidity is assumed the employment effects may be quite far reaching, as, in the event of a generalised reform, agricultural employment would be reduced by up to 10 per cent.

The remainder of the paper is organised as follows. Section 2 identifies some basic features of the Greek agricultural sector and discusses the outlook for the CAP. Section 3 presents the AGE model with particular emphasis on the modelling of agricultural support and the structure of Greek agricultural labour market. Section 4 describes the benchmark data set. Section 5 shows the policy experiments and the final section concludes.

2. THE FUTURE OF CAP AND THE STRUCTURE OF GREEK AGRICULTURE

The agricultural sector is still very important in Greece. In 1995, 20 per cent of the total working population declared agricultural activities as their main occupation. At the same time Gross Value Added in agriculture represented 7.5 per cent of GDP. These shares are following a slow but increasing downward trend. A number of other features are quite important. In particular, Greek agriculture is characterised by:

- *High percentage of self-employed*
- *A very skewed age distribution of self-employed*
- *Underemployment*

According to National Accounts data wage earners represent around 10 per cent of total employment in the agricultural sector. An Eurostat survey conducted in 1993 shows that 29 per cent of family heads of agricultural establishments are over 65 years of age, 49 per cent are between 45 and 65 and only 22 per cent below 45 years of age.[2] The picture is somewhat better if one takes into account younger family members like children, but still this age distribution suggests very inflexible employment structures. Underemployment is a very serious problem. Referring again to the same Eurostat survey, we can see that around 70 per cent of agricultural labour force is employed at a rate below 50 per cent of full time equivalent, and 45 per cent of heads of agricultural establishments is employed at a rate below 20 per cent. The EC calculates an average conversion factor between numbers of workers and full time equivalent units equal to 0.44 in 1989 and 0.4 in 1993 (EC, 1996a).

The above figures are indicative of the high degree of labour market rigidity. In fact European Union studies have shown that overall inter-sector labour mobility and turnover rates are among the lowest in the EU, which is partly attributed to agriculture's relative importance in the economy.[3]

Given the rigidity in the agricultural labour market, any restructuring policy will likely have a large negative impact on farmers, either because they would loose their job

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[2] Eurostat: Farm Structure, 1993 survey : Main Results.
[3] EU (1994).

or, alternatively, because they would face a lower real return. In both scenarios, farmers would suffer a large welfare loss, if compensatory payments were not transferred.

The Greek agricultural sector is currently receiving strong support from EU under the CAP system. The price and income support mechanisms contribute crucially in the formation of agricultural income. The CAP support regime involves a complex system of administered market prices, production and export subsidies, direct payments to producers and tariffs. The support received by the Greek agricultural sector under the above schemes takes mainly the form of production subsidies and direct payments. Export subsidies have less quantitative significance but they affect a variety of products.

The most significant change in the 1992 CAP reform was a reduction in the levels of intervention prices, which was accompanied with the introduction of direct payments to farmers. The above change was applied mainly to the arable sector, with the purpose to reduce supply, increase demand and thereby reduce or even eliminate surpluses and, in effect, reduce budgetary costs. The budget is now subject to less fluctuation due to changes in world markets, but most importantly income support expenditure is under direct control of the EU.

Although the 1992 CAP reform has been completed only recently, policy thinking about further reform of the CAP continues to be on the agenda. There is a wide range of views within the EU about the future of the CAP. Discussions on the extent and pace of further cuts in administered prices, as well as on the definition and implementation of non-production linked agricultural measures, are continuing. These issues are linked with the discussions about the expected enlargement to include up to fifteen associated European countries. Views are also being influenced by preliminary assessments of the mid-term implications of the Uruguay Round agreement, especially its export subsidy provisions, and by the prospect of further agricultural trade negotiations, by the end of the century.

In view of these internal and external pressures the present status would become increasingly untenable after year 2000. Growing surpluses would be unexportable because of the Uruguay Round commitments, even if the enlargement were not envisaged. Nevertheless radical reform is rejected in the medium term because of

possible negative social and environmental consequences, or high budgetary costs of compensations for reducing prices to world levels. The current Commission strategy regarding the CAP reform, is that the process that began in 1992 should be "consolidated, simplified and built upon"[4]. In other words it dentifies the deepening of the reform as the best approach to meet the full range of future policy challenges. This would mean a further reduction in reliance on market price support and a clearer distinction between the price and income objectives of the CAP.

In what follows we explore two types of further reforms. Firstly, a widening of the 1992 reform and secondly, a more radical scenario involving elimination of all agricultural subsidies.

[4] European Commission, The Agricultural Situation in the European Union, 1996 report.

3. AN AGE MODEL FOR GREEK AGRICULTURE

The model presented in this study is a static multi-sector AGE model for Greece, built to analyse the effects of the CAP reform on Greek economy and the agricultural sector in particular, under various assumptions about capital and labour mobility. The EC periodically set a target price for some agricultural commodities, such that farmers can receive an adequate income from the sale of their agricultural production in the European market as well as in the foreign market. As the target price is set above the world price, the EC endogenously determines the subsidy rates on goods exported to the RoW, and the tariff rates levied on goods imported from the RoW, in order to protect European agricultural production from world competition. In addition, European farmers receive a subsidy on agricultural production and this further encourages output to expand. Given the level of domestic demand, the growing surpluses have been stocked, destroyed or exported with the aid of export subsidies. Thus, production subsidy rates, export subsidy rates and import levies are the key policy instruments, which should be reduced in order to lessen the inefficient allocation of resources due to the artificially high prices much above the free market levels.

Throughout, we assume that Greek economic agents cannot modify the setting of a particular intervention price by the EU. Thus, Greek producers face exogenous production and export subsidy rates. Similarly, the common import levy is modelled as an exogenous parameter. The storage and withdrawal activity is not modelled due to the low importance for Greek agriculture. To simplify the presentation, the specification of the model is divided into five components: production technology and factor demands, treatment of traded goods, household revenues and consumption, production subsidy and equilibrating conditions of the model.

3.1. Production technology and factor demands

The production technology is described by a four stage nested separable CES functions. At the first stage, sectoral production (Y_i) is generated as a Leontief function

between raw-material inputs (x_{ji}), which are assumed to be strictly complementary, and the value added (V_i). At the second stage, V_i is a CES combination of the sector specific land ($\overline{LAND_i}$) and the composite labour-capital input (LK_i), with elasticity of substitution ξ_i. At the third stage, LK_i is a CES function of composite labour (L_i) and capital (K_i) with elasticity of substitution σ_i. Finally, at the fourth stage, L_i is a CES function of self employed (SE_i) and employees (EM_i) with elasticity of substitution λ_i:

(1) $$Y_i = \min\left[\frac{x_{ji}}{a_{ji}}, \frac{V_i}{a_i^v}\right],$$

(2) $$V_i = \Phi_i\left[\delta_i \overline{LAND_i}^{(\xi_i-1)/\xi_i} + (1-\delta_i)LK_i^{(\xi_i-1)/\xi_i}\right]^{\xi_i/(\xi_i-1)},$$

(3) $$LK_i = \Theta_i\left[\gamma_i L_i^{(\sigma_i-1)/\sigma_i} + (1-\gamma_i)K_i^{(\sigma_i-1)/\sigma_i}\right]^{\sigma_i/(\sigma_i-1)},$$

(4) $$L_i = \Psi_i\left[\mu_i SE_i^{(\lambda_i-1)/\lambda_i} + (1-\mu_i)EM_i^{(\lambda_i-1)/\lambda_i}\right]^{\lambda_i/(\lambda_i-1)}.$$

Where a_{ji} denote the input-output coefficients, a_i^v the value added requirement per unit of sectoral output, Φ_i and δ_i the shift and the share parameters in the value added function, Θ_i and γ_i the shift and the share parameters in the labour-capital aggregation function, and Ψ_i and μ_i the shift and the share parameters in the labour aggregation function.

The demand for factor inputs is derived by solving a three stage dual problem. Firstly, the minimisation of the labour cost function subject to the labour aggregation function yields the demand of the two labour categories. Secondly, the minimisation of the composite labour and capital cost function subject to the labour-capital aggregation function yields the demand of labour and capital. Thirdly, the minimisation of the total cost function subject to the production technology yields the demand for land and the demand for composite labour-capital. Producers behave competitively, hence the demand of factor inputs in each sector is determined by the equality between factor returns and their marginal revenue product. With this specification, a set-aside policy

would determine a backwards shift of the isoquant towards the origin, bringing about the desired contraction of sectoral output.

In addition, the assumption that intermediate inputs and value added are net complements allows us to define the total demand of intermediate goods (X_j) as follows:

(5) $$X_j = \sum_i a_{ji} Y_i$$

The technology (1) - (4) is a precise description of the agricultural sectors' technology. Conversely, the value added generated by industries and services is simply given by equation (3). In addition, these sectors employ only one labour category, which is mobile and entirely employed.

In order to examine the impact on employment in the Greek primary sector, three different closure rules have been postulated for factors of production, Firstly, capital and self-employed labour are assumed to be sector specific, and unemployment is only allowed among agricultural employees. Secondly, both self-employed and agricultural employees are allowed to be unemployed while retaining capital sector specific. Finally, capital is fully mobile among sectors, and both self-employed and employees are allowed to be unemployed.

3.2. Treatment of traded goods

In order to properly treat the subsidies on exports to the RoW and the common external tariff, we assume that each tradable commodity is exchanged in five different markets: the domestic market, the markets for imports from the EU and the RoW, and the markets for export to the EU and the RoW. Hence, tradable commodities are imperfect substitutes, and this assumption allows for intraindustry trade.

3.2.1. Supply and demand of tradables

The production possibility frontier (Y_i) is described by a constant elasticity transformation (CET) curve of domestic goods (D_i) and exports (E_i^C). The solution of the sale revenues maximisation problem faced by firms, subject to Y_i yields the optimal combination of domestic and export supply:

$$D_i = \Gamma_i^{-1} \frac{\varsigma_i^{-\tau_i} pd_i^{\tau_i}}{\left[\varsigma_i^{-\tau_i} pd_i^{(1+\tau_i)} + (1-\varsigma_i)^{-\tau_i} pe_i^{(1+\tau_i)}\right]^{\tau_i/(1+\tau_i)}} Y_i, \tag{6}$$

$$E_i^C = \Gamma_i^{-1} \frac{(1-\varsigma_i)^{-\tau_i} pe_i^{\tau_i}}{\left[\varsigma_i^{-\tau_i} pd_i^{(1+\tau_i)} + (1-\varsigma_i)^{-\tau_i} pe_i^{(1+\tau_i)}\right]^{\tau_i/(1+\tau_i)}} Y_i, \tag{7}$$

where pd_i denotes the price vector of domestic goods, pe_i the price vector of composite exports, τ_i the elasticity of transformation, and Γ_i and ς_i the shift and the share parameters of the transformation curve.

On the demand side, the trade Armington aggregation function (Q_j) is a CES combination of domestic goods and imports (M_j^C) with elasticity of substitution ρ_j, according to the Armington specification (Armington, 1969), which states that products of different countries competing in the same market are imperfect substitutes. The solution of the dual problem faced by firms and by the representative consumer yields total domestic demand and total import demand:

$$D_j = X_j^{(\rho_j-1)} \varphi_j^{\rho_j} \left(\frac{pd_j}{p_j}\right)^{-\rho_j} Q_j, \tag{8}$$

$$M_j^C = X_j^{(\rho_j-1)} (1-\varphi_j)^{\rho_j} \left(\frac{pm_j}{p_j}\right)^{-\rho_j} Q_j, \tag{9}$$

where $p_j = X_j^{-1}\left[\varphi_j^{\rho_j} pd_j^{(1-\rho_j)} + (1-\varphi_j)^{\rho_j} pm_j^{(1-\rho_j)}\right]^{1/(1-\rho_j)}$ is the price vector of final and intermediate goods, pm_j the domestic price vector of composite imports, and X_j and φ_j the shift and the share parameters of the trade aggregation function.

3.2.2. *Regional import demand and supply*

As far as the disaggregation of imports is concerned, on the supply side the *small country* assumption is postulated. On the import demand side, a two stage nested separable CES function is employed. Thus, it is assumed that buyers first decide between D_j and M_j^C, and then choose between imports from the EU (M_j^{EU}) and imports from the RoW (M_j^{RoW}) with elasticity of substitution ε_j:

$$(10) \qquad M_j^{EU} = A_j^{(\varepsilon_j - 1)} \alpha_j^{\varepsilon_j} \left(\frac{\overline{pwm}_j^{EU}}{pm_j} \right)^{-\varepsilon_j} M_j^C ,$$

$$(11) \qquad M_j^{RoW} = A_j^{(\varepsilon_j - 1)} (1 - \alpha_j)^{\varepsilon_j} \left(\frac{\overline{pwm}_j^{RoW} (1 + tr_j)}{pm_j} \right)^{-\varepsilon_j} M_j^C ,$$

where $\overline{pwm}_j^{EU}$ and $\overline{pwm}_j^{RoW}$ represent the fixed world prices of imports produced by the EU and the RoW, respectively; tr_j the *ad valorem* common external tariff; A_j and α_j are the shift and the share parameters of the CES import aggregation function. With this specification, any change in tr_j would directly affect the import demand from the RoW.

3.2.3. *Regional export demand and supply*

With regard to exports, on the demand side, the *small country* assumption implies the export demand functions to be infinitely elastic. Hence, the Greek export production is totally absorbed by foreign trade partners at world prices. On the supply side, the export supply functions to the EU (E_i^{EU}) and the RoW (E_i^{RoW}) are derived by maximising total export sale revenues subject to the export possibility frontier (E_i^C), which is also defined as a CET specification. Hence,

$$(12) \qquad E_i^{EU} = B_i^{-(\eta_i + 1)} \beta_i^{-\eta_i} \left(\frac{\overline{pwe}_i^{EU}}{pe_i} \right)^{\eta_i} E_i^C ,$$

$$(13) \qquad E_i^{RoW} = B_i^{-(\eta_i+1)}(1-\beta_i)^{-\eta_i}\left[\frac{\overline{pwe}_i^{RoW}\left(1+se_i^{RoW}\right)}{pe_i}\right]^{\eta_i} E_i^C,$$

where $\overline{pwe}_i^{EU}$ and $\overline{pwe}_i^{RoW}$ are the fixed price of exports prevailing in the EU and RoW markets, respectively; se_i^{RoW} the *ad valorem* subsidy rate on exports to the RoW; η_i the elasticity of transformation, B_i and β_i the shift and the share parameters of the CET export aggregation function. With this specification, a change in se_i^{RoW} would directly affect sectoral export supply to the RoW.

3.3. *Household revenues and consumption*

3.3.1. *Household revenues*

The source of the representative household income (HR) originates from wage payments, returns to land and capital, and transfers from the EU ($TRAN^{EU}$):

$$(14) \quad HR = \sum_a w_a^{se} SE_a + \sum_a w_a^{em} EM_a + \sum_b wL_b + \sum_a l_a \overline{LAND}_a + \sum_i r_i K_i + TRAN^{EU},$$

where w_a^{se} and w_a^{em} denote the wage rates to self-employed and employees in the primary sector (a), respectively; w represents the wage rate paid to mobile employees in all other sectors (b); l_a the returns on land; and r_i the returns on capital ($i = a \cup b$). $TRAN^{EU}$ is endogenously computed as a difference between total ex-ante and ex-post agricultural production and export subsidies. With this specification, the amount of subsidies coming from the EU does not vary, as policy simulations are performed.[5] As a result, the move from a price support scheme to an income support scheme has to be

[5] Compensatory payments, created with the MacSharry reform, constitute an income transfer directly to farmers, which is not linked to output, but linked to the use of certain production factors. Arable payments are provided on a per hectare basis to arable farming and as per head premium to livestock farmers. However, producers have to enrol in a set-aside scheme in order to be entitled to receive the transfer. Its method of calculation is quite complicated, as it is based on the expected income effect of the reform's price reduction (EC, 1996b). Obviously, the latter is not captured by our simple approach. However, the balance of payments statistics for Greece indicate that total agricultural transfers from the EU have not decreased since the 1992. Consequently, the assumption that total agricultural transfers do

welfare improving due to a better reallocation of resources. However, if the full employment assumption is relaxed, this move, which is at the core of the MacSharry reform, is analytically indeterminate.

3.3.2. *Household consumption*

Since the model is static, the consumer's utility function is defined only over composite commodities. The consumption behaviour of a representative household is obtained by maximising his utility function, subject to the disposable income. Because of lack of data on the values of the elasticity of substitution among commodities, consumer preferences have been described simply by a Cobb-Douglas utility function. Hence, household demand for composite commodities (C_j) is given by:

$$C_j = \vartheta_j \frac{HR}{p_j}, \tag{15}$$

where ϑ_j denotes the vector of household budget shares.

3.4. *The production subsidy*

The model assumes perfect competition and constant returns to scale. Thus, the marginal cost (c_a) to produce one unit of agricultural output (Y_a) can be defined as follows:

$$c_a = \left(w_a^{se} SE_a + w_a^{em} EM_a + r_a K_a + l_a \overline{LAND_a}\right) / Y_a + \sum_j a_{ja} p_a . \tag{16}$$

In addition, the assumptions that the technology exhibits constant returns to scale, and that there are no barriers to entry, imply the equality between total costs and total revenues for the zero profit condition to hold. As total revenues originate from domestic and foreign sales, plus the agricultural subsidies on exports and on total production, then the zero profit condition can be written as:

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not vary as policy simulations are performed is not far away from reality.

(17) $$c_a Y_a = \left[pd_a D_a + \overline{pwe}_a^{EU} E_a^{EU} + \left(1 + se_a^{RoW}\right) \overline{pwe}_a^{RoW} E_a^{RoW} \right] \left(1 + s_a\right),$$

where s_a denotes the *ad valorem* subsidy rate on total agricultural production at the sectoral level. Producers then equate the marginal cost with the market price gross of subsidies. With this specification, the subsidy on agricultural production directly affects the amount of output produced.

3.5. *The equilibrating conditions*

As a consequence of the EU transfers in the form of production and export subsidies, of the new income support scheme, and of the common external tariff revenues, which are simply collected by Greek authorities and immediately transferred to the EC, the balance of payments is in equilibrium if the following condition holds:

(18) $$\begin{aligned} &\sum_i \overline{pwe}_i^{EU} E_i^{EU} + \sum_i \overline{pwe}_i^{RoW} \left(1 + se_i^{RoW}\right) E_i^{RoW} + \sum_a s_a py_a Y_a + \\ &TRAN^{EU} = \sum_j \overline{pwm}_j^{EU} M_j^{EU} + \sum_j \overline{pwm}_j^{RoW} \left(1 + tr_j\right) M_j^{RoW} \end{aligned}.$$

The equilibrium in the commodity market is given by:

(19) $$Q_j = C_j + X_j.$$

With regard to the factors' market, as already described, different assumptions have been postulated. However, the following equilibrium conditions are valid in all policy scenarios:

(20) $$\overline{LAB} = \sum_b L_b,$$

(21) $$\overline{CAP} = \sum_i K_i.$$

4. THE BENCHMARK

The benchmark of the model is based on a Social Accounting Matrix (SAM) for Greece, built on the basis of 1990 data. The construction of the SAM was based on data provided by the National Statistical Service, the Bank of Greece and the Department of Agriculture.[6] The SAM identifies 22 sectors, 13 of which related to the agribusiness activities.[7] By using further data of the National Statistical Service, agricultural labour has been further disaggregated among self-employed and employees.

With regard to the grains land to be set-aside under the MacSharry plan, only large farmers producing at least 92 tonnes of cereals are subject to the set-aside policy. Since Greek agriculture is characterised by small holdings, we estimate the amount of land to be set-aside equal to 2.5 per cent of the total grains land. This figure is very close to the estimates produced by Folmer, *et al.* (1994), who compute the percentage of the Greek land to be set-aside equal to 2.2 per cent of the basic area.

The calibrated effective rates of agricultural production and export subsidy rates indicate that the Greek sectors, which are strongly protected by the CAP Policy, are grains, fruit, milk, processed fruit and vegetables, oils and fats, and processed tobacco.[8] In particular, we estimate the effective production subsidy rates to be equal to 15.3 per cent in grains, 0.4 per cent in vegetables, 7.3 per cent in fruit and 6.7 per cent in milk. The export subsidy rates equal to 10.9 per cent in grain, 13.3 per cent in vegetables, 50.8 per cent in fruit and 6.8 per cent in milk; and the effective tariff rates equal to 0.8 per cent in grain, 4 per cent in vegetables, 18.5 per cent in fruit and 15.7 per cent in milk.

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[6] For more information on the structure and data sources of the SAM see Balfoussias an De Santis (1998).

[7] The 22 sectors of the AGE model for Greece are: Grains and related activities; Vegetables; Fruit; Milk and other animal products; Forestry, fishing and related activities; Processed meat; Processed fruit and vegetables; Oils and fats; Dairy products; Bread and sugar industry; Beverages; Tobacco industry; Processed fish, processed cereals, and animal food industry; Mining; Other consumer industries; Capital industries; Construction; Electricity, gas and water; Trade, tourism, transport, Banking and other market services; Health and education; Non market services. The first 13 sectors correspond to the agribusiness activities. The first 5 activities correspond to the primary sectors.

[8] The calibration procedure consists of estimating unknown parameters, such that the observed values of endogenous variables constitute an equilibrium of the numerical model. It is important to stress that the numerical calibration does not involve any econometric testing procedure (Mansur and Whalley, 1984).

The effect of changes in the protection rates of some of these sectors is of course the object of subsequent analysis.

The values of elasticities used come from a variety of sources. Those related to the technology and the first nest Armington trade aggregation function have been estimated, or selected from other published or unpublished Greek studies.[9] The elasticities of substitution among imports from different regions, and the elasticities of transformation, have been assumed quite large to allow sufficient flexibility, although some experimentation has shown that the results are quite robust to changes in the values of these elasticities.

[9] See Balfoussias (1996), Caramanis(1981), Reziti (1996).

5. SIMULATIONS OF POLICY SCENARIOS

The policy simulations reported in this section explore the sensitivity of the Greek agricultural sector and the economy at large, to major reform of the CAP under various assumptions about the flexibility of the agricultural labour market. The experiments have two objectives. First to obtain an assessment of the likely welfare effects of a forthcoming deepening of the reform and secondly to explore the implications of various reform scenarios on agricultural employment.

Although we are interested in the effects of the CAP reform on the Greek economy by employing a single-country model, our experiments must take into account any changes in European prices that come about as a consequence of CAP reforms which apply to all member states. In all subsequent simulations sectoral European prices decline in accordance with the modifications of the sectoral production and export subsidy rates so that sectoral terms of trade are not affected, and the small country assumption is not violated.

All simulations are performed under the assumption that price reduction policy is accompanied by income support measures. Furthermore, since European agricultural prices are well above the corresponding world levels, we postulate the effective common external tariff to be constant in all scenarios.

The simulation experiments are distinguished according to three types of features: first the extent of the reform, secondly the flexibility of sectoral wages and finally the mobility of capital and self-employed labour in the agricultural sector. Various combinations of the above assumptions allow some interesting policy scenarios involving comparisons of the implications of anticipated policy changes to the effects of the 1992 reform. In the first set of experiments we assume perfect factor mobility and flexibility of wages in all sectors. These experiments are thereby encompassing a full employment set-up. The results are reported in Tables 1 and 2. Differences between scenarios reflect merely the extent of the assumed reform. In the second set of experiments (see Tables 3-6) full employment and perfect factor mobility are abandoned. Thus, scenarios referring to the same package of policy measures are

distinguished on the basis of the assumed inflexibility of factors as well as the extent of unemployment allowed. The latter always stems from an assumption of inflexible real wage rates.

5.1. Scenarios with labour and capital mobility

Tables 1 and 2 report three scenarios. In the first scenario, we simulate the 1992 CAP reform where production and export subsidy rates to grains, milk and other animal products are eliminated and Greek farmers set-aside 2.5 per cent of their arable land. In the second scenario, we extend the 1992 CAP reform to fresh fruit and vegetables. The target price is reduced by 12 per cent, which implies that all subsidies are cut to zero, with the exemption of the export subsidy rate on fruit, which decreases from 50.5 per cent to 32.7 per cent. Finally, the third scenario involves elimination of all agricultural subsidies.

As shown in Tables 1 and 2, the main impact of the 1992 CAP reform on the Greek economy stems from reallocation of resources towards the agricultural sectors non affected by the reform. Given the size of the set-aside policy in Greece, these effects come about mainly due to the change in price interventions, as the set-aside itself does not have any significant impact on Greek economy. Total value added in agriculture and agribusiness industry increases by 0.3 per cent. The impact of the reform on non-agricultural sectors is, however, insignificant. Aggregate output, measured by a quantity Leysperes index, is higher by 0.4 per cent, and overall welfare, measured by the widely used Hicksian equivalent variation index, also rises by 0.4 as a percentage of the consumer income.

Looking at sectoral results, the most severe implication is for the grain sector as grain production decreases by 5.9 per cent. It turns out that the livestock and milk sector is not affected, and this is because the meat-processing industry grows. On the other hand, fruit records a 3 per cent growth. Sectoral exports are also strongly affected by the policy change. The reduction of export subsidy rates in grain and milk causes a fall in the exports of these goods by 53.9 per cent and 32.3 per cent, respectively.

Finally, since the aims of the MacSharry reform included cutting the Community budgetary expenditure in the form of production and export subsidies, it seems that the 1992 CAP reform fulfils this goal. However, farmers need to be compensated for their loss of revenues through a system of acreage payments, which we estimate to be equal to 118 billions of drachmas. In summary, under the full employment assumption, it seems that the MacSharry reform would achieve its aim.

In the "wider" CAP reform scenario, price cuts are extended to fruit and vegetable sectors. Under this scenario resources are reallocated outside the agribusiness sectors, favouring the expansion of other industrial activities and services. All sectors subject to the reform record output contraction accompanied by export contraction in real terms As a result, the value added produced by the agribusiness activities decreases by 0.6 per cent. This scenario also confirms that production and export subsidies would largely fall, whereas the income support scheme would require financial resources of the size of 159 billions of drachmas.

The final scenario, in this first set of experiments, comprises a complete elimination of production and export subsidies. The reallocation effect of such a radical reform is quite strong as resources are moving towards non-agricultural sectors, generating a 4.8 per cent increase of non-agricultural value added accompanied by a 7.4 reduction in the value added of agribusiness sector. In addition, the export volume of agricultural products dramatically contracts by nearly 70 per cent, whereas exports of non-agricultural products increase by almost 20 per cent. Hence, if all agricultural subsidies are eliminated, the Greek agricultural sectors would contract enormously, and a large reallocation of resources would take place among economic activities.

At the aggregate level however GDP would increase only by 0.5 per cent whereas welfare would remain almost unchanged. The latter is not surprising for the present set-up for two main reasons. First we have to keep in mind that the reduction in subsidies is not directly associated with lower taxation so the welfare gain for the taxpayer is not present. Secondly and perhaps more importantly the aggregate welfare outcome is heavily affected by the impact of the reform on the price of land. The price of grain land decreases by 24 per cent in the case of 1992 reform. In the "wide" reform

scenario, the decrease in the price of land extents to all primary sectors subject to reform whereas in the scenario eliminating all subsidies the price of land, except for livestock land, records a huge fall. These results stem from the assumed specificity of land allocated to various agricultural activities. The substantial fall of the return on land introduces a further negative welfare implication, not captured by this static model, and relating to investment decisions in the agricultural sector, since land is often used as collateral in the credit market.

5.2. Scenarios with rigidity in labour and capital markets

The results of the first set of experiments can be interpreted as long- term effects since they are obtained under the assumption of fully employed production factors and fully mobile capital and labour between agricultural sectors and the rest of the economy. To gain some insights about short run effects and to accommodate more realistic representations of the structure of Greek agriculture, we construct a second group of experiments in which we modify our assumptions about mobility of factors and about flexibility of wages.

As the discussion in section 2 has indicated the stylised facts about agricultural sector imply serious immobility of agricultural self-employed labour. Immobility of agricultural capital is a more general phenomenon. It is particularly linked to certain types of capital, like fixed structures, and is more crucial when considering rather dissimilar sectors like, for example, the arable and the livestock sectors.

Certain inflexibility of the real wage rate in the agricultural sector is also expected to be the case, as the Greek labour market operates under a minimum wage rate regime, and so far as the agricultural sector employs predominantly unskilled labour[10]. It is also reasonable to assume that wage rate may be rigid for a good part of self-employed labour and in particular younger members of agricultural families.

[10] Though no data exist on the number of workers receiving the minimum wage, the Centre of Planning and Economic Research (1996), estimates that the share could be as high as 30 per cent in the industrial sector (similar to an estimate provided by the Federation of Greek Industrialists) and much higher than this in labour intensive activities and for certain groups of workers, such as women.

In what follows we perform a number of experiments embodying varying degrees of factor and wage rigidity within the agricultural sectors. In the other branches of the economy, labour and capital are assumed to be fully mobile facing respectively a common flexible wage and rental rate in all three scenarios.

We do not attempt to select one of the scenarios as representing the reality, but we rather explore the extent to which the full-mobility full-employment implications of reform would be modified under various inflexibility assumptions.

Table 3 shows the extent to which factor immobility alters the impact of reform on key economic variables. The table contains two scenarios. Scenario 1 comprises a minimum immobility assumption. The only difference from a full mobility situation is that self-employed labour is assumed mobile only among primary sectors. Scenario 2 reflects a maximum immobility situation as both self-employed labour and agricultural capital are sector specific. As the table shows the reallocation effect takes opposite directions in the two scenarios for both the 1992 and the "wide" reforms. In the latter case the reform would result in 0.5 per cent reduction in agribusiness value added and 0.7 per cent increase in the production of other sectors in the case of Minimum immobility which is very close to the full mobility outcome. On the other hand, under an extremely immobile set-up, the reform would induce an increase of 1 per cent in agribusiness value added and a reduction of 0.3 per cent in the other sectors. Aggregate effects on GDP and welfare are very similar.

Table 4 shows how allowing for unemployment would differentiate the results. The table compares two scenarios that embody the same assumptions about factor mobility –capital is mobile within agricultural sectors- but they differ in their treatment of wage rate as the second scenario assumes that both employees and self-employed in agriculture have perfectly elastic labour supply schedules. The first conclusion from this comparison is that the direction and extent of reallocation effect are not altered by the introduction of unemployment. The major difference refers to the aggregate GDP effect of the reform which is lower in the presence of unemployment and becomes zero in the "wide" reform case.

Finally, a very interesting question concerns the effects of the CAP reforms on agricultural employment when the wage flexibility assumption is relaxed. Employment results are shown in Table 5. As explained in section 2, it is necessary to distinguish between full time equivalent workers and effective number of workers. Using the average conversion factor of 0.42, we can see that the number of workers losing their jobs varies enormously according to the type of closure rule adopted for factors of production. Given the labour farming structure of Greek agriculture, the loss of jobs would come mainly from farmers themselves. Obviously, the scenario where farmers are immobile indicates a modest impact of the CAP reform on Greek agricultural employment. However, this entails a loss of wages and capital income for self-employed farmers involved in grain and fruit activities, and a similar loss of return on arable land. When both employees and self-employed are assumed to have a perfectly elastic supply curve, an assumption embodied in scenarios 2 and 3, the loss of agricultural jobs would rise to 9000-30000 workers under the 1992 CAP reform, and even to 74500-85200 if the reform is extended to fruit and vegetables. Thus, a "wider" CAP reform appears to have a far more significant effect on employment. When capital is assumed variable within the two broad branches of the economy, employment effects on are more severe due to the input substitution effect. These estimates are large in relative terms even as upper limits. In fact, a loss of 60.000 jobs amounts to around 10 per cent of agricultural employment. With a labour force of 3.8million of workers, of which 400000 unemployed such an impact is quite significant. It should be noted however that as a result of the present structure of agricultural employment reduction in employment may take predominantly the form of withdrawal from the labour force rather than direct addition to the ranks of the unemployed.

6. SUMMARY AND CONCLUSIONS

This paper attempts to evaluate the economic effects on the Greek economy of a number of CAP reform scenarios, relating both to recent policy changes and to possible future ones as increased attention is now focused on the future policy options for EU agriculture. The 1992 CAP reform was applied mainly to the arable sector and to a lesser extent to milk and other animal products. In a full mobility, full employment set-up the aggregate implications of the reform are rather modest, as overall welfare gains are in the order of 0.3 as a percentage of consumer income. The main impact the 1992 CAP reform on the Greek economy is a reallocation of resources towards agricultural sectors not affected by the reform. A wider reform, extending 1992 measures to the fruit and vegetable sectors, would result in some reallocation of resources towards non-agricultural sectors. In the event of a complete elimination of agricultural subsidies, however, reallocation of resources towards non-agricultural sectors is far more extensive. Key primary sectors subject to policy intervention contract leading to a 7 per cent reduction in agricultural value added and a 5 per cent increase in value added of other sectors. Exports of agricultural products are reduced substantially whereas exports of non-agricultural products increase appreciably. In addition, production and export subsidies record a huge fall. This outcome leads to the conclusion that the CAP reform is able to achieve its main aim. Nevertheless welfare gains are very moderate and disappear in the more radical scenario owing to substantial reduction in the return to agricultural land.

When more realistic representations of the workings of agricultural sector are allowed for, at least in terms of short-term responses, the results appear to be quite different. Factor immobility would prevent any significant reallocation towards non-agricultural sectors whereas wage rigidity would result in substantial unemployment and zero gains on aggregate GDP. Evidently, the most disturbing results from these experiments relate to the employment implications of the reforms. Given the labour structure of Greek agriculture, a possible extension of the reform to other land sectors would result in significant loss of jobs mainly among self-employed farmers. In terms of present agricultural employment the estimated losses are in the order of 10 per cent.

These results give a strong signal to policy makers as to the direction of agricultural policy. The policy should aim at increasing the mobility and flexibility of the agricultural market and encourage mobility between agricultural and non-agricultural sectors. At the same time new job opportunities must be created in the rest of the economy to account for the inevitable agricultural unemployment stemming not only from CAP reform but also from the usual demand and technology trends.

In assessing these results, one should keep in mind that they are obtained under the assumption that price reduction policy is always accompanied by income support measures. It was argued here that this assumption could be taken as realistic for some years. In a long-run perspective, such assumption may not be valid. Hence, national policy should take this option also into consideration.

TABLE 1

Effects of CAP reforms on key economic variables: Full employment Full mobility context
(Base year : 100)

	The 1992 CAP reform	A wider CAP reform	Elimination of all subsidies
Value added in agribusiness activities in real terms	100.3	99.4	93.2
Value added in other sectors in real terms	100.1	100.8	104.8
Volume of agricultural exports	98.1	86.6	30.4
Volume of non-agricultural exports	101.2	104.6	119.0
EU production subsidies in agriculture	64.3	54.1	0.0
EU export subsidies in agriculture	89.8	61.6	0.0
GDP	100.3	100.3	100.1
Aggregate output	100.5	100.3	100.7
Welfare	100.4	100.5	100.1
EU direct payment to farmers (millions Drachmas)	120,511	158,954	349,168

TABLE 2

Effects of CAP reforms on primary sectors: Full employment context (Base year : 100)

	The 1992 CAP reform			A wider reform			Elimination of Subsidies		
	Output	***Exports***	***Return on land***	***Output***	***Exports***	***Return on land***	***Output***	***Exports***	***Return on land***
Grains and related activities	94.1	46.1	79.2	93.4	45.8	75.9	82.8	40.6	39.0
Vegetables	100.2	100.5	100.2	97.8	67.3	91.6	75.4	33.2	35.7
Fruit	103.1	105.1	111.6	91.1	51.3	70.2	66.7	15.5	23.0
Milk and animal products	101.9	67.7	106.0	104.3	71.4	114.1	106.0	72.6	119.9
Forestry and fishery	100.4	101.5	100.7	100.3	100.2	100.3	91.7	63.2	73.8

TABLE 3

Effects of alternative CAP reforms on key economic variables

When Agricultural Factors are Immobile (Base year: 100)

	The 1992 CAP reform		A wider CAP reform	
	Minimum Immobility	Maximum Immobility	Minimum Immobility	Maximum Immobility
Value added in agribusiness activities in real terms	100.1	100.8	99.5	100.9
Value added in other sectors in real terms	100.3	100.0	100.7	99.7
Volume of agricultural exports	96.2	100.6	87.3	103.4
Volume of non-agricultural exports	101.6	101.1	104.5	100.3
EU production subsidies in agriculture	63.5	65.1	54.2	57.9
EU export subsidies in agriculture	87.9	89.7	60.7	75.6
Aggregate output	100.4	100.7	100.3	100.8
GDP	100.3	100.4	100.3	100.3
Welfare	100.4	100.6	100.5	100.4
EU direct payment to farmers (millions Drachmas)	123,338	117,860	158,925	144,981

TABLE 4

Effects of the CAP reform on reforms on key economic variables

Under assumptions of wage rigidity (Base year : 100)

	The 1992 CAP reform		A wider CAP reform	
	Full Employment	Unemployment	Full Employment	Unemployment
Value added in agribusiness activities in real terms	100.1	100.0	99.5	99.5
Value added in other sectors in real terms	100.3	100.1	100.7	100.4
Volume of agricultural exports	96.2	96.1	87.3	88.9
Volume of non-agricultural exports	101.6	101.5	104.5	103.1
EU production subsidies in agriculture	63.5	63.6	54.2	54.4
EU export subsidies in agriculture	87.9	86.6	60.7	60.8
Aggregate output	100.4	100.4	100.3	100.4
GDP	100.3	100.1	100.3	100.0

TABLE 5

The impact of the CAP reform on agricultural employment

	Self employed		Employees		Total	
	Full time equivalent	***Number of workers***	***Full time equivalent***	***Number of workers***	***Full time equivalent***	***Number of workers***
The 1992 CAP Reform						
Sce. 1	-	-	196	466	196	466
Sce. 2	3,263	7,769	580	1,382	3,843	9,150
Sce. 3	11,852	28,218	704	1,677	12,556	29,895
A wider CAP Reform						
Sce. 1	-	-	469	1,118	469	1,118
Sce. 2	30,202	71,909	1,124	2,677	31,326	74,586
Sce. 3	34,510	82,167	1,282	3,051	35,792	85,219

* Sce. 1 = Primary sectors: Capital sector specific, self-employed fixed and employees unemployed;other sectors: Capital and labour mobile.
Sce. 2 = Primary sectors: Capital sector specific, self-employed and employees unemployed; other sectors: Capital and labour mobile.
Sce. 3 = Primary sectors: Capital mobile, self-employed and employees unemployed; other sectors: Capital and labour mobile.

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