European Network of Agricultural and Rural Policy Research Institutes

MODELLING THE EFFECTS OF TRADE POLICY SCENARIOS ON MULTIFUNCTIONALITY IN GREEK AGRICULTURE:
A SOCIAL ACCOUNTING MATRIX APPROACH

DIMITRIS PSALTOPOULOS

AND

EUDOKIA BALAMOU

Abstract

This paper presents a Social Accounting Matrix (SAM) model for conducting an assessment on the potential impacts of trade agreements on several multifunctionality indicators in Greek agriculture. More specifically, two SAM models were constructed, one for Greece and one for local economy of Archanes (Crete), an agriculturally dependent NUTS IV area, which has demonstrated a noticeable record in terms of the implementation of Pillar 2 policies. Along these lines, five alternative scenarios were specified with regards to anticipated EU policy reactions under different future outcomes of the Doha round negotiations. In broad terms these scenarios range from a status quo (2003 CAP reform) hypothesis to full decoupling, taking also into account the possibility of further reductions in domestic (EU) support as well as developments on Pillar 2 funding. Results suggest that under the scenarios examined, the effects of policy reform upon multifunctionality indicators are rather mixed and surely not extremely worrying. Effects of the status quo scenarios seem to be optimistic in terms of projected economy-wide output and employment at both national and regional level. On the other hand, Scenario 1(bis) generates negative results in terms of farm output and employment (for Archanes), land-use abandonment projections are marginal at the national and rather moderate at the regional level, while environmental repercussions are negative at the national level. The regional analysis has also shown that the impacts of Scenarios 2, 2b and 3 are rather worrying in terms of all categories of projections, with the exception of "Total Output". Taking account of the specification of Scenario 3, this finding generates rather justified reservations on the "ability" of Pillar 2 policies to ameliorate for economic activity contraction caused by a decrease in Pillar 1 support in Archanes economy.

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DIMITRIS PSALTOPOULOS AND EUDOKIA BALAMOU[*]

1. Introduction

As stated in the technical annex to ENARPRI's terms of reference, one objective of the research project (specified as Work Package 4.3) is to utilise existing quantitative models and methodologies developed by the participating institutes to conduct an assessment of the potential impacts of trade agreements on several multifunctionality indicators. Along these lines, a methodology paper by Dwyer et al., (2005), specified five alternative scenarios with regard to anticipated EU policy reactions under different future outcomes of the Doha round of WTO negotiations. In broad terms these scenarios range from a status quo (2003 CAP reform) hypothesis to full decoupling, taking also into account the possibility of further reductions in domestic (EU) support as well as developments in Pillar 2 funding.

As stated in the paper by Dwyer et al., (2005), it seems that none of the research institutions amongst those participating in ENARPRI has developed models that directly link the outcome of international trade agreements with specific impacts upon multifunctionality. However, as in the case of other ENARPRI partners, the Greek research team has access to national and regional models which to some extent, can explore the multifunctionality implications of domestic policy changes that are 'induced' by trade agreements. More specifically, over the last decade the Greek research team has developed a series of input-output (I/O) models and social accounting matrices (SAMs) at both the national and regional contexts. These models have been developed in the context of international and national research projects and applied to the analysis of the economic effects of the EU structural policy and CAP support and also of possible scenarios regarding future developments in agricultural market support, etc. (Psaltopoulos & Efstratoglou, 2000; Psaltopoulos, 2001; Psaltopoulos et al., 2004; Psaltopoulos & Balamou, 2005). The Greek research team will utilise the above models and use the SAM general equilibrium approach to evaluate the impacts of domestic policy changes on multifunctionality, along the lines foreseen in W.P. 4.3. of ENARPRI.

Within this context, the objective of the Working Paper is to analytically present this effort. In more detail, the next section of the paper presents the relevant background, namely the characteristics of the SAM models utilised in this effort and the specific likely decisions of the Hellenic authorities on the implementation of the CAP reform. Section 3 presents the applied methodology and the model-construction process, while Section 4 indicates the methodological procedures of the policy impact assessment. Section 5 presents the specification of the alternative policy scenarios, and estimates their impacts. Based on the findings of this analysis, the paper ends with the relevant conclusions.

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[*] Assistant Professor and Ph.D. Candidate, respectively, at the Department of Economics, University of Patras, Greece (e-mail address: dempsa@upatras.gr, ebalamou@upatras.gr).

2.   Background to the Study

2.1   Models utilised

The models that will be utilised by the Greek team in the context of W.P. 4.3 are: i) a 1998 SAM for Greece and ii) a 1998 SAM for the local economy of Archanes (Crete), an agriculturally-dependent NUTS IV area, specialising in the production of olive-oil, grapes and wine and at the same time, 'exhibiting' a noticeable record in terms of the implementation of Pillar 2 policies.

The first model consists of 22 sectors and amongst them there are several of major importance for Greek rural areas (agriculture, tobacco cultivation, food processing, tobacco processing, etc.). The regional SAM for Archanes (an agriculturally-dependent NUTS IV rural area in Crete) consists of 13 sectors; at the sectoral level, this model also provides detailed information on sectors that are important for this rural economy and includes three agricultural sub-sectors (vine-growing, olive-growing, other agriculture).

With regards to the identification of multifunctionality indicators that these models would be able to examine, these include farm output levels (at 1998 prices), agricultural employment, total employment, agricultural land use and pollution emissions. It should be also noted here that initially, both models aggregate several agricultural sectors as one (namely agriculture). However, this was not be a problem for a further disaggregation of agriculture, as these models were built through a 'bottom-up' procedure, while all estimates will be "directed" by the linearity assumption.

Finally, estimated results are presented in an average annual form for the period 2007-2013, with the exception of tobacco, where estimates relate to the post-2010 period.

2.2   Implementation of the CAP reform in Greece

At the time of the completion of the relevant W.P. 3.3 working paper for Greece (Psaltopoulos, 2004), it was stated that "…An important problem that worries the Greek research team is relevant to the determination (by the Greek Ministry of Agriculture) of the degree of decoupling (in various regimes such as arable and sheep) and the distribution of the national envelope in the case of (e.g.) olive oil. Our team considers the delay of this determination as quite possible…"

Unfortunately, the above-mentioned shortcoming also exists nowadays. However, in order to proceed with the country-specific specification of the scenarios, the Greek research team utilised information provided by the Ministry of Agriculture (2004); this information was related to a Committee of experts established by the Ministry in order to provide opinion on the implementation of the New CAP in Greece. According to the Committee, the main characteristics of the implementation of the New CAP in Greece would (should) be as follows:

- Implementation of the Single Payment Scheme for all products covered by the reform will start in 1/1/2006.
- There will be full decoupling in the case of arable crops (including durum wheat), sheep and goat, and olive oil.
- In the bovine sector, Greece will opt for keeping 100% of the suckler cow premium and 40% of the slaughter premium coupled.
- Greece will not utilise the regional application options.
- Greece will not utilise the option to grant up to 10% of the national ceiling as sector-specific payment for improving quality and marketing of agricultural products.
- The Single Payment Scheme will fully apply for the Aegean Islands.

Finally, the financial implications of the above likely-development were (where applicable) deducted from Bourdaras (2004; 2005).

3. Modelling Framework

3.1 Methods

The impact of agricultural and rural policies has been evaluated – officially and otherwise – by different tools and approaches, as regards targeted groups in different rural areas (European Commission, 1996; 1997; 2001; Midmore, 1998; Bossard et al., 2000). Quantitative evaluations range from descriptive techniques, "rational checking procedures" and local growth indicators (for example, see CEAS Consultants, 1995; Schrader, 1995), to more sophisticated macro- and micro- models, input-output models, cost-benefit analysis, multicriteria analysis (for a review, see Psaltopoulos *et al.*, 2004). On the other hand, several studies (e.g. Midmore et al., 1994; Ray, 1996) have used some form of qualitative analysis to evaluate rural policy action (Midmore, 1998). Evaluation of CAP effects has also taken a number of directions, such as environmental and competitive aspects, and overall regional analysis in the Cohesion Reports of the European Commission (1996, 2001, 2004a).

The selection of an 'appropriate' evaluation technique mainly depends on the policy actions to be evaluated and on the focus of the evaluation. As policy interventions are made at three distinct levels (the project, the programme and the policy) and as policy is usually defined as "a set of activities which may differ and may have different direct beneficiaries at different domains, and which are directed towards common general objectives or goals" (European Commission, 1997), a general equilibrium approach seems more appropriate at evaluating the policy impacts. Such a model can be based on the Social Accounting Matrix (SAM) technique (Pyatt & Roe, 1977), which allows the identification of the economic effects of policy funding on both investment and direct income transfers, in a national or regional economy. Such a model was therefore selected as the analytical tool in this work.

Such models, based on the Social Accounting Matrix (SAM) technique (Stone et al., 1962; Pyatt & Roe, 1977; Pyatt & Round, 1977, 1985), allow the identification of the effects of both Pillar I and II funding (i.e. investment and direct income transfers), in a national or/and local economy. Other possible advantages of this modelling framework can be described as follows: a) the multisectoral dimension of SAM accommodates the analysis of the effects induced by current rural development policies, which have shifted attention from the traditional product/sector-oriented support to a more broadly based (multisectoral) one; b) while several evaluation approaches estimate only the direct effects of policy action, being a general equilibrium approach, the SAM technique allows for the estimation of the 'global' economic effects of these injections; and c) the ability of the SAM technique (in comparison to the more-traditional Leontief input-output approach) to capture the distributional effects of exogenous injections (investment funding and transfers) in an economy. In particular, the increased presence of the CAP subsidy payments to farmers further substantiates the use of the SAM method since analysis which focuses solely on production linkages (input-output) may ignore the implications (particularly the distributional effects) arising from other types of links between rural sectors (especially agriculture) and the macro economy.

On the other hand, it has to be noted that the use of this technique for impact assessment also involves some simplistic assumptions regarding the economic behaviour of sectors, households, etc., which are all assumed to maintain their recorded pattern of expenditure in the base period (the linearity assumption). Furthermore the 'snapshot' nature of the technique does not allow the exploration of changes in technology, relative prices, incomes and expenditures over time. Most of the above weaknesses could have been dealt with via the use of computable general

equilibrium analysis (and a considerable number of additional and often speculative assumptions), but this is clearly beyond the resources of this effort.

Despite the above-mentioned advantages, the SAM technique has not been often used for policy-impact analysis, mainly due to (usually) severe data demands, especially at the regional level. However, in recent years, some indicative studies have applied this technique; Marcouiller et al. (1995) analysed the differential impact of natural resource management programmes and policies on timber development on three groups of households by income level. Roberts (1995) investigated links between UK agriculture and the wider economy, showing significant magnitude of benefits that leak from the farm sector, while Leatherman & Marcouiller (1996) used a SAM to analyse a small rural region in Wisconsin, and concluded that local policy could influence distributional patterns, through targeting specific economic sectors for growth. In another indicative study, Roberts (1998) constructed an interregional SAM in Scotland to identify interdependencies between rural and urban areas. Psaltopoulos & Efstratoglou (2000) have reported preliminary impacts of Structural Policy implementation in Evrytania, while Psaltopoulos (2000) has estimated the economy-wide impacts of alternative policy scenarios related to the tobacco sector on the national economy of Greece. Also, Roberts (2003) built a 1997 SAM for the Western Isles in Scotland and estimated the economic impacts of both central government funding of public services and exogenous transfers of income to local households. Finally, Psaltopoulos et al. (2004) built regional SAMs for six remote rural areas of Scotland, Finland and Greece, in an attempt to discover how EU Structural Policies have affected their economies, while Psaltopoulos & Balamou (2005) built an interregional SAM for Crete to assess the impacts of CAP Pillar 1 and 2 measures.

3.2 Application

The objective of this section is to present the analytical procedure applied to the generation of a National SAM for the Greek economy for year 1998 and a regional SAM for the local economy of Archanes (Crete) for the same year.

a) <u>National SAM for Greece, 1998</u>

The basis of the national SAM-construction process was the National Accounts and detailed I-O Tables for year 1998. Subsequently, by using various data sources (Household Income and Expenditure Survey, National Statistical Service data on Taxes, Subsidies, Government Transfers, etc.), a National SAM is constructed for year 1998, with this particular model including detailed information on the structure of sectors relevant to this study, namely Cultivation of Arable, Vegetables, Fruit, Tobacco and Livestock production. The tasks fulfilled for the construction of the National SAM for 1998 and the related identities are described as follows:

The basis of the procedure are the statistical tables of the National Statistical Service of Greece (NSSG) on Accounts of Economic Agents (National Accounts ESA95, Detailed tables by sector). In more detail, these tables are:

1. Economic Accounts of Enterprises and Households (hhs)

2. Economic Accounts of the Rest of the World

3. Economic Accounts of Non-Profit Institutions

4. Eurostat National Accounts Principal Aggregates

5. Transactions Table

The relevant identities are specified as follows:

1. Construction of the GDP account (GDP in factor prices)

   GDP= Final Consumption (Households + Government) + Investment (Investment in Dwellings + Private Investment + Government Investment) + Stocks (Stocks of Households + Stocks of Firms + Stocks of Government) + Exports (Exports + Final Consumption of non-resident households) - Imports (Imports – Final Consumption of resident households in the Rest the World)

2. Total Intermediate Consumption

   This should be equal to total accounted in the National Input – Output Table, and more precisely: Total Intermediate Consumption (I-O) - Total VAT Intermediate Consumption.

3. Balance of Products (Total)

   Products Total (row) = Total Intermediate Consumption + Total Factors + Final Private Consumption (Households + Firms) + Final Consumption of Government + Exports (Exports + Final Consumption of non-resident households) + Investment (Dwellings + Private Investment + Government Investment) + Stocks (Stocks of Households + Stocks of Firms + Stocks of Government)

   Products Total (column) = Total Intermediate Consumption + Value Added (Wages + Capital) + Indirect Taxes (Vat on Intermediate Consumption + taxes linked to production) + Subsidies (Subsidies to Intermediate Consumption) + Social Security + Direct Taxes + Duties (Taxes linked to inputs excluding VAT) + Imports (Imports – Final Consumption of resident households in the rest the World)

   Products Total (row) = Products Total (column)

4. Attribution of Value Added to Factors

   Value Added Total = Wages and salaries + employer's social contribution + imputed social contribution + compensation of employees to the Rest of the World – compensation of employees from the Rest of the World + Value Added Capital

5. Balance of Labour

   Labour (row) = Value Added Labour + Value Added Foreign Labour (compensation of employees from the Rest of the World)

   Labour (column) = Factors Labour (Households + Firms) + Factors Labour Government + Factors Labour Foreign

   Verification on Households and Firms.

6. Balance of Capital

   Capital (row) = Value Added Capital

   Capital (column) = Private Factors Capital (Gross operating surplus of Households and Firms) + Government Factors Capital + Foreign Factors Capital

   Verification of the balance.

7. Balance of Households and Firms

   Households + Firms (row) = Factors Labour + Factors Capital + interest and other income from Government + social benefits from Government - social benefits to abroad + interest and other income from abroad

   Households + Firms (column) = Final Consumption (market consumption of private sector) + Government Direct Taxes (current taxes on income and wealth) + Government Indirect

Taxes (VAT) + actual social contributions + imputed social contributions from government + other transfers to abroad + Savings

From the balance Savings are computed.

8. <u>Balance of Government</u>

Government (row) = From products: (Indirect Taxes on intermediate consumption + Vat non deductible on intermediate consumption − Subsidies on intermediate consumption) + Current taxes on income and wealth paid by government + Subsidies paid by government (including investment) + Vat (on consumption and investment) + Other transfers from abroad

Government (column) = Government Consumption + Transfers to Households and Firms + current taxes on income and wealth paid by Government + other transfers to abroad + Savings

Then, the balance computes Savings.

9. <u>Verifications</u>

Total Expenditures = Total Receipts

From Products, Labour, Capital, Households and Firms, Government, Foreign.

10. <u>Capital Accounts</u>

Savings (Households and firms, plus government plus Rest of the World) = Investment (Households and firms, Government and Rest of the World) + Stocks + Vat and Other Taxes (on Investment)

11. <u>Lending / Borrowing</u>

Lending/Borrowing (Households + Firms + Government) = Lending / Borrowing (Rest of the World).

The product of the above-described process was a preliminary 17-sector Social Accounting Matrix for the Greek National Economy for year 1998. The matrix contained aggregated structural information for Agriculture and Forestry. Therefore, in order to generate detailed information on the structure of sectors relevant to this study (i.e. disaggregate Agriculture and Forestry into: Cultivation of Arable, Vegetables, Fruit, Tobacco, Livestock production, and Forestry), data were obtained and utilised from Psaltopoulos (2001), Zografakis (2003) and Bourdaras (2005). As a result, the final form of the constructed national SAM (see Appendix) consists of 22 sectors, two production factors (labour and capital), three institutions (households, firms and government), the rest of the world and a capital account.

b) <u>Regional SAM for Archanes, 1998</u>

The construction of the regional I/O table represents a very significant part of the regional SAM construction process, and therefore it is considered necessary to refer in detail to the regionalisation process adopted in this work.

In this study, a regional I/O table was first generated for Archanes, by using the hybrid Generation of Regional I-O Tables (GRIT) technique developed by Jensen et al. (1979). This method was chosen since the cost of using a full survey-based method to generate the regional table was prohibitive, while regional I-O tables constructed via non-survey techniques suffer from insufficient accuracy (Richardson, 1972). The GRIT technique generates an initial regional transactions matrix via the mechanical adjustment of the national direct requirements matrix by using employment-based Simple Location Quotients (SLQs) and Cross-Industry Location

Quotients (CILQs). Subsequently, the analyst can 'interfere' with the mechanically produced table through the insertion of 'superior' data from surveys or other sources, at various stages in the development of the table. Thus, GRIT incorporates the advantages of both the 'survey' and 'non-survey' I/O regionalisation approaches.

In this application, the balance of interference varied not only according to study resources but also due to the size of the study area and the specific needs of the analysis. The benchmark year was determined by the availability of both national I/O tables and data from other secondary sources. Therefore, it was decided that the regional I/O table to be constructed should correspond to year 1998.

After regionalising the available national I/O tables (first, to the prefectural and then to the study-area level) via the use of the mechanical GRIT procedure, information available from a sectoral business surveys in Archanes was utilised. The selection of target sectors for the business survey was primarily based on the importance of particular sectors within the structure of the local economy, and as recipients of CAP funds. The sample was selected so as to be representative of the geographical distribution of businesses within the local economy. Businesses were selected through stratified random sampling from business directories supplied by local authorities. Although sampling was largely random, some major businesses were purposely chosen due to their major economic impact on the study areas (which mostly consisted of small enterprises). Surveys were conducted face-to-face with business owners, using a structured questionnaire, while the sample accounted for 40% of local units.

The second main source of superior data was an extended survey of households in Archanes. Around 10% of local households (125) provided information on the sources of their income and their consumption patterns. Then, in order to develop the non-I/O components of the regional SAM, a wide range of regional and national data sources was used, in more detail:

- the 1998 Household Income and Expenditure Survey;

- the National Statistical Service of Greece regional accounts;

- the business surveys carried out in the two study areas; and

- interviews with local policy-makers and local government data.

As a result, the final form of the constructed regional SAM (see Appendix) consists of 13 sectors, three production factors (labour, capital and land), three institutions (households, firms and government), the rest of the world and a capital account.

4. Impact Analysis Methodology

4.1 Conceptual issues

In accordance to the SAM analytical framework (general-equilibrium comparative statics), impact analysis deals with the comparison of levels of study-area output, employment, etc., calculated by applying multiplier and coefficient values to the injections of expenditure (treated as additional final demand) associated with agricultural and rural policy. Implicitly, this compares two alternative equilibrium positions of the national/regional economy, i.e. mutually balanced levels of production, firm and household incomes, trade flows, etc. which are consistent without, and with, respectively, these expenditure patterns. No account is taken of the time pattern of adjustment to the additions to final demand; calculations here seek to isolate the effects of policy expenditures from those of these other influences.

In this particular exercise (see also Psaltopoulos, 2004) scenario-specific domestic policy changes will be fed into the model as injections to the final demand part. More analytically:

a) decreases in subsidies (due to modulation and other revisions to the market support parts of the CAP) constitute a negative injection on the agricultural subsidies cell (Government column);

b) any increase in Pillar II funds will be converted into projections of rural development action (programmes and measures) and constitute an increase in the relevant Capital Account column (for investment action) or agricultural subsidies cell (e.g. for agri-environment measures). In terms of the sectoral distribution of these changes of exogenous final demand, the 2000-06 area-specific pattern is observed in both study areas;

c) possible adjustments of produced volume and their effects (e.g. increase in the milk quota) can be modelled through the use of the mixed endogenous/exogenous version of the Leontief model, extended to a SAM framework;

d) in the case of a decline in prices, supply is linearly adjusted through the use of the relevant product-specific price elasticities (obtained from Mergos, 2003) and relevant effects are modelled through the use of the mixed endogenous/exogenous version of the Leontief model, extended to a SAM framework;

e) the impacts of possible substitution (e.g. from cotton to cereals) and/or abandonment (e.g. 30% of cotton production is abandoned) of agricultural activity in several sub-sectors attributed to decoupling, will be modelled through the use of the mixed endogenous/exogenous version of the Leontief model, extended to a SAM framework; and "Exogenous" estimates of these developments are obtained from Tsiboukas (2003).

f) Finally, impacts on land use are projected via the utilisation of the relevant input elasticities estimated in Sarris (2003).

4.2 Analytical procedures

The analytical procedures for the estimation of scenario-specific impacts are as follows:

a) Conventional Leontief Procedure

In a SAM framework, the conventional Leontief procedure can be used in order to estimate the economy-wide impacts of changes in exogenous demand. More analytically, the identification of the shocks whose effects will be investigated (e.g. changes in investment due to Pillar 2 measures, in consumer demand, in Pillar 1 subsidies) is followed by the specification of the model's exogenous accounts (in this case Government, the Rest of the World and Capital) and the 'utilisation' of the available SAM multipliers and coefficients, in order to produce economy-wide impacts in terms of output, labour income, firm income, household income and employment.

b) Economic Impacts of Fixed Supply

In parallel, in a SAM context, exogenous changes in sectoral gross output(s) – as a result of forces outside the model, such as a decline in prices (which causes an adjustment in supply), an abandonment or shift in cultivation due to decoupling, an increase of production quotas and targets, natural disasters, etc. – can have a profound impact on the accounts of the other components of the economy under study, through the relevant interdependence relationships portrayed by this general equilibrium data system. Along these lines, this part of Section 4 describes the methodological procedure that can be applied for the estimation of the economic impacts of possible new output levels (induced by agricultural and rural policy developments) in the agricultural sub-sectors of the two models.

This method is based on the 'mixed exogenous/endogenous variable version of the I-O model' devised by by Miller & Blair (1985) for I-O analysis, extended to a SAM context by Roberts (1992) who estimated the (UK) economy-wide effects of milk quotas, which are an upper limit on the level of gross output of a particular sector, and also extended by Psaltopoulos & Thomson (1998) for estimating the capacity-adjustment effects of structural policy implementation in remote rural areas of the EU. To operate the estimation procedure, the following steps should be taken, with respect to a 'mixed exogenous/endogenous variable version of the SAM Leontief model', as below:

$$
\begin{bmatrix} A & K & F \\ H & B & C \\ J & D & E \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}
$$

where the usual division of matrix and vectors into two components, i.e. industry sectors and institutional (final demand) sectors, and thus the matrix into four quadrants, has been amplified by having two institutional sectors, one to be endogenous and the other exogenous, and thus three components in the vectors and nine in the matrix. In the above equation, which represents the three sets of accounts in each of which total income must equal total expenditure for each industry or sector, x is a vector of industry sector activity levels, y is a vector of endogenous institutional sector levels (incomes/expenditures of factors, households and firms), z is a vector of exogenous institutional sector levels (government budget, external trade, capital savings and investment), A is the technology matrix, K and F are matrices of expenditure shares, H and J are institutional share payments, and B, C, D and E are inter-institutional payments. Following Roberts (1992), but taking account of the fact that the above framework has several endogenous and several exogenous institutions rather than her single endogenous institution (households), we construct the following matrix:

$$
N = \begin{bmatrix} I_n - A_n & -K_n \\ -H_n & -B_n \end{bmatrix}
$$

where A_n is the A matrix without row f and column f, I_n is the identity matrix of the same dimension, and K_n, H_n and B_n are defined similarly to A_n.

Then the activity levels of industries and institutions given one exogenously fixed output level x_f are given by:

$$
\begin{bmatrix} x_n \\ y \end{bmatrix} = \begin{bmatrix} \alpha_{nn} & \alpha_{nf} \\ \alpha_{fn} & \alpha_{ff} \end{bmatrix} \begin{bmatrix} a_{nf} \\ h_{ff} \end{bmatrix} x_f
$$

where x_n is x without the sector f, y are the endogenous institutional sector levels as above, the a_{nf} are the elements of the A matrix in column f but not in row f, h_{ff} are the payments to endogenous institutions by industry f, and the α's are the elements of the inverse of the matrix N.

In this way, new activity levels lead us to the execution of comparative analysis and the estimation of the relevant economic effects (of changes in supply) on output, labour income,

capital income, land rent (for the regional model), firm income, household income and employment.

c) Impact on Pollution Emissions

In order to estimate the scenario-specific level of pollution emissions, drawing from the methodology suggested by Leontief & Ford (1972), we utilised the national pollution matrix produced by the National Statistical Service of Greece for year 2000 (Mylonas, 2000).

This particular matrix was transformed by Loizou (2001) in order to reflect the disaggregation of agriculture into several sub-sectors. As a next step, a matrix of total pollution coefficients was estimated for both the national (Greece) and regional (Archanes) economies, after carrying out the relevant sectoral classification adjustments. Elements in this matrix reflect total (i.e. direct and indirect) pollution of pollutant k, which occurs from increased economic activity in sector j caused (in turn) by a unitary increase of final demand for this particular sector. Emissions estimated concerned nine pollutants (CO_2, CH_4, N_2O, NOx, CO, $NMVOC$, SO_2, BOD_5 and Nitrates).

5. Scenario Analysis

5.1 Specification of scenarios

The alternative scenarios considered in this report have been specified by Dwyer et al. (2005). Based on this specification, the relevant decisions on the CAP reform (Council of the EU, 2003; European Commission, 2004b) and the recent Commission proposals on Pillar 2 (European Commission, 2004c), the Greek research team carried out the national/regional specification of the scenario elements. The outcome of this procedure is the development of the following scenarios:

a) Greece

SCENARIO 1bis

A. Subsidies

Durum Wheat: - 12.4 ml. Euro
Rice: -6,8% of the reference period levels
Other cereals: + 9 ml. Euro
Dairy: + 29 ml Euro
Tobacco (post-2010): -50% of the reference period levels
Cotton: -12 ml. Euro
The above elements are drawn from Bourdaras (2004; 2005).

B. Prices

Rice: -15% (assumption due to market liberalisation) *1.241 (supply elasticity) = -18.6% in gross output.
Dairy: -10% in gross output.

Elasticities and estimates for milk production adjustments are drawn from Mergos (2003).

C. Modulation

According to Ministry of Agriculture records, 10% of agricultural holdings - 48% of subsidies are related to those over the €5,000 threshold. Consequently, there is a -2.4% decrease in subsidies for the products covered by the reform.

 D. Decoupling

Based on the study by Tsiboukas (2003), the following developments are specified:

Cotton: 30% of production is abandoned – 30% is converted to cereals.
Tobacco: 40% of production is abandoned – 11% is converted to sugar-beets.
Cereals: 14% per cent of production is abandoned.
Olive Oil: 10% of production is abandoned.
Sheep and Goats: 15% of production is abandoned.
Bovines: 5% of production is abandoned.

E. Pillar 2

Annual average expenditure for the 2000-06 period (includes all EAGGF funding for this purpose) + €88.6 million Community Contribution, related to modulation and sectoral transfers (European Commission, 2004c; private discussions with Commission officials).

b) Archanes

SCENARIO 1 (similar to 1bis)

A. Modulation

Taking account that 30% of farms – 55% of subsidies relate to those over the €5,000 threshold in olive-oil: -2.8 % of subsidies for this particular product.

B. Decoupling

According to the local authorities, 40% of olive-oil production relates to absentees. Local estimates forecast abandonment of 50% of this. As a result, 20% of olive-oil production is abandoned.

C. Pillar 2

Average annual expenditure for 2000-06 + 25% increase due to the impressive local record in utilising structural and rural development policy funds.

SCENARIO 2

A + B + C (see above) +

D. Prices

Olive Oil: -10% (assumption due to market liberalisation) *0.256 (supply elasticity) = -2.56% in gross output.
Raisins: -10% (assumption due to market liberalisation) *0.146 (supply elasticity) = -1.46% in gross output.
Grapes for Wine: -10% (assumption due to market liberalisation) *0.42 (supply elasticity) = -4.2% in gross output.
Table Grapes: -10% (assumption due to market liberalisation) *0.317 (supply elasticity) = -3.17% in gross output.

SCENARIO 2B

A + B + C + D +

E. Subsidies

Olive Oil: - 20% of the reference period levels.

SCENARIO 3

A + B + C + D + E +

F. Pillar 2

A further increase of expenditure, which is equivalent to the decline in olive-oil subsidies (see E of scenario 2B.

5.2 Results of the scenario effects

Tables A1-A8 and B1-B18 present in significant detail the estimated effects of scenario 1bis for Greece and for all scenarios for Archanes, respectively. The tables include results on several variables, some of which may not be related to multifunctionality. However, comments presented in this section will refer to estimated changes of indicators linked to the multifunctionality concept (see Table 1).

In the case of Greece, it seems that if scenario 1bis is realised, effects in the national economy will be marginally positive, with the exception of agricultural employment, where a decline of 10.11% is forecasted (Table A1).

In more detail, agricultural output is expected to decline (Table A7) mainly in the case of tobacco (-38.99%), but also in livestock (-5.49%) and fruit (-3.22%). Output in the vegetables sector is forecasted to increase by 1.15%, while the output of arable crops remains more or less constant. Farm employment is projected to decline by a significant 10.11%, mainly due to developments in the tobacco sector. In terms of land-use, a 10.3% reduction of tobacco land is projected, while the livestock figure is expected to decline by 1.73%. At the economy-wide level, output effects seem to be positive (+0.66%) due to the increase of Pillar 2 spending and the declining importance of agriculture in the Greek economy, while (for the same reasons) a moderate increase in total employment is projected (+0.10%). Finally, pollution emissions are expected to increase by 1.97%, a figure attributed to a projected 5.45% increase due to Pillar 2 policies and a decline of 3.48% attributed to the contraction of farm activity.

Examining the elements of scenario 1bis, it should be noted that agricultural output (-5.3%) and employment (-10.84%), and total employment (-2.38%) mostly 'suffer' from decoupling, which also contributes to a 2.6% reduction of pollution. Effects of the remaining elements of the scenario (decline in subsidies and prices; modulation) seem to be rather marginal, while developments in Pillar 2 generate positive impacts even in the cases of farm output (+1.64%) and farm employment (+1.45%), but more important, in the case of total employment (+3.05%).

Finally, pollution-emission forecasts indicate a possible increase of emissions in total, but there are projections (Table A8) of reductions in the cases of BOD_5 (-7.56%), N_2O (-7.54%), CH_4 (-4%) and Nitrates (-2.30%). On the other hand, these positive projections are rather 'eliminated' by a projected 2.08% increase in CO_2 emissions, as the particular pollutant is by far the most important in Greece.

In the case of the agriculturally-dependent local economy of Archanes, projections are rather negative (Tables B1-B18). Not surprisingly, scenario 2b (reduction of income support aids) generates the most negative results, followed by those of scenarios 2 (full decoupling and elimination of export subsidies) and 3. The fact that the status quo-specific scenario 1 seems to be associated with (comparatively) less-pessimistic prospects comes is possibly a welcomed consolation.

As in the case of national projections, negative impact projections are quite significant in the case of farm output and employment, being around the -11% mark for scenarios 2, 2b and 3. Furthermore, economy-wide job losses seem significant for these three scenarios (ranging from -3.8% to -6.6%), as are reductions in agricultural land use (around -8%). Finally, projections on the reduction of pollution are also quite significant for these three scenarios, ranging from -2.14% for scenario 3 to more than -5% for scenarios 2 and 2b, respectively.

Table 1. Scenario-specific impacts, Greece – Archanes (% annual average changes from 1998 levels, 1998 prices)

Scenarios	Farm Output	Farm Employment	Total Output	Total Employment	Agricultural Land Use	Pollution Emissions
Greece – S1bis	-5.01	-10.11	0.66	0.10	-3.1	1.97
Archanes S1	-5.90	-5.20	0.03	-1.88	-5.2	-0.35
Archanes S2	-11.3	-11.40	-1.74	-6.27	-8.0	-5.29
Archanes S2b	-11.5	-11.60	-1.91	-6.58	-8.2	-5.55
Archanes S3	-10.3	-20.30	-0.03	-3.83	-7.4	-2.14

Source: Authors' calculations.

In more detail in the case of the status-quo scenario 1, agricultural output is expected to decline (Table B8) by 5.9%, mainly due to the decline of olive-oil production (-18.6%). For the same reason, farm employment is projected to decline by 5.22%. In terms of land use, a 5.44% reduction of land dedicated to olive trees is projected, while land dedicated to vineyards could increase by 0.5%. At the local economy-wide level, output effects seem to be marginally positive (+0.03%) due to the increase of Pillar 2 spending, while (for the same reason) a rather moderate decline in total employment is projected (-1.88%). Finally, pollution emissions are expected to decrease by 0.35%, a figure attributed to a projected 3.55% increase due to Pillar 2 policies and a decline of 3.90% attributed to the contraction of farm activity.

Examining the elements of scenario 1, it should be noted that agricultural output (-6.6%) and employment (-6.55%), and total employment (-4.74%) decrease due to decoupling, which also contributes to a 3.86% reduction of pollution. Effects of modulation seem to be marginal, while developments in Pillar 2 generate positive impacts even in the cases of farm employment (+1.33%), but more important, in the case of total employment (+2.91%).

Finally, pollution-emission forecasts show a decline of emissions in total (Table B15), but this projection is almost solely attributed to a projected reduction of Nitrates (-6.05%).

Results associated with scenario 2 (elimination of export subsidies) are further negative, due to the impacts of the projected decline in prices. Agricultural output is expected to decline (Table B10) by a significant 11.3%, as olive-oil production declines by 21.17% and vine production by 8.33%. For the same reasons, farm employment is projected to decline by a significant 11.4%. In terms of land use, a 6.18% reduction of land dedicated to olive trees is projected, while land dedicated to vineyards could decline by 1.86%. At the economy-wide level, output effects seem to be negative (-1.74%), due to negative effects of both modulation and the expected decline in prices, while (for the same reasons) projections are also negative for total employment (-6.27%). Finally, pollution emissions are expected to decrease by an important 5.29%, as the expected decrease in prices could contribute to a decline of 4.93%.

Examining the elements of scenario 2, it should be noted that the contribution of decoupling and the expected decline in prices in the forecasted negative trends seems to be rather balanced. However, it seems that decoupling affects negatively (mostly) the olive-oil sub-sector, while a possible decline in prices seems to mostly hit vine-growers (Tables B6 and B9). Effects of modulation and Pillar 2 are similar to those of scenario 1.

Finally, pollution-emission forecasts show a decline in almost all categories of emissions (Table B16) and especially Nitrates (-14.4%), CH_4 (-12.91%), N_2O (-12.46%) and even CO_2 (-4.51%).

Results associated with scenario 2b (further reduction in support) are more pessimistic than those related to scenario 2, due to the marginally negative impacts of a further decline in

support. However, in terms of 'structural characteristics', relevant projections are almost similar to those related to the previous scenario, as the negative contribution of a further cut in subsidies is rather marginal in all categories of estimates.

Finally, the increase in Pillar 2 funds, associated with scenario 3, improves the projections, especially in the case of economy-wide output and employment (Table B4). On the other hand, projections on agricultural output, agricultural employment and land abandonment differ only marginally from those of scenarios 2 and 2b, while the decline of pollution emissions is forecasted to decrease by half (compared to the levels of scenarios 2 and 2b), as Pillar 2 action seems to be associated with an increase of (all types) of emissions (Table B18).

6.   Overall Conclusion

Overall, the results of this analysis suggest that under the scenarios examined, the effects of policy reform upon multifunctionality indicators are rather mixed and surely not extremely worrying. Effects of the status quo scenarios seem to be optimistic in terms of projected economy-wide output and employment at both the national and regional level. On the other hand, scenario 1(bis) generates negative results in terms of farm output and employment (especially for the agriculturally-dependent Archanes economy), land-use abandonment projections are marginal at the national and rather moderate at the regional level, while environmental repercussions are negative at the national level. The regional analysis has also shown that (at least in this case study), the impacts of scenarios 2, 2b and (even) 3 are rather worrying in terms of all categories of projections, with the exception, however, of the important 'Total Output' one. Taking account of the specification of scenario 3, this finding generates rather justified reservations on the 'ability' of Pillar 2 policies to ameliorate economic activity contraction caused by a decrease in Pillar 1 support in such an agriculturally-dependent local economy.

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APPENDIX A

Table A1. Impacts of Scenario 1bis, Greece (annual average changes from 1998 levels, 1998 prices)

Scenario Elements	Output Effects ($ mil)	% Change	Labour Income Effects ($ mil)	% Change	Capital Income Effects ($ mil)	% Change	Firm Income Effects ($ mil)	% Change
A. Decline of Subsidies	-46,972.54	-0.07	-7,329.99	-0.06	-64,367.51	-0.32	-61,571.41	-0.32
B. Decline in Prices	-65,549.41	-0.10	-5,914.43	-0.05	-33,200.80	-0.16	-31,758.57	-0.16
C. Modulation	-15,730.18	-0.02	-2,454.67	-0.02	-21,555.42	-0.11	-20,619.06	-0.11
D. Decoupling	-325,627.10	-0.52	-46,553.68	-0.39	-104,178.69	-0.52	-99,653.20	-0.51
E. Pillar 2	868,512.04	1.38	139,340.20	1.16	397,586.45	1.97	380,315.39	1.96
Total	414,632.81	0.66	77,087.42	0.64	174,284.02	0.87	166,713.17	0.86

Scenario Elements	Household Income Effects ($ mil)	% Change	Agricultural Employment Effects (no. of jobs)	% Change	Employment Effects (no. of jobs)	% Change	Pollution Effects (tonnes)	% Change
A. Decline of Subsidies	-46,020.65	-0.14	-551	-0.08	-10624	-0.17	-248,708.99	-0.30
B. Decline in Prices	-25,888.48	-0.08	-4229	-0.61	-20401	-0.34	-409,075.75	-0.49
C. Modulation	-15,411.42	-0.05	-184	-0.03	-3588	-0.06	-83,287.77	-0.10
D. Decoupling	-109,457.08	-0.34	-74640	-10.84	-144759	-2.38	-2,179,302.14	-2.60
E. Pillar 2	379,071.78	1.17	9988	1.45	185588	3.05	4,570,732.83	5.45
Total	182,314.15	0.56	-69616	-10.11	6246	0.10	1,650,335.18	1.97

Table A2. Impacts of Scenario 1bis – Decline of Subsidies, Greece (annual average changes from 1998 levels, 1998 prices)

Sectors	1998 ($ mil)	Change	New levels	% Change
1. Arable sector	743,387.24	-671.98	742,715.26	-0.09
2. Vegetable growing	384,459.66	-405.80	384,053.87	-0.11
3. Fruit growing	680,490.60	-696.19	679,794.41	-0.10
4. Livestock	828,625.62	-850.59	827,775.03	-0.10
5. Tobacco	202,507.60	-72.14	202,435.46	-0.04
6. Forestry	46,344.00	-50.29	46,293.71	-0.11
7. Fisheries	217,958.00	-210.93	217,747.07	-0.10
8. Mining – Energy	2,726,096.00	-2,336.12	2,723,759.88	-0.09
9. Food and Drinks	4,229,295.06	-4,383.28	4,224,911.78	-0.10
10. Tobacco Processing	162,656.86	-75.61	162,581.25	-0.05
11. Secondary Sector - Consumption Goods	4,565,998.00	-4,425.69	4,561,572.31	-0.10
12. Secondary Sector – Intermediate Goods	5,064,576.00	-2,790.28	5,061,785.72	-0.06
13. Machinery	4,055,889.00	-1,318.50	4,054,570.50	-0.03
14. Construction	5,282,391.00	-712.68	5,281,678.32	-0.01
15. Transport & Telecom.	3,486,562.00	-2,941.38	3,483,620.62	-0.08
16. Trade	7,330,872.29	-7,493.96	7,323,378.34	-0.10
17. Domestic Services	5,124,587.00	-6,481.35	5,118,105.65	-0.13
18. Health	2,337,566.00	-1,980.83	2,335,585.17	-0.08
19. Education	1,920,726.00	-828.52	1,919,897.48	-0.04
20. Recreation & Tourism	4,668,607.04	-3,983.91	4,664,623.13	-0.09
21. Other Services	4,079,822.00	-2,851.75	4,076,970.25	-0.07
22. Public Administration	4,785,519.00	-1,410.77	4,784,108.23	-0.03
Total	**62,924,935.97**	**-46,972.54**	**62,877,963.44**	**-0.07**
Labour Income	11,981,702.04	-7,329.99	11,974,372.05	-0.06
Capital Income	20,147,956.39	-64,367.51	20,083,588.87	-0.32
Households Income	32,361,715.51	-46,020.65	32,315,694.86	-0.14
Firms Income	19,411,949.39	-61,571.41	19,350,377.98	-0.32
Employment (jobs)	6075124	-10624	6064500	-0.17
Pollution (tonnes)	83,152,428.00	-248,708.99	82,903,719.01	-0.30

Table A3. Impacts of Scenario 1bis – Decline in Prices, Greece (annual average changes from 1998 levels, 1998 prices)

Sectors	1998 ($ mil)	Change	New levels	% Change
1. Arable sector	743,387.24	-3,488.59	739,898.65	-0.47
2. Vegetable growing	384,459.66	-268.50	384,191.16	-0.07
3. Fruit growing	680,490.60	-638.05	679,852.55	-0.09
4. Livestock	828,625.62	-30,183.00	798,442.63	-3.64
5. Tobacco	202,507.60	-46.86	202,460.73	-0.02
6. Forestry	46,344.00	-29.30	46,314.70	-0.06
7. Fisheries	217,958.00	-120.42	217,837.58	-0.06
8. Mining – Energy	2,726,096.00	-1,879.86	2,724,216.14	-0.07
9. Food and Drinks	4,229,295.06	-5,120.95	4,224,174.11	-0.12
10. Tobacco Processing	162,656.86	-42.54	162,614.33	-0.03
11. Secondary Sector - Consumption Goods	4,565,998.00	-2,607.34	4,563,390.66	-0.06
12. Secondary Sector – Intermediate Goods	5,064,576.00	-2,697.00	5,061,879.00	-0.05
13. Machinery	4,055,889.00	-894.10	4,054,994.90	-0.02
14. Construction	5,282,391.00	-432.52	5,281,958.48	-0.01
15. Transport & Telecom.	3,486,562.00	-1,824.44	3,484,737.56	-0.05
16. Trade	7,330,872.29	-4,914.56	7,325,957.74	-0.07
17. Domestic Services	5,124,587.00	-3,725.52	5,120,861.48	-0.07
18. Health	2,337,566.00	-1,134.52	2,336,431.48	-0.05
19. Education	1,920,726.00	-468.49	1,920,257.51	-0.02
20. Recreation & Tourism	4,668,607.04	-2,246.22	4,666,360.82	-0.05
21. Other Services	4,079,822.00	-1,974.75	4,077,847.25	-0.05
22. Public Administration	4,785,519.00	-811.90	4,784,707.10	-0.02
Total	**62,924,935.97**	**-65,549.41**	**62,859,396.56**	**-0.10**
Labour Income	11,981,702.04	-5,914.43	11,975,787.61	-0.05
Capital Income	20,147,956.39	-33,200.80	20,114,755.59	-0.16
Households Income	32,361,715.51	-25,888.48	32,335,827.03	-0.08
Firms Income	19,411,949.39	-31,758.57	19,380,190.82	-0.16
Employment (jobs)	6075124	-20401	6054723	-0.34
Pollution (tonnes)	83,152,428.00	-409,078.75	82,743,349.25	-0.49

Table A4. Impacts of Scenario 1bis – Modulation, Greece (annual average changes from 1998 levels, 1998 prices)

Sectors	1998 ($ mil)	Change	New levels	% Change
1. Arable sector	743,387.24	-225.03	743,162.20	-0.03
2. Vegetable growing	384,459.66	-135.89	384,323.77	-0.04
3. Fruit growing	680,490.60	-233.14	680,257.46	-0.03
4. Livestock	828,625.62	-284.85	828,340.78	-0.03
5. Tobacco	202,507.60	-24.16	202,483.44	-0.01
6. Forestry	46,344.00	-16.84	46,327.16	-0.04
7. Fisheries	217,958.00	-70.64	217,887.36	-0.03
8. Mining – Energy	2,726,096.00	-782.32	2,725,313.68	-0.03
9. Food and Drinks	4,229,295.06	-1,467.87	4,227,827.19	-0.03
10. Tobacco Processing	162,656.86	-25.32	162,631.54	-0.02
11. Secondary Sector - Consumption Goods	4,565,998.00	-1,482.08	4,564,515.92	-0.03
12. Secondary Sector – Intermediate Goods	5,064,576.00	-934.41	5,063,641.59	-0.02
13. Machinery	4,055,889.00	-441.54	4,055,447.46	-0.01
14. Construction	5,282,391.00	-238.66	5,282,152.34	0.00
15. Transport & Telecom.	3,486,562.00	-985.01	3,485,576.99	-0.03
16. Trade	7,330,872.29	-2,509.58	7,328,362.71	-0.03
17. Domestic Services	5,124,587.00	-2,170.48	5,122,416.52	-0.04
18. Health	2,337,566.00	-663.34	2,336,902.66	-0.03
19. Education	1,920,726.00	-277.46	1,920,448.54	-0.01
20. Recreation & Tourism	4,668,607.04	-1,334.13	4,667,272.90	-0.03
21. Other Services	4,079,822.00	-954.99	4,078,867.01	-0.02
22. Public Administration	4,785,519.00	-472.44	4,785,046.56	-0.01
Total	**62,924,935.97**	**-15,730.18**	**62,909,205.79**	**-0.02**
Labour Income	11,981,702.04	-2,454.67	11,979,247.37	-0.02
Capital Income	20,147,956.39	-21,555.42	20,126,400.97	-0.11
Households Income	32,361,715.51	-15,411.42	32,346,304.09	-0.05
Firms Income	19,411,949.39	-20,619.06	19,391,330.33	-0.11
Employment (jobs)	6,075,124	-3,558	6,071,566	-0.06
Pollution (tonnes)	83,152,428.00	-83,287.77	83,069,140.23	-0.10

Table A5. Impacts of Scenario 1bis – Decoupling, Greece (annual average changes from 1998 levels, 1998 prices)

Sectors	1998 ($ mil)	Change	New levels	% Change
1. Arable sector	743,387.24	-8,353.76	735,033.47	-1.12
2. Vegetable growing	384,459.66	-1,282.66	383,177.01	-0.33
3. Fruit growing	680,490.60	-31,427.04	649,063.56	-4.62
4. Livestock	828,625.62	-28,537.15	800,088.47	-3.44
5. Tobacco	202,507.60	-81,003.04	121,504.56	-40.00
6. Forestry	46,344.00	-130.38	46,213.62	-0.28
7. Fisheries	217,958.00	-515.87	217,442.13	-0.24
8. Mining – Energy	2,726,096.00	-19,435.49	2,706,660.51	-0.71
9. Food and Drinks	4,229,295.06	-31,082.42	4,198,212.65	-0.73
10. Tobacco Processing	162,656.86	-179.86	162,477.00	-0.11
11. Secondary Sector - Consumption Goods	4,565,998.00	-11,673.80	4,554,324.20	-0.26
12. Secondary Sector – Intermediate Goods	5,064,576.00	-19,962.85	5,044,613.15	-0.39
13. Machinery	4,055,889.00	-4,585.28	4,051,303.72	-0.11
14. Construction	5,282,391.00	-3,381.94	5,279,009.06	-0.06
15. Transport & Telecom.	3,486,562.00	-8,861.04	3,477,700.96	-0.25
16. Trade	7,330,872.29	-25,572.78	7,305,299.51	-0.35
17. Domestic Services	5,124,587.00	-16,370.94	5,108,216.06	-0.32
18. Health	2,337,566.00	-5,111.63	2,332,454.37	-0.22
19. Education	1,920,726.00	-2,005.07	1,918,720.93	-0.10
20. Recreation & Tourism	4,668,607.04	-9,545.40	4,659,061.63	-0.20
21. Other Services	4,079,822.00	-13,005.45	4,066,816.55	-0.32
22. Public Administration	4,785,519.00	-3,603.24	4,781,915.76	-0.08
Total	**62,924,935.97**	**-325,627.10**	**62,599,308.87**	**-0.52**
Labour Income	11,981,702.04	-46,553.68	11,935,148.36	-0.39
Capital Income	20,147,956.39	-104,178.69	20,043,777.69	-0.52
Households Income	32,361,715.51	-109,457.08	32,252,258.43	-0.34
Firms Income	19,411,949.39	-99,653.20	19,312,296.19	-0.51
Employment (jobs)	6,075,124	-144,759	5,930,365	-2.38
Pollution (tonnes)	83,152,428.00	-2,179,302.14	80,973,125.86	-2.60

Table A6. Impacts of Scenario 1bis – Pillar 2, Greece (annual average changes from 1998 levels, 1998 prices)

Sectors	1998 ($ mil)	Change	New levels	% Change
1. Arable sector	743,387.24	12,369.39	755,756.63	1.66
2. Vegetable growing	384,459.66	6,509.50	390,969.17	1.69
3. Fruit growing	680,490.60	11,067.94	691,558.53	1.63
4. Livestock	828,625.62	14,394.45	843,020.07	1.74
5. Tobacco	202,507.60	2,189.07	204,696.66	1.08
6. Forestry	46,344.00	21,052.98	67,396.98	45.43
7. Fisheries	217,958.00	1,747.52	219,705.52	0.80
8. Mining – Energy	2,726,096.00	31,282.91	2,757,378.90	1.15
9. Food and Drinks	4,229,295.06	38,280.82	4,267,575.89	0.91
10. Tobacco Processing	162,656.86	622.92	163,279.78	0.38
11. Secondary Sector - Consumption Goods	4,565,998.00	50,909.30	4,616,907.30	1.11
12. Secondary Sector – Intermediate Goods	5,064,576.00	101,269.26	5,165,845.26	2.00
13. Machinery	4,055,889.00	25,336.21	4,081,225.21	0.62
14. Construction	5,282,391.00	260,700.40	5,543,091.40	4.94
15. Transport & Telecom.	3,486,562.00	29,483.12	3,516,045.12	0.85
16. Trade	7,330,872.29	84,412.81	7,415,285.10	1.15
17. Domestic Services	5,124,587.00	57,349.80	5,181,936.80	1.12
18. Health	2,337,566.00	16,441.36	2,354,007.36	0.70
19. Education	1,920,726.00	11,282.92	1,932,008.92	0.59
20. Recreation & Tourism	4,668,607.04	33,310.98	4,701,918.02	0.71
21. Other Services	4,079,822.00	41,610.48	4,121,432.48	1.02
22. Public Administration	4,785,519.00	16,887.91	4,802,406.91	0.35
Total	**62,924,935.97**	**868,512.04**	**63,793,448.01**	**1.38**
Labour Income	11,981,702.04	139,340.20	12,121,042.24	1.16
Capital Income	20,147,956.39	397,586.45	20,545,542.83	1.97
Households Income	32,361,715.51	379,091.78	32,740,807.29	1.17
Firms Income	19,411,949.39	380,315.39	19,792,264.78	1.96
Employment (jobs)	6,075,124	185,588	6,260,712	3.05
Pollution (tonnes)	83,152,428.00	4,570,732.83	87,723,160.83	5.45

Table A7. Impacts of Scenario 1bis – Total, Greece (annual average changes from 1998 levels, 1998 prices)

Sectors	1998 ($ mil)	Change	New levels	% Change
1. Arable sector	743,387.24	-369.97	743,017.261	-0.05
2. Vegetable growing	384,459.66	4,416.65	388,876.32	1.15
3. Fruit growing	680,490.60	-21,926.48	658,564.12	-3.22
4. Livestock	828,625.62	-45,461.14	783,164.49	-5.49
5. Tobacco	202,507.60	-78,957.13	123,550.47	-38.99
6. Forestry	46,344.00	20,826.17	67,170.17	44.94
7. Fisheries	217,958.00	829.66	218,787.66	0.38
8. Mining – Energy	2,726,096.00	6,849.11	2,732,945.11	0.25
9. Food and Drinks	4,229,295.06	-3,773.70	4,225,521.36	-0.09
10. Tobacco Processing	162,656.86	299.59	162,956.45	0.18
11. Secondary Sector - Consumption Goods	4,565,998.00	30,720.40	4,596,718.40	0.67
12. Secondary Sector – Intermediate Goods	5,064,576.00	74,884.73	5,139,460.73	1.48
13. Machinery	4,055,889.00	18,096.80	4,073,985.80	0.45
14. Construction	5,282,391.00	255,934.60	5,538,325.60	4.85
15. Transport & Telecom.	3,486,562.00	14,871.24	3,501,433.24	0.43
16. Trade	7,330,872.29	43,921.94	7,374,794.23	0.60
17. Domestic Services	5,124,587.00	28,601.52	5,153,188.52	0.56
18. Health	2,337,566.00	7,551.04	2,345,117.04	0.32
19. Education	1,920,726.00	7,703.38	1,928,429.38	0.40
20. Recreation & Tourism	4,668,607.04	16,201.32	4,684,808.36	0.35
21. Other Services	4,079,822.00	22,823.53	4,102,645.53	0.56
22. Public Administration	4,785,519.00	10,589.56	4,796,108.56	0.22
Total	**62,924,935.97**	**414,632.81**	**63,339,568.79**	**0.66**
Labour Income	11,981,702.04	77,087.42	12,058,789.46	0.64
Capital Income	20,147,956.39	174,284.02	20,322,240.41	0.87
Households Income	32,361,715.51	182,314.15	32,544,029.66	0.56
Firms Income	19,411,949.39	166,713.17	19,578,662.55	0.86
Employment (jobs)	6,075,124	6,246	6,081,370	0.10
Pollution (tonnes)	83,152,428.00	1,650,355.18	84,802,783.18	1.97

Table A8. Impacts of Scenario 1bis on Pollution, Greece (annual average changes from 1998 levels)

Scenario 1bis, Greece

Scenario Elements	Changes in Pollution (tonnes)	% Change
A. Decline of Subsidies	-248,708.99	-0.30
B. Decline in Prices	-409,078.75	-0.49
C. Modulation	-83,287.77	-0.10
D. Decoupling	-2,179,302.14	-2.60
E. Pillar 2	4,570,732.83	5.45
Total	**1,650,335.18**	**1.97**

	A. Decline of Subsidies		B. Decline in Prices		C. Modulation	
Pollutants	Changes in Pollution (tonnes)	% Change	Changes in Pollution (tonnes)	% Change	Changes in Pollution (tonnes)	% Change
CO_2	-236,446.51	-0.29	-355,882.88	-0.44	-79,181.31	-0.10
CH_4	-1,797.02	-0.53	-8,085.06	-2.39	-601.79	-0.18
N_2O	-449.01	-1.59	-2,044.42	-7.25	-150.36	-0.53
Nox	-1,044.30	-0.35	-2,189.39	-0.73	-349.71	-0.12
CO	-3,185.97	-0.36	-8,198.68	-0.93	-1,066.92	-0.12
NMVOC	-995.43	-0.38	-2,336.94	-0.90	-333.35	-0.13
SO_2	-1,558.29	-0.30	-1,914.21	-0.36	-521.84	-0.10
BOD_5	-1,373.53	-0.45	-19,370.68	-6.39	-459.97	-0.15
Nitrates	-1,858.93	-0.47	-9,056.48	-2.30	-622.52	-0.16
Total	**-248,708.99**	**-0.30**	**-409,078.75**	**-0.49**	**-83,287.77**	**-0.10**

	D. Decoupling		E. Pillar 2	
Pollutants	Changes in Pollution (tonnes)	% Change	Changes in Pollution (tonnes)	% Change
CO_2	-2,011,687.80	-2.49	4,363,267.79	5.40
CH_4	-31,225.20	-9.23	2,8191.19	8.33
N_2O	-6,613.45	-23.45	7,131.37	25.29
Nox	-11,949.12	-3.97	18,524.17	6.15
CO	-42,624.49	-4.85	57,721.49	6.57
NMVOC	-13,289.02	-5.09	17,718.48	6.79
SO_2	-11,823.07	-2.25	27,319.58	5.20
BOD_5	-23,131.29	-7.63	21,409.62	7.06
Nitrates	-26,958.71	-6.84	29,449.15	7.47
Total	**-2,179,302.14**	**-2.60**	**4,570,732.83**	**5.45**

Total Scenario 1bis, Greece

Pollutants	Changes in Pollution (tonnes)	% Change
CO_2	1,680,069.28	2.08
CH_4	-13,517.87	-4.00
N_2O	-2,125.88	-7.54
NOx	2,991.64	0.99
CO	2,645.42	0.30
NMVOC	763.74	0.29
SO_2	11,502.17	2.19
BOD_5	-22,925.86	-7.56
Nitrates	-9,047.48	-2.30
Total	1,650,355.18	1.97

APPENDIX B

Table B1. Impacts of Scenario 1, Archanes (annual average changes from 1998 levels, 1998 prices)

Scenario Elements	Output Effects ($ mil)	% Change	Labour Income Effects ($ mil)	% Change	Capital Income Effects ($ mil)	% Change	Land Rent Effects ($ mil)	% Change	Firm Income Effects ($ mil)	% Change
A.Modulation	-5.50	-0.03	-0.74	-0.02	-11.82	-0.17	-0.50	-0.03	-11.88	-0.14
B.Decoupling	-450.62	-1.91	-36.19	-0.86	-110.47	-1.62	-106.89	-5.60	-209.50	-2.43
C. Pillar 2	463.80	1.96	65.03	1.55	587.06	8.61	31.68	1.66	596.35	6.91
Total	7.68	0.03	28.10	0.67	464.74	6.81	-75.71	-3.96	374.97	4.34

Scenario Elements	Household Income Effects ($ mil)	% Change	Agricultural Employment Effects (no. of jobs)	% Change	Employment Effects (no. of jobs)	% Change	Pollution Effects (tonnes)	% Change
A.Modulation	-9.03	-0.07	0	0	-1	-0.05	-3.32	-0.04
B.Decoupling	-181.00	-1.32	-56	-6.55	-93	-4.74	-335.98	-3.86
C. Pillar 2	479.51	3.49	11	1.33	57	2.91	308.79	3.55
Total	289.49	2.11	-45	-5.22	-37	-1.88	-30.51	-0.35

Table B2. Impacts of Scenario 2, Archanes (annual average changes from 1998 levels, 1998 prices)

Scenario Elements	Output Effects ($ mil)	% Change	Labour Income Effects ($ mil)	% Change	Capital Income Effects ($ mil)	% Change	Land Rent Effects ($ mil)	% Change	Firm Income Effects ($ mil)	% Change
A.Modulation	-5.50	-0.03	-0.74	-0.02	-11.82	-0.17	-0.50	-0.03	-11.88	-0.14
B.Decoupling	-450.62	-1.91	-36.19	-0.86	-110.47	-1.62	-106.89	-5.60	-209.50	-2.43
C. Pillar 2	463.80	1.96	65.03	1.55	587.06	8.61	31.68	1.66	596.35	6.91
D. Decline in Prices	-419.59	-1.77	-32.74	-0.78	-107.99	-1.58	-93.27	-4.88	-193.99	-2.25
Total	-411.91	-1.74	-4.64	-0.11	356.78	5.24	-168.98	-8.85	180.98	2.09

Scenario Elements	Household Income Effects ($ mil)	% Change	Agricultural Employment Effects (no. of jobs)	% Change	Employment Effects (no. of jobs)	% Change	Pollution Effects (tonnes)	% Change
A.Modulation	-9.03	-0.07	0	0	-1	-0.05	-3.32	-0.04
B.Decoupling	-181.00	-1.32	-56	-6.55	-93	-4.74	-335.98	-3.86
C. Pillar 2	479.51	3.49	11	1.33	57	2.91	308.79	3.55
D. Decline in Prices	-166.88	-1.22	-53	-6.18	-86	-4.39	-429.51	-4.93
Total	122.60	0.88	-98	-11.40	-123	-6.27	-460.01	-5.29

Table B3. Impacts of Scenario 2B, Archanes (annual average changes from 1998 levels, 1998 prices)

Scenario Elements	Output Effects ($ mil)	% Change	Labour Income Effects ($ mil)	% Change	Capital Income Effects ($ mil)	% Change	Land Rent Effects ($ mil)	% Change	Firm Income Effects ($ mil)	% Change
A.Modulation	-5.50	-0.03	-0.74	-0.02	-11.82	-0.17	-0.50	-0.03	-11.88	-0.14
B.Decoupling	-450.62	-1.91	-36.19	-0.86	-110.47	-1.62	-106.89	-5.60	-209.50	-2.43
C. Pillar 2	463.80	1.96	65.03	1.55	587.06	8.61	31.68	1.66	596.35	6.91
D. Decline in Prices	-419.59	-1.77	-32.74	-0.78	-107.99	-1.58	-93.27	-4.88	-193.99	-2.25
E. Decline of Subsidies	-39.26	-0.17	-5.27	-0.13	-84.46	-1.24	-3.57	-0.19	-84.84	-0.98
Total	-451.17	-1.91	-9.91	-0.24	272.32	4.00	-172.55	-9.04	96.14	1.11

Scenario Elements	Household Income Effects ($ mil)	% Change	Agricultural Employment Effects (no. of jobs)	% Change	Employment Effects (no. of jobs)	% Change	Pollution Effects (tonnes)	% Change
A.Modulation	-9.03	-0.07	0	0	-1	-0.05	-3.32	-0.04
B.Decoupling	-181.00	-1.32	-56	-6.55	-93	-4.74	-335.98	-3.86
C. Pillar 2	479.51	3.49	11	1.33	57	2.91	308.79	3.55
D. Decline in Prices	-166.88	-1.22	-53	-6.18	-86	-4.39	-429.51	-4.93
E. Decline of Subsidies	-64.47	-0.47	-2	-0.18	-6	-0.31	-23.69	-0.27
Total	58.13	0.41	-100	-11.58	-129	-6.58	-483.71	-5.55

Table B4. Impacts of Scenario 3, Archanes (annual average changes from 1998 levels, 1998 prices)

Scenario Elements	Output Effects ($ mil)	% Change	Labour Income Effects ($ mil)	% Change	Capital Income Effects ($ mil)	% Change	Land Rent Effects ($ mil)	% Change	Firm Income Effects ($ mil)	% Change
A.Modulation	-5.50	-0.03	-0.74	-0.02	-11.82	-0.17	-0.50	-0.03	-11.88	-0.14
B.Decoupling	-450.62	-1.91	-36.19	-0.86	-110.47	-1.62	-106.89	-5.60	-209.50	-2.43
C. Pillar 2	463.80	1.96	65.03	1.55	587.06	8.61	31.68	1.66	596.35	6.91
D. Decline in Prices	-419.59	-1.77	-32.74	-0.78	-107.99	-1.58	-93.27	-4.88	-193.99	-2.25
E. Decline of Subsidies	-39.26	-0.17	-5.27	-0.13	-84.46	-1.24	-3.57	-0.19	-84.84	-0.98
F. Increase in Pillar 2 funds	445.25	1.88	62.43	1.49	563.58	8.26	30.41	1.59	572.49	6.63
Total	-5.91	-0.03	52.53	1.25	835.89	12.25	-142.13	-7.44	668.63	7.74

Scenario Elements	Household Income Effects ($ mil)	% Change	Agricultural Employment Effects (no. of jobs)	% Change	Employment Effects (no. of jobs)	% Change	Pollution Effects (tonnes)	% Change
A.Modulation	-9.03	-0.07	0	0	-1	-0.05	-3.32	-0.04
B.Decoupling	-181.00	-1.32	-56	-6.55	-93	-4.74	-335.98	-3.86
C. Pillar 2	479.51	3.49	11	1.33	57	2.91	308.79	3.55
D. Decline in Prices	-166.88	-1.22	-53	-6.18	-86	-4.39	-429.51	-4.93
E. Decline of Subsidies	-64.47	-0.47	-2	-0.18	-6	-0.31	-23.69	-0.27
F. Increase in Pillar 2 funds	460.33	3.35	11	1.27	54	2.75	296.44	3.41
Total	518.47	3.78	-89	-10.31	-75	-3.83	-187.27	-2.14

Table B5. Impacts of Scenario 1 - Modulation, Archanes (annual average changes from 1998 levels, 1998 prices)

Sectors	1998 ($ mil)	Change	New levels	% Change
1 Vine-growing	2971.02	-0.72	2970.30	-0.02
2 Olive-growing	1522.81	-0.40	1522.41	-0.03
3 Other Agriculture	579.55	-0.13	579.42	-0.02
4 Food Processing	4163.93	-1.46	4162.47	-0.03
5 Timber & Furniture	475.99	-0.03	475.96	-0.01
6 Metal Products	742.60	-0.04	742.56	-0.01
7 Construction	599.50	-0.04	599.46	-0.01
8 Trade	3772.77	-1.92	3770.85	-0.05
9 Hotels & Restaurants	4167.19	-0.30	4166.89	-0.01
10 Research & Develop.	2295.37	0.00	2295.37	0
11 Public Administration	1206.96	-0.14	1206.82	-0.01
12 Health and Social Care	423.54	-0.19	423.35	-0.04
13 Other Services	719.46	-0.12	719.34	-0.02
Total	**23640.70**	**-5.50**	**23635.20**	**-0.03**
Labour Income	4194.77	-0.74	4194.03	-0.02
Capital Income	6821.13	-11.82	6809.31	-0.17
Land Rent	1910.27	-0.50	1909.77	-0.03
Household Income	13731.97	-9.03	13722.94	-0.07
Firm Income	8633.48	-11.88	8621.60	-0.14
Employment (jobs)	1,960	-1	1,959	-0.05
Pollution (tonnes)	8704.03	-3.32	8700.71	-0.04

Table B6. Impacts of Scenario 1 - Decoupling, Archanes (annual average changes from 1998 levels, 1998 prices)

Sectors	1998 ($ mil)	Change	New levels	% Change
1 Vine-growing	2971.02	-23.13	2947.89	-0.78
2 Olive-growing	1522.81	-304.56	1218.25	-20.0
3 Other Agriculture	579.55	-6.29	573.26	-1.08
4 Food Processing	4163.93	-34.24	4129.69	-0.82
5 Timber & Furniture	475.99	-1.13	474.86	-0.24
6 Metal Products	742.60	-1.69	740.91	-0.23
7 Construction	599.50	-6.30	593.2	-1.05
8 Trade	3772.77	-52.47	3720.30	-1.39
9 Hotels & Restaurants	4167.19	-6.30	4160.89	-0.15
10 Research & Develop.	2295.37	-0.80	2294.57	-0.03
11 Public Administration	1206.96	-2.97	1203.99	-0.25
12 Health and Social Care	423.54	-3.91	419.63	-0.92
13 Other Services	719.46	-6.82	712.64	-0.95
Total	**23640.70**	**-450.62**	**23190.08**	**-1.91**
Labour Income	4194.77	-36.19	4158.58	-0.86
Capital Income	6821.13	-110.47	6710.66	-1.62
Land Rent	1910.27	-106.89	1803.38	-5.60
Household Income	13731.97	-181.00	13550.97	-1.32
Firm Income	8633.48	-209.50	8423.98	-2.43
Employment (jobs)	1,960	-93	1867	-4.74
Pollution (tonnes)	8704.03	-335.98	8368.05	-3.86

Table B7. Impacts of Scenario 1 – Pillar 2, Archanes (annual average changes from 1998 levels, 1998 prices)

Sectors	1998 ($ mil)	Change	New levels	% Change
1 Vine-growing	2971.02	38.59	3009.60	1.30
2 Olive-growing	1522.81	21.50	1544.31	1.41
3 Other Agriculture	579.55	7.18	586.73	1.24
4 Food Processing	4163.93	77.70	4241.62	1.87
5 Timber & Furniture	475.99	6.04	482.03	1.27
6 Metal Products	742.60	17.96	760.56	2.42
7 Construction	599.50	142.57	742.07	23.78
8 Trade	3772.77	109.95	3882.72	2.91
9 Hotels & Restaurants	4167.19	16.24	4183.43	0.39
10 Research & Develop.	2295.37	0.22	2295.59	0.01
11 Public Administration	1206.96	7.20	1214.17	0.60
12 Health and Social Care	423.54	10.12	433.66	2.39
13 Other Services	719.46	8.54	728.00	1.19
Total	**23640.70**	**463.80**	**24104.50**	**1.96**
Labour Income	4194.77	65.03	4259.80	1.55
Capital Income	6821.13	587.06	7408.20	8.61
Land Rent	1910.27	31.68	1941.95	1.66
Household Income	13731.97	479.51	14211.49	3.49
Firm Income	8633.48	596.35	9229.82	6.91
Employment (jobs)	1,960	57	2,017	2.91
Pollution (tonnes)	8704.03	308.79	9012.82	3.55

Table B8: Impacts of Scenario 1 - Total, Archanes (annual average changes from 1998 levels, 1998 prices)

Sectors	1998 ($ mil)	Change	New levels	% Change
1 Vine-growing	2971.02	14.73	2985.75	0.50
2 Olive-growing	1522.81	-283.47	1239.35	-18.61
3 Other Agriculture	579.55	0.75	580.31	0.13
4 Food Processing	4163.93	42.00	4205.93	1.01
5 Timber & Furniture	475.99	4.88	480.87	1.02
6 Metal Products	742.60	16.23	758.83	2.19
7 Construction	599.50	136.23	735.73	22.72
8 Trade	3772.77	55.57	3828.34	1.47
9 Hotels & Restaurants	4167.19	9.63	4176.83	0.23
10 Research & Develop.	2295.37	-0.58	2294.79	-0.03
11 Public Administration	1206.96	4.10	1211.06	0.34
12 Health and Social Care	423.54	6.02	429.56	1.42
13 Other Services	719.46	1.60	721.06	0.22
Total	**23640.70**	**7.68**	**23648.38**	**0.03**
Labour Income	4194.77	28.10	4222.87	0.67
Capital Income	6821.13	464.74	7285.90	6.81
Land Rent	1910.27	-75.71	1834.56	-3.96
Household Income	13731.97	289.49	14021.46	2.11
Firm Income	8633.48	374.97	9008.44	4.34
Employment (jobs)	1,960	-37	1,923	-1.88
Pollution (tonnes)	8704.03	-30.51	8673.52	-0.35

Table B9. Impacts of Scenario 2 – Decline in Prices, Archanes (annual average changes from 1998 levels, 1998 prices)

Sectors	1998 ($ mil)	Change	New levels	% Change
1 Vine-growing	2971.02	-262.34	2708.68	-8.83
2 Olive-growing	1522.81	-38.99	1483.82	-2.56
3 Other Agriculture	579.55	-6.55	573.00	-1.13
4 Food Processing	4163.93	-31.57	4132.36	-0.76
5 Timber & Furniture	475.99	-1.10	474.89	-0.23
6 Metal Products	742.60	-1.79	740.81	-0.24
7 Construction	599.50	-7.86	591.64	-1.31
8 Trade	3772.77	-51.81	3702.96	-1.37
9 Hotels & Restaurants	4167.19	-5.76	4161.43	-0.14
10 Research & Develop.	2295.37	-1.09	2294.28	-0.05
11 Public Administration	1206.96	-2.69	1204.27	-0.22
12 Health and Social Care	423.54	-3.61	419.93	-0.85
13 Other Services	719.46	-4.43	715.03	-0.62
Total	**23640.70**	**-419.59**	**23221.11**	**-1.77**
Labour Income	4194.77	-32.74	4162.03	-0.78
Capital Income	6821.13	-107.99	6713.14	-1.58
Land Rent	1910.27	-93.27	1817.00	-4.88
Household Income	13731.97	-166.88	13565.09	-1.22
Firm Income	8633.48	-193.99	8439.49	-2.25
Employment (jobs)	1,960	-86	1,874	-4.39
Pollution (tonnes)	8704.03	-429.51	8274.52	-4.93

Table B10. Impacts of Scenario 2 - Total, Archanes (annual average changes from 1998 levels, 1998 prices)

Sectors	1998 ($ mil)	Change	New levels	% Change
1 Vine-growing	2971.02	-247.61	2723.40	-8.33
2 Olive-growing	1522.81	-322.45	1200.36	-21.17
3 Other Agriculture	579.55	-5.79	573.76	-1.00
4 Food Processing	4163.93	10.43	4174.36	0.25
5 Timber & Furniture	475.99	3.78	479.77	0.79
6 Metal Products	742.60	14.44	757.04	1.94
7 Construction	599.50	128.36	727.86	21.41
8 Trade	3772.77	3.75	3776.53	0.10
9 Hotels & Restaurants	4167.19	3.88	4171.07	0.09
10 Research & Develop.	2295.37	-1.68	2293.69	-0.07
11 Public Administration	1206.96	1.41	1208.37	0.12
12 Health and Social Care	423.54	2.41	425.95	0.57
13 Other Services	719.46	-2.83	716.64	-0.39
Total	**23640.70**	**-411.91**	**23228.80**	**-1.74**
Labour Income	4194.77	-4.64	4190.13	-0.11
Capital Income	6821.13	356.78	7177.91	5.24
Land Rent	1910.27	-168.98	1741.29	-8.85
Household Income	13731.97	122.60	13854.58	0.88
Firm Income	8633.48	180.98	8814.45	2.09
Employment (jobs)	1960	-123	1837	-6.27
Pollution (tonnes)	8704.03	-460.01	8250.65	-5.29

Table B11. Impacts of Scenario 2B – Decline of Subsidies, Archanes (annual average changes from 1998 levels, 1998 prices)

Sectors	1998 ($ mil)	Change	New levels	% Change
1 Vine-growing	2971.02	-5.17	2965.84	-0.17
2 Olive-growing	1522.81	-2.88	1519.93	-0.19
3 Other Agriculture	579.55	-0.96	578.59	-0.17
4 Food Processing	4163.93	-10.40	4153.53	-0.25
5 Timber & Furniture	475.99	-0.24	475.75	-0.05
6 Metal Products	742.60	-0.30	742.30	-0.04
7 Construction	599.50	-0.27	599.23	-0.04
8 Trade	3772.77	-13.70	3759.07	-0.36
9 Hotels & Restaurants	4167.19	-2.16	4165.04	-0.05
10 Research & Develop.	2295.37	-0.03	2295.34	0.00
11 Public Administration	1206.96	-0.97	1205.99	-0.08
12 Health and Social Care	423.54	-1.35	422.18	-0.32
13 Other Services	719.46	-0.83	718.64	-0.12
Total	**23640.70**	**-39.26**	**23601.44**	**-0.17**
Labour Income	4194.77	-5.27	4189.50	-0.13
Capital Income	6821.13	-84.46	6736.68	-1.24
Land Rent	1910.27	-3.57	1906.71	-0.19
Household Income	13731.97	-64.47	13667.50	-0.47
Firm Income	8633.48	-84.84	8548.64	-0.98
Employment (jobs)	1960	-6	1954	-0.31
Pollution (tonnes)	8704.03	-23.69	8680.34	-0.27

Table B12. Impacts of Scenario 2B - Total, Archanes (annual average changes from 1998 levels, 1998 prices)

Sectors	1998 ($ mil)	Change	New levels	% Change
1 Vine-growing	2971.02	-252.79	2718.23	-8.51
2 Olive-growing	1522.81	-325.33	1197.48	-21.36
3 Other Agriculture	579.55	-6.76	572.80	-1.17
4 Food Processing	4163.93	0.03	4163.96	0.00
5 Timber & Furniture	475.99	3.54	479.53	0.74
6 Metal Products	742.60	14.14	756.74	1.90
7 Construction	599.50	128.10	727.60	21.37
8 Trade	3772.77	-9.95	3762.82	-0.26
9 Hotels & Restaurants	4167.19	1.72	4168.91	0.04
10 Research & Develop.	2295.37	-1.70	2293.67	-0.07
11 Public Administration	1206.96	0.44	1207.40	0.04
12 Health and Social Care	423.54	1.06	424.59	0.25
13 Other Services	719.46	-3.66	715.81	-0.51
Total	**23640.70**	**-451.17**	**23189.53**	**-1.91**
Labour Income	4194.77	-9.91	4184.85	-0.24
Capital Income	6821.13	272.32	7093.45	4.00
Land Rent	1910.27	-172.55	1737.73	-9.04
Household Income	13731.97	58.13	13790.11	0.41
Firm Income	8633.48	96.14	8729.62	1.11
Employment (jobs)	1960	-129	1831	-6.58
Pollution (tonnes)	8704.03	-483.71	8220.32	-5.55

Table B13. Impacts of Scenario 3 – Increase in Pillar 2 Funds, Archanes (annual average changes from 1998 levels, 1998 prices)

Sectors	1998 ($ mil)	Change	New levels	% Change
1 Vine-growing	2971.02	37.04	3008.06	1.25
2 Olive-growing	1522.81	20.64	1543.45	1.36
3 Other Agriculture	579.55	6.89	586.44	1.19
4 Food Processing	4163.93	74.59	4238.52	1.79
5 Timber & Furniture	475.99	5.80	481.79	1.22
6 Metal Products	742.60	17.24	759.84	2.32
7 Construction	599.50	136.86	736.37	22.83
8 Trade	3772.77	105.55	3878.33	2.80
9 Hotels & Restaurants	4167.19	15.59	4182.78	0.37
10 Research & Develop.	2295.37	0.21	2295.58	0.01
11 Public Administration	1206.96	6.92	1213.88	0.57
12 Health and Social Care	423.54	9.71	433.25	2.29
13 Other Services	719.46	8.20	727.66	1.14
Total	**23640.70**	**445.25**	**24085.95**	**1.88**
Labour Income	4194.77	62.43	4257.20	1.49
Capital Income	6821.13	563.58	7384.71	8.26
Land Rent	1910.27	30.41	1940.69	1.59
Household Income	13731.97	460.33	14192.31	3.35
Firm Income	8633.48	572.49	9205.97	6.63
Employment (jobs)	1960	54	2014	2.75
Pollution (tonnes)	8704.03	296.44	9000.47	3.41

Table B14. Impacts of Scenario 3 - Total, Archanes (annual average changes from 1998 levels, 1998 prices)

Sectors	1998 ($ mil)	Change	New levels	% Change
1 Vine-growing	2971.02	-215.74	2755.27	-7.26
2 Olive-growing	1522.81	-304.70	1218.12	-20.01
3 Other Agriculture	579.55	0.13	579.69	0.02
4 Food Processing	4163.93	74.62	4238.55	1.79
5 Timber & Furniture	475.99	9.34	485.33	1.96
6 Metal Products	742.60	31.38	773.98	4.23
7 Construction	599.50	264.96	864.46	44.20
8 Trade	3772.77	95.60	3868.38	2.53
9 Hotels & Restaurants	4167.19	17.31	4184.50	0.42
10 Research & Develop.	2295.37	-1.49	2293.88	-0.06
11 Public Administration	1206.96	7.35	1214.31	0.61
12 Health and Social Care	423.54	10.77	434.31	2.54
13 Other Services	719.46	4.54	724.01	0.63
Total	**23640.70**	**-5.91**	**23634.79**	**-0.03**
Labour Income	4194.77	52.53	4247.30	1.25
Capital Income	6821.13	835.89	7657.03	12.25
Land Rent	1910.27	-142.13	1768.14	-7.44
Household Income	13731.97	518.47	14250.45	3.78
Firm Income	8633.48	668.63	9302.11	7.74
Employment (jobs)	1960	-75	-1885	-3.83
Pollution (tonnes)	8704.03	-187.27	8523.40	-2.14

Table B15. Impacts of Scenario 1 on Pollution, Archanes (annual average changes from 1998 levels)

Scenario 1, Archanes

Scenario Elements	Changes in Pollution (tonnes)	% Change
A.Modulation	-3.32	-0.04
B.Decoupling	-335.98	-3.86
C. Pillar 2	308.79	3.55
Total	-30.51	-0.35

Pollutants	A. Modulation		B. Decoupling		C. Pillar 2	
	Changes in Pollution (tonnes)	% Change	Changes in Pollution (tonnes)	% Change	Changes in Pollution (tonnes)	% Change
CO_2	-2.67	-0.04	-256.61	-3.51	267.91	3.66
CH_4	-0.09	-0.05	-12.29	-6.43	5.26	2.76
N_2O	-0.01	-0.06	-1.05	-7.13	0.68	4.58
NOx	-0.02	-0.04	-2.88	-5.02	1.77	3.08
CO	-0.13	-0.04	-14.43	-4.76	9.10	3.00
NMVOC	-0.04	-0.04	-3.91	-4.59	2.88	3.37
SO_2	0.00	-0.02	-0.34	-1.64	0.95	4.56
BOD_5	-0.16	-0.05	-9.90	-3.03	9.32	2.85
Nitrates	-0.19	-0.05	-34.56	-8.78	10.94	2.78
Total	**-3.32**	**-0.04**	**-335.98**	**-3.86**	**308.79**	**3.55**

Total Scenario 1, Archanes

Pollutants	Changes in Pollution (tonnes)	% Change
CO_2	8.62	0.12
CH_4	-7.11	-3.72
N_2O	-0.39	-2.62
NOx	-1.14	-1.99
CO	-5.47	-1.80
NMVOC	-1.07	-1.26
SO_2	0.61	2.90
BOD_5	-0.74	-0.23
Nitrates	-23.82	-6.05
Total	**-30.51**	**-0.35**

Table B16. Impacts of Scenario 2 on Pollution, Archanes (annual average changes from 1998 levels)

Scenario 2, Archanes

Scenario Elements	Changes in Pollution (tonnes)	% Change
A.Modulation	-3.32	-0.04
B.Decoupling	-335.98	-3.86
C. Pillar 2	308.79	3.55
D. Decline in Prices	-429.51	-4.93
Total	-460.01	-5.29

D. Decline in Prices

Pollutants	Changes in Pollution (tonnes)	% Change
CO_2	-338.22	-4.63
CH_4	-17.57	-9.19
N_2O	-1.45	-9.85
NOx	-4.00	-6.98
CO	-19.67	-6.49
NMVOC	-5.27	-6.19
SO_2	-0.42	-1.99
BOD_5	-10.05	-3.08
Nitrates	-32.87	-8.35
Total	**-429.51**	**-4.93**

Total Scenario 2, Archanes

Pollutants	Changes in Pollution (tonnes)	% Change
CO_2	-329.59	-4.51
CH_4	-24.68	-12.91
N_2O	-1.84	-12.46
NOx	-5.13	-8.96
CO	-25.13	-8.29
NMVOC	-6.34	-7.44
SO_2	0.19	0.91
BOD_5	-10.79	-3.31
Nitrates	-56.68	-14.40
Total	**-460.01**	**-5.29**

Table B17. Impacts of Scenario 2B on Pollution, Archanes (annual average changes from 1998 levels)

Scenario 2B, Archanes

Scenario Elements	Changes in Pollution (tonnes)	% Change
A.Modulation	-3.32	-0.04
B.Decoupling	-335.98	-3.86
C. Pillar 2	308.79	3.55
D. Decline in Prices	-429.51	-4.93
E. Decline of Subsidies	-23.69	-0.27
Total	**-483.71**	**-5.55**

E. Decline of Subsidies

Pollutants	Changes in Pollution (tonnes)	% Change
CO_2	-19.06	-0.26
CH_4	-0.64	-0.34
N_2O	-0.06	-0.43
NOx	-0.18	-0.31
CO	-0.96	-0.32
NMVOC	-0.27	-0.32
SO_2	-0.03	-0.15
BOD_5	-1.15	-0.35
Nitrates	-1.34	-0.34
Total	**-23.69**	**-0.27**

Total Scenario 2B, Archanes

Pollutants	Changes in Pollution (tonnes)	% Change
CO_2	-348.65	-4.77
CH_4	-25.32	-13.25
N_2O	-1.90	-12.89
NOx	-5.31	-9.27
CO	-26.09	-8.60
NMVOC	-6.62	-7.76
SO_2	0.16	0.76
BOD_5	-11.94	-3.66
Nitrates	-58.03	-14.74
Total	**-483.71**	**-5.55**

Table B18. Impacts of Scenario 3 on Pollution, Archanes (annual average changes from 1998 levels)

Scenario 3, Archanes

Scenario Elements	Changes in Pollution (tonnes)	% Change
A.Modulation	-3.32	-0.04
B.Decoupling	-335.98	-3.86
C. Pillar 2	308.79	3.55
D. Decline in Prices	-429.51	-4.93
E. Decline of Subsidies	-23.69	-0.27
F. Increase of Pillar 2 Funds	296.44	3.41
Total	**-187.27**	**-2.14**

F. Increase of Pillar 2 Funds

Pollutants	Changes in Pollution (tonnes)	% Change
CO_2	257.19	3.52
CH_4	5.05	2.64
N_2O	0.65	4.39
NOx	1.69	2.96
CO	8.74	2.88
NMVOC	2.76	3.24
SO_2	0.91	4.38
BOD_5	8.94	2.74
Nitrates	10.50	2.67
Total	**296.44**	**3.41**

Total Scenario 3, Archanes

Pollutants	Changes in Pollution (tonnes)	% Change
CO_2	-91.46	-1.25
CH_4	-20.26	-10.60
N_2O	-1.25	-8.50
NOx	-3.62	-6.31
CO	-17.35	-5.72
NMVOC	-3.85	-4.52
SO_2	1.07	5.14
BOD_5	-3.00	-0.92
Nitrates	-47.53	-12.07
Total	**-187.27**	**-2.14**

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