Agriculture and Income Distribution: Insights from a SAM of the Italian Economy

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ABSTRACT: The paper presents the results of the first SAM analysis of the agricultural sector in Italy. A SAM of the Italian economy has been properly modified in order to focus the analysis on agriculture. Two type of analysis have been carried out: (*i*) a multiplier analysis, and (*ii*) an assessment of the distributive impacts of different agricultural policies. This paper proposes also a new method for disaggregating the institutional sectors and production factors in order to analyze income distribution within the economy, with special emphasis on the agricultural sector.

Main results are: (*i*) 'fully' decoupled income supporting schemes (transfers to agricultural households) are the most equitable interventions and determine a perfect targeting of the distributive effect on the relevant institutional sectors; (*ii*) 'partially' decoupled income supporting interventions, as the ones implemented under the current CAP, are more effective than others in indirectly (i.e., through multiplier effects) generating positive impacts on the income of agricultural households; (*iii*) agricultural price support interventions show less desirable effects in terms of their distributive impacts: they are less effective as agricultural income-increasing policies and their distributive impacts are biased against poorer households both in agricultural and non-agricultural sectors.

KEY WORDS: Social accounting matrix, agriculture, income distribution, Italy.
JEL classification: R13, R15, Q18, E25

1. INTRODUCTION

The number of studies on the linkages between agriculture and the rest of the economy using a Social Accounting Matrices (SAM) framework has sensibly increased in last years. In fact, the SAM is an economy-wide model showing several appealing features. It represents a very general accounting model which subsumes all possible 'real-life' national accounting systems[1]. Moreover, the SAM framework is characterized by great flexibility in depicting the flows within the economy[2]. Therefore, building a SAM is often the first step towards the economic analysis of both sectoral and economy-wide issues as the matrix shows the interactions between a sector and the whole economy, and the resulting model is theoretically consistent as well as 'fine-tuned' with respect to the needs of the specific empirical analysis at hand.

In the last decade the analysis of agriculture using a SAM framework has received growing attention, in both less and more developed countries (Pyatt and Round, 1985). This paper will present the results of an analysis of the agricultural sector in Italy. A SAM of the Italian economy was built focusing the disaggregation on agriculture, and two type of analysis has been carried out: (*i*) a multiplier analysis, and (*ii*) an assessment of the distributive impacts of different agricultural policies. This paper, though in the same methodological vein of similar studies (Bernat and Johnson, 1991; Marcoullier *et al.*, 1995; Roberts and Russell, 1996), proposes a new method for disaggregating

[1] In the last revision of the System of National Accounts (UN *et al.*, 1993) the structure of the system of accounts is presented as a matrix aiming at checking the overall consistency of the system of fundamental accounting relations, so that they can represent a useful basis for international comparisons between countries as well as for improvements of accounting systems for specific pourposes.

[2] Indeed, using appropriate classification systems, it is possible to analyze virtually all economic issues involving transactions among sectors and institutions with the desired level of accuracy.

institutional sectors and production factors aiming at analyzing income distribution within the economy, with special emphasis on the agricultural sector.

The paper is structured as follows. Section 2 presents a brief review of the state of the art of SAM analysis as applied to agriculture in developed economies. Section 3 introduces the data set used in the analysis, explaining how original data were modified in order to get a model consistent with the objectives of the analysis. The model will be then used to carry out multiplier analysis (section 4) as well as policy simulations with emphasis on the distribution effects of alternative agricultural policies (section 5). Finally, section 6 summarizes the main findings and discusses further development of the analysis.

2. THE AGRICULTURE IN DEVELOPED ECONOMIES THROUGH THE EXPERIENCE OF SAM MODELLING: A REVIEW

The analysis of the agricultural sector through SAMs is quite widespread as applied to LDCs economies, where agriculture represents a substantial part of the whole economy (see, for example, Pyatt and Round, 1985). Less common is the use of SAM as applied to the agriculture in more developed economies. However, in the last decade several studies focusing on developed countries agriculture have been published: this review will focus on these recent contributions.

To begin with, it is useful to distinguish between two main - not mutually exclusive - uses of SAMs in the agricultural economics literature: (*i*) SAM used for structural analysis and/or estimates of sectoral policies impacts, and (*ii*) SAM used as an accounting model to calibrate CGE models. The former group of studies are relatively more numerous than the latter.

Several studies use the SAM to analyze the structural interdependencies between the agricultural sector and the rest of the economy. For instance, Bernat and Johnson (1991) built several SAMs for some regions of Virginia analyzing the linkages existing among groups of households characterized by different income levels. On the same vein, two recent studies applied to Oregon (Waters *et al.*, 1999) and Washington state (Holland, 1999), have focused on the structural analysis of interdependencies, computing indexes of total employment generated by agricultural activities. Moreover, the study carried out by Waters *et al*. (1999) devoted a special effort to the analysis of distributive flows and eventually ended up to the assessment of some flows that are usually beyond the traditional input-output analysis, like the export of services, the federal transfers to local government as well as to households, the revenues coming from estates located outside the state boundaries, etc.

The studies carried out by Roberts and Russell (1996) and by Roberts (1998, 2000) in the UK belong also to the structural analysis group. In the former a SAM of the English economy was built, with a special emphasis on disaggregating the production account of the agricultural sector. The matrices of household income multipliers were also disaggregated into five classes and, hypothesizing different exogenous shocks on the economy, showed how the SAM framework could have been used to simulate the impacts of agricultural policies[3]. The latter studies referred to the Grampian region in Scotland focusing on rural-urban spillover effects using a complete bi-regional SAM using multiplier decomposition to investigate the nature of the spillovers. The study showed that the magnitude of inter-regional feedback effects between the urban and the rural area was small, with

[3] The potential distributive effects of sectoral policies are analyzed also in two studies applied to forest sector in Oklahoma (Marcoullier *et al*., 1995) and Alberta (Alavapati *et al*., 1999).

stronger spillover effects from the urban to rural Grampian than vice versa.

A new strain of studies is represented by the use of SAM to analyze the environmental impacts of given economic activities (Winter, 2000). An interesting application of such approach to agriculture was the study on cotton production in California carried out by Golan *et al*. (2000). A California SAM highly disaggregated in its agricultural production account, was corrected to internalize negative externalities caused by cotton production as leakage of water-table pollutants as well as soil erosion[4]. This corrected SAM was eventually used to assess the distributive effects as well as welfare impacts, and to estimate the environmentally-correct national income taking into account the damages caused by cotton production on the current and subsequent years.

A different group of studies focused on the SAM as a tool to calibrate CGE models that eventually could be used to make agricultural policy simulations. This approach was discussed from a methodological point of view, with reference to access to the EU, by Bojnec (2000). Brockmeier *et al*. (1994) derived a CGE model of German economy from a SAM, and then used it to evaluate the impacts of alternative scenarios of pesticides use restrictions. A similar analysis was carried out in the Netherlands by Komen and Peerlings (1996 and 1998) aimed at analyzing more environmentally friendly livestock sector policies. More recently McDonald and Roberts (1998) have used a CGE model to assess alternative policies to support the British livestock sector after the BSE crises.

CGE models were also derived from bi-regional SAMs (i.e., rural-urban) in the US: among others, Kilkenny (1993) evaluated the impacts and distributive effects of farm subsidies, while Kilkenny *et al*. (2000) focused on the impacts of social program reform, namely welfare and food assistance schemes to poor households.

3. A SAM FOR ITALIAN AGRICULTURE

A SAM is basically a representation of the circular flow in an exchange economy in matrix structure. Unlike an input-output model, which capture only sectoral interdependencies in a disaggregated production account, the SAM accounts for interrelationships among production activities, production factors, incomes, consumptions and capital formation.

Each row of the SAM matrix shows the receipts for a specific sector while the corresponding column lists the sector expenditures. We can find several type of accounts in the rows of the matrix: a) production activities, b) factors of production, c) institutions' current accounts for groups such as households (possibly further disaggregated by type), firms, government, d) a capital formation account, and e) the rest of the world account. A similar structure holds for the columns of the matrix.

Being a double entry accountancy system, the sums of corresponding rows and columns must equal. The economic meaning of this balancing condition is that: a) costs must equal revenues for each production sector, b) expenditure must equal income for each institutional actor, and c) total saving must equal total investments and financial capital accumulation.

The SAM used in this paper was built modifying a non-symmetric 'transaction table' of the Italian economy that had been originally built for fiscal simulation purposes from the 1990 input-output table of the Italian economy (Accardo and Cavalletti, 1999). Its inter-industry part was, as usual, a square matrix. The peculiarity was that the figures in each cell could represent either expenditures or receipts

[4] The 'correction' was carried out building an 'externality SAM', characterized by the same structure of the original SAM (and whose cells had as entries monetary estimations of all positive/negative externalities), subtracting it from the original one, and balancing the resulting corrected SAM.

according to their sign (i.e., negative for expenditures and positive for receipts). As a consequence, the totals by columns and by rows were zero.

In order to have a suitable model for the purposes of this paper, we needed to re-classify the original entries of this transaction table (*i*) getting the standard square structure of a SAM, and (*ii*) taking into account the distinction between agricultural and non-agricultural households. Usually, the latter is done building a bi-regional SAM on the basis of the location of institutions, i.e. rural-urban (Roberts, 1998 and 2000). However, this does not fit the Italian development pattern, characterized by no spatial segregation of economic activities[5] (Saraceno, 1992). Therefore, the transaction table was modified singling out the agricultural households account according to the Eurostat definition reported in the surveys on 'Total Income of Agricultural Households'[6] (Eurostat, 1995).

Moreover, taking into account that a non trivial share of Italian agricultural activities is characterized as pluri-activity and/or part-time farming (Istat, 1999), the factor accounts were disaggregated to enucleate incomes accruing to self-employed agricultural labor from other self-employed incomes: this means that our SAM explicitly keeps records of income flows from agriculture to non-agricultural households and vice versa.

According to the above-mentioned hypotheses, the construction of this SAM required the following steps:

1. Reorganizing the transaction table flows according to a symmetric structure (39x39), where columns and rows refer to 30 activities, 3 production factors (self-employed labor, employed labor, and capital), 4 institutions (3 households accounts, grouped according to income classes, plus the Government), 1 capital accounts, and 1 residual account (the rest of the world).
2. Disaggregating the household final consumption sub-matrix in order to disentangle final consumption of agricultural households from consumption of non-agricultural ones per each class of income: this yielded a (30x6) sub-matrix. Data from the Italian household budget survey were used to estimate the share of consumption per each income class[7].
3. Estimating the income distribution (6x4) sub-matrix[8]. The data needed to make these estimates were derived from the survey on agricultural household total incomes (Istat, 1998), namely figures on social security contributions and the share of agricultural income on total income of agricultural and non-agricultural households.

Indirect estimate, based on the allocation of the relevant shares to each aggregate figure, ensured the balancing of the resulting SAM, whose structure is (43x43). From an accounting point of view the modified SAM shares the same limits of the original transaction table, namely the lacking of detailed accounts for firms. However, being the Italian agriculture dominated by family farms, this limit does not seem too constraining.

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[5] The process of economic development in Italy has been – as compared to other industrialized countries - highly specific and more spatially differentiated. As a consequence, rural areas didn't play only the classical function of foodstuff production, rather they have evolved as mixed economies (diffused industrialization). Therefore, the rural/urban dichotomy does not seem to be consistent with the agricultural/non agricultural dichotomy being the Italian countryside characterized by increasingly diversifying economic activities.

[6] According to this definition «the agricultural household sector contains only those households for which farming is the *main* source of income. Other households with some income from agriculture, but where agriculture is not the main income spurce, will not be included in the agricultural household sector» (Hill, 1998: 372).

[7] The disaggregation methodology was consistent with the one that had been adopted in the construction of the original transaction table (Accardo and Ferrari, 2000).

[8] The (6x4) dimension of this sub-matrix is derived as follows: 3 household income classes x 2 production sectors (agricultural/non agricultural) yield 6 household typologies; 4 refers to the production factors (agricultural self-employed labor, non-agricultural self-employed labor, employed labor, and capital).

4. MULTIPLIER ANALYSIS

The SAM we developed for Italy, besides being an integrated accounting framework, provides the basis for a model that can be employed in policy simulation exercises. In this paper, we apply multiplier analysis and further investigate the nature of the impact of external shocks on income applying the decompositional method originally proposed by Pyatt and Round (1979) and Stone (1985).

As our main objective is the evaluation of distributive effects of agricultural policies, the model has been closed considering as exogenous Government, capital and rest of the world accounts. This leads to a (40x40) matrix of direct coefficients **B** (i.e., 30 activities, 4 factors, and 6 institutions) made up by four sub-matrices as follows[9]:

$$\mathbf{B} = \begin{bmatrix} \mathbf{A} & & \mathbf{C} \\ \mathbf{V} & & \\ & \mathbf{D} & \end{bmatrix}$$

where $\mathbf{A}_{(30x30)}$ is the matrix of input-output coefficients, $\mathbf{V}_{(4x30)}$ is the matrix of value added coefficients per each factor, $\mathbf{D}_{(6x4)}$ is the matrix of distribution coefficients of factor earnings to institutions, and $\mathbf{C}_{(30x6)}$ is the matrix of average consumption propensities[10] of institutions.

According to Pyatt and Round (1979), the estimation of multipliers matrix **M** has been carried out by decomposition into two sub-matrices, **Z** and **Q**, having the same order of **B** such that

$$\mathbf{B} = \mathbf{Z} + \mathbf{Q} \tag{1}$$

where **Z** is a block diagonal matrix containing only those sub-matrices whose coefficients refer to transactions within of each group of accounts (in this case, only **A**), and **Q** contains, in the appropriate position, the remaining sub-matrices of **B**. the above mentioned authors proved that

$$\mathbf{y} = \mathbf{B}\mathbf{y} + \mathbf{x} = \mathbf{Z}\mathbf{y} + \mathbf{Q}\mathbf{y} + \mathbf{x} = \mathbf{M}_3\mathbf{M}_2\mathbf{M}_1\mathbf{x} \tag{2}$$

where **y** is the vector of endogenous accounts totals, **x** is the vector of flows from exogenous to endogenous accounts, and $\mathbf{M}_\mathbf{i}$ can be derived in term of the sub-matrices of **B**. From (2) the multiplier matrix **M** can be decomposed into four additive terms according to the following expression (Stone, 1985):

$$\mathbf{M} = \mathbf{I} + (\mathbf{M}_1 - \mathbf{I}) + (\mathbf{M}_2 - \mathbf{I})\mathbf{M}_1 + (\mathbf{M}_3 - \mathbf{I})\mathbf{M}_2\mathbf{M}_1 \tag{3}$$

where **I** is the identity matrix. Relation (3) represents a decomposition of the total effects of an exogenous shocks on a given account into four components:

[9] Usually, the lower-right corner should contain the coefficient sub-matrix of transactions between institutions, **T**. In our case, it is empty because the only considered institutions are government, which in our model is exogenous, and households, whose transactions estimates were not available.

[10] As average expenditure propensities do not change with marginal changes in exogenous accounts their use imply assuming that average and marginal expenditure are equal. This shortcoming has been addressed by Pyatt and Round (1979) by susbstituting marginal for average propensities. In our case lack of data has prevented the implementation of this procedure.

a) direct effect on that account (represented by the identity matrix **I**),
b) indirect effect due to linkages within the same group of accounts[11] ('intra-group' effect),
c) induced effects to the group of accounts originally affected by the shock as a consequence of its impacts on account groups other than the initial-one[12] ('inter-group' effect), and
d) the impact of the initial shock on the groups of accounts other than the initial one ('extra-group' effect).

Table 1 shows the decomposition of total multiplier of the agricultural sector (i.e., the sum of the agricultural column of **M**). One additional euro of exogenous demand for the agricultural sector generates an increase of total output of 1.315 euro (0.470 in the agricultural sector itself and 0.895 in non-agricultural sectors). The production increase generates new income inducing more consumption which in turns stimulates new output and so on, resulting in a total inter-group effect equal to 1.907 euro. Finally the extra-group effect amounts to 2.810 euro.

Final impacts on factor earnings and on household incomes provide a 'first-glance' assessment of distributive effects as a consequence of an increase in demand for agricultural products . Agricultural self-employed income receives an inflow equal to 27% of initial shock, slightly more than the income increase accruing to non-agricultural self-employed labor. More interesting is the analysis of the impacts on households accounts: the income increase is *coeteris paribus* higher in non-agricultural households than in agricultural ones and it is consistently higher the richer the household is.

A SAM can be also used to analyze the distributive effects of the impacts generated on household incomes by different exogenous shocks. This can be done comparing the coefficients of sub-matrices in **M** corresponding to institutions accounts. Table 2 ranks the largest 10 multipliers of agricultural household incomes generated by shocks from different sectors. Besides the agricultural sector itself, we found two of the closest client sectors, like food and beverage, and hotels and restaurants[13]. The distribution pattern among different classes of households is very similar irrespective of the sector from which the shock originates.

Let us compare the magnitude of household income multipliers generated by exogenous shocks from production sectors, factor earnings and household incomes. Recalling that the model closure was made keeping the Government as an exogenous sector, the three types of injection can be regarded as proxies of increasingly decoupled agricultural supporting measures. As suggested by Roberts and Russell (1996), indeed, a) price support can be simulated as an exogenous determined increase of the nominal value of output, b) income supporting schemes linked to the level of factor use can be simulated by increases of factor earnings, and c) decoupled household income supporting schemes (i.e., transfers to agricultural households) can be simulated in a SAM framework as positive shock on the relevant account[14].

Table 3 reports the results of such an exercise. Current CAP 'partially' decoupled measures, being linked to the use of specific factors (cultivated land area, livestock population) exogenously support the net operating surplus of self-employed farming that includes earnings from fixed factors such as land or livestock. Vice versa, the disaggregation of agricultural vs. non-agricultural households is essential to single out the impacts of household income supporting schemes

[11] The sum of direct and intra-group effects is equal to the leontievian multiplier as in the standard input-output model.

[12] The sum of direct, intra-group and inter-group effects is equal to the leontievian-keynesian multiplier as in the standard input-output model.

[13] The strong importance of injections into the real estate services account depends on the wide diffusion of house ownership in Italy.

[14] Thanks to sectoral disaggregation of both factors and households, our simulation exercise allows for a more realistic analysis of policy options compared with the one carried out by Roberts and Russell (1996).

implemented as part of *sectoral* policies. The figures of Table 3 show that the transmission mechanisms of income support schemes are quite diversified. As expected, the higher impact on agricultural household is given by a direct exogenous injection into the account itself. However, if we focus on the indirect impact generated by the circular redistribution process, we can notice that partially decoupled measures transfer more additional income to households, with a higher share accruing to agricultural households. Finally, it is worth noticing the decreasing impacts, beyond the initial income aid, of direct income transfers: because of the consumption structure of the SAM, directly supporting the income of poorer households determines an incremental impact of 0.595 *vis-à-vis* 0.469 impact on richer households. In both cases, however, most of the additional impact generated by multiplier effects is captured by *non*-agricultural households.

5. DISTRIBUTIVE EFFECTS AND POLICY IMPACTS

While multipliers provide an estimate of the total effect induced by an external shock on specific economic sectors, and decompositional techniques help to explain how the total effect accumulate through the economic system, neither provide an analysis of the distributional effects. It is interesting to analyze how the multiplier effects is distributed across households by type (agricultural vs. non agricultural) and by income tertile so that the equity implications of alternative policies can be appreciated.

Alternative techniques have been proposed to analyze the distributional consequences of policy changes in the SAM model such as the Relative Distributive Measure by Cohen (1996) and the 'Redistribution Matrix' described in Roland-Holst and Sancho (1992). The latter technique, also applied in Roberts and Russell (1996), is implemented in this analysis.

To illustrate the nature of this distributional measure, consider the standard linear model of endogenous income determination:

$$\mathbf{y} = (\mathbf{I} - \mathbf{B})^{-1} = \mathbf{Mx} \tag{4}$$

where $\mathbf{y}$ is a vector of nominal income for endogenous accounts, $\mathbf{B}$ is the matrix of expenditure shares, $\mathbf{M}$ is the multiplier matrix and $\mathbf{x}$ is a vector of exogenous inflows (or injections). As the analysis focus on distribution effects a normalized measure of income shares ($\hat{\mathbf{y}}$) is required:

$$\hat{\mathbf{y}} = \mathbf{y}[\mathbf{i}'\mathbf{y}]^{-1} \tag{5}$$

where $\mathbf{i}'$ is the unit vector. Following Roland-Holst and Sancho (1992), the change in $\hat{\mathbf{y}}$ induced by an exogenous injection $d\mathbf{x}$ is given by:

$$\begin{aligned} \hat{\mathbf{y}} &= [\mathbf{i}'\mathbf{Mx}]^{-1}\{\mathbf{I} - [\mathbf{i}'\mathbf{Mx}]^{-1}(\mathbf{Mx})\mathbf{i}'\}\mathbf{M}d\mathbf{x} = \\ &= \left[\frac{\mathbf{1}}{\mathbf{i}'\mathbf{y}}\right]\left\{\mathbf{I} - \left[\frac{\mathbf{y}}{\mathbf{i}'\mathbf{y}}\right]^{-1}\mathbf{i}'\right\}\mathbf{M}d\mathbf{x} = \mathbf{R(x)}d\mathbf{x}. \end{aligned} \tag{6}$$

$\mathbf{R(x)}$ can be interpreted as a redistribution matrix that shows the impact of a change in $\mathbf{x}$ on the account income shares $\hat{\mathbf{y}}$. The expression for a generic element of **R** is:

$$R_{ij} = \frac{\mathbf{1}}{\mathbf{i}'\mathbf{y}}\left[M_{ij} - \frac{y_i}{\mathbf{i}'\mathbf{y}}\mathbf{i}'\mathbf{M}_{.j}\right] \tag{7}$$

where $\mathbf{M}_{.j}$ denotes the elements of the j^{th} column of **M**. After some rearrangement, we obtain:

$$R_{ij} = \frac{\mathbf{i}'\mathbf{M}_{.j}}{\mathbf{i}'\mathbf{y}}\left[\frac{M_{ij}}{\mathbf{i}'\mathbf{M}_{.j}} - \hat{y}_i\right] \tag{8}$$

that permits to identify the two elements in brackets that affect the sign of R_{ij}. If the share of the i^{th} account in the total multiplier effect ($M_{ij}/\mathbf{i}'\mathbf{M}_{.j}$) is greater than its initial income share ($\hat{\mathbf{y}}_i$), then a beneficial link is established from institution (or sector) *j* to institution *i*. In other words, the relative position of institution *i*, measured by its income share, is improved when an exogenous inflow affects institution *j*[15]. Thus, the elements of **R** capture the institutional asymmetries determined by the way the economic structure transmits income effects.

Several empirical implementations of transformations of the distribution matrix R have been suggested by Roland-Holst and Sancho (1992). First of all, a matrix of non-normalized effects **R*** can be calculated to obtain the value of the redistribution induced by an additional unit of exogenous inflow while total income is held constant at the initial level:

$$\mathbf{R}^* = [\mathbf{i}'\mathbf{y}]\mathbf{R} = \left\{\mathbf{I} - \left[\frac{\mathbf{y}}{\mathbf{i}'\mathbf{y}}\right]^{-1}\mathbf{i}'\right\}\mathbf{M} \tag{9}$$

where **R*** is a sign-preserving transformation of **R** and the elements of each column sum to zero as do those of the original matrix since only redistributive effects are accounted for. The sum of the positive elements of each column shows the extent to which income composition shifts, while the sign of each element indicates the direction of the change. Due to the nature of the matrix most off-diagonal elements are negative; positive elements indicate sectors with strong forward linkages such as food processing and agriculture.

It is interesting to compare alternative options of agricultural households income support. Table 4 has the same structure of Table 3, but in this case figures represent the elements of **R*** matrix instead of multipliers, so that the relative magnitude of income distribution effects can be readily assessed. It is self-evident that the more decoupled the adopted policy, the higher is the re-distributive impact: while in the case of an agricultural price support policy the total income distribution effect is only 0.184 euro per one euro of price increase, other income-oriented decoupled policies generates much higher distributive impacts (as much as four times higher in the case of a partially decoupled policy and more than five times in the case of a fully decoupled one).

Moreover, the disaggregation adopted in our SAM shows the relative 'sectoral consistency' of

[15] The ratio ($M_{ij}/\mathbf{i}'\mathbf{M}_{.j}$)/($\hat{\mathbf{y}}_i$) is similar to the Relative Distributive Measure (RDM) proposed by Cohen (1996). However, in RDM shares refer to total income or multiplier effect per institution type (that is, in the case of households to the total household income) while in the Roland-Holst and Sancho framework totals are calculated over all endogenous accounts.

distributive effects of each policy. To this purpose, Table 5 reports distributive impacts as percentage[16]. In the case of direct transfer to agricultural households, the nature itself of the proposed policy determines a perfect targeting of the distributive effect on the relevant institutional sectors. The other two policies are characterized by similar profiles on the incomes of agricultural households, improving more the position of higher income ones.

Vice versa, the impact of the three policies on non-agricultural households is more contrasted. The income effect of price support policies concentrates the worsening of income position on lower income classes (46.7% of total distributive effects), whilst the other two policy options concentrate the worsening on higher income non-agricultural households (more than one half of total). Therefore, this could be another justification of CAP reform switching to decoupled policies: besides the usual efficiency-based critics to price support schemes, there is also a strong equity-based justification for abandoning these policies, since through multiplier effects they impact negatively the income position of poorer households, in agricultural as well as non-agricultural sectors.

Finally, we computed also the elasticities of distributive effects, i.e. the relative importance of the effect to the initial position of the relevant institutional sector[17]. Table 6 figures show an increasingly strength of distributive effects moving from price support to more decoupled policy interventions. This can be explained with the relative 'proximity' of the exogenous shock to the household as the policy option becomes more decoupled: the income effect of price support policies reach the households after the transmission of impacts through the whole economic system circular flow, while the income effect of direct income support schemes hits the households more directly. As expected, in the case of completely decoupled measures, the value of elasticities is higher the lower the income class of the household targeted.

6. CONCLUSIONS

This paper analyzes the distributive effects of alternative agricultural policy interventions. The analysis has been carried out deriving a SAM of the Italian economy from pre-existing models and disaggregating it in order to focus the analysis on agriculture. This is the first example of using a SAM framework to analyze agricultural policy issues in Italy.

From the methodological point of view what is novel, as compared to similar foreign studies, is the method of disaggregation. In fact, the distinction between agricultural and non-agricultural households is usually done building a bi-regional SAM on the basis of the location of institutions, i.e. rural-urban (Roberts, 1998 and 2000). However, this does not fit the Italian development pattern, characterized by no spatial segregation of economic activities. Therefore, the disaggregation was carried out with reference to the 'main' income source approach (Eurostat, 1995), i.e. agricultural

[16] Figures in table 5 are elements of the matrix of redistribution shares that is obtained dividing each element of **R*** by the sum of positive elements of the corresponding column. The generic element of this matrix is given by:

$$R_{ij}^{**} = \frac{R_{ij}^{*}}{\frac{1}{2}\sum_{i}\left|R_{ij}^{*}\right|}.$$

[17] The generic element (E_{ij}) of the elasticity matrix is given by the ratio of the percentage change in the income of the endogenous institution *i* to the percentage change of the exogenous accounts *j*:

$$E_{ij} = \frac{R_{ij}^{*}}{y_i} \bigg/ \frac{dx_j}{x_j}.$$

household sector contains only those households for which farming is the main source of income. Moreover, factor accounts have been disaggregated to enucleate incomes accruing to self-employed agricultural labor from other self-employed incomes: this allowed to estimate income flows from agriculture to non-agricultural households and vice versa.

Two types of analysis were carried out: (*i*) a multiplier analysis, that shed light on the distributive 'structure' of Italian agriculture, and (*ii*) a simulation of the distributive impacts of alternative agricultural policies.

'Fully' decoupled agricultural household income supporting schemes (transfers to agricultural households) are the most equitable interventions and determine a perfect targeting of the distributive effect to the relevant institutional sectors.

'Partially' decoupled income supporting interventions, as the ones implemented under the current CAP, are more effective than others in indirectly (i.e., through multiplier effects) generating positive impacts on the income of agricultural households: this is likely so because subsiding specific factors (such as land and livestock) increases the income of non-agricultural household (part-time and pluri-activity farming income) and eventually their consumption.

Agricultural price support interventions show less desirable effects in terms of their distributive impacts. They are less effective as agricultural income-increasing policies and their distributive impacts are biased against poorer households both in agricultural and non-agricultural sectors.

These results, though interesting, need a few words of caution because, being our SAM derived using indirect methods, it shares the same limits of the transaction table from which it has been derived. For instance, it lacks the account of firms. It is true that being the purpose of the study the analysis of distributive effects in agriculture and being Italian agriculture dominated by family farms, this limit does not seem too constraining, but extending our SAM to the above mentioned accounts would have provided a more realistic picture of the structure of the Italian economy. Another improvement could be the disaggregation of factor earnings accounts to enucleate land rents: again, in this case too, the indirect methodology used in the study did not allowed for such an improvement. Finally, a more realistic mimic of consumption behavior would have proved useful. Our SAM is characterized by average consumption propensities, but this means that marginal and average expenditure are equal in our model: such shortcoming could be addressed by substituting marginal for average propensities, but this would have required the estimation of a specific model.

Acknowledging these limits does not mean, however, that the preliminary results we have presented are not useful in (*i*) confirming the usefulness of SAM as a framework for agricultural policy analysis, and (*ii*) discriminating among relative effectiveness of alternative agricultural policies in term of their own income distribution impacts.

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Table 1. SAM Multiplier Decomposition for Agriculture, Italy (1990)

	Effects				
	Direct	Intra-group	Inter-group	Extra-group	Total
Sectors					
Agriculture and fishery	1.000	0.420	0.146	0.000	1.567
Other productive sectors	0.000	0.895	1.761	0.000	2.655
Factors					
Agricultural self-employed labour	0.000	0.000	0.000	0.270	0.270
Other self-employed labour	0.000	0.000	0.000	0.237	0.237
Employed labour	0.000	0.000	0.000	0.514	0.514
Capital	0.000	0.000	0.000	0.398	0.398
Households[a]					
Agricultural, income class I	0.000	0.000	0.000	0.030	0.030
Agricultural, income class II	0.000	0.000	0.000	0.049	0.049
Agricultural, income class III	0.000	0.000	0.000	0.163	0.163
Others, income class I	0.000	0.000	0.000	0.145	0.145
Others, income class II	0.000	0.000	0.000	0.251	0.251
Others, income class III	0.000	0.000	0.000	0.752	0.752
Total	1.000	1.315	1.907	2.810	7.032

[a] The household income classes are the following: I) less than 27 m ITL (13,944 €); II) 27-45 m ITL (13,944-23,240 €); III) more than 45 m ITL (23,240 €)

Table 2. SAM Multipliers on Household Incomes for Different Production Sectors, Italy (1990)

	Agricultural HHs			Non Agricultural HHs		
	Class I	Class II	Class III	Class I	Class II	Class III
Agriculture and Fishery	0.030	0.049	0.163	0.145	0.251	0.752
Real estate services	0.012	0.018	0.057	0.274	0.439	1.351
Food products and beverages	0.010	0.017	0.055	0.123	0.215	0.642
Hotels and restaurants	0.009	0.015	0.049	0.157	0.268	0.808
Transport, storage, communication	0.006	0.011	0.032	0.153	0.279	0.810
Trade services	0.006	0.010	0.032	0.159	0.275	0.837
Financial Intermediation	0.006	0.010	0.031	0.146	0.259	0.751
Leather and footwear	0.006	0.010	0.030	0.123	0.218	0.643
Public Administration	0.006	0.010	0.029	0.126	0.247	0.669

Table 3. Household Income Nominal Multiplier of Different Agricultural Policies, Italy (1990)

	Support measures				
			Agricultural HHs incomes		
Households	Agricultural prices	Agricultural self-empl. incomes	Class I	Class II	Class III
Agricultural, income class I	0.030	0.102	1.005	0.004	0.003
Agricultural, income class II	0.049	0.166	0.008	1.007	1.005
Agricultural, income class III	0.163	0.561	0.026	0.021	0.017
Others, income class I	0.145	0.081	0.071	0.060	0.056
Others, income class II	0.251	0.139	0.122	0.104	0.098
Others, income class III	0.752	0.431	0.363	0.309	0.290
Total	1.391	1.479	1.595	1.505	1.469

Table 4. Re-Distributive Effects of Different Agricultural Policies (Absolute Values), Italy (1990)

Households	Support Measures				
	Agricultural prices	Agricultural self-empl. incomes	Agricultural HHs incomes		
			Class I	Class II	Class III
Agricultural, income class I	0.021	0.092	0.994	-0.006	-0.007
Agricultural, income class II	0.036	0.152	-0.007	0.993	-0.008
Agricultural, income class III	0.127	0.523	-0.015	-0.017	0.979
Others, income class I	-0.086	-0.165	-0.194	-0.190	-0.188
Others, income class II	-0.067	-0.200	-0.244	-0.241	-0.239
Others, income class III	-0.031	-0.402	-0.535	-0.538	-0.537
Total	0.184	0.767	0.994	0.993	0.979

Table 5. Re-Distributive Effects of Different Agricultural Policies (Percentage Values) Italy (1990)

Households	Support measures				
	Agricultural prices	Agricultural self-empl. incomes	Agricultural HHs incomes		
			Class I	Class II	Class III
Agricultural, income class I	11.29	12.00	100.00	-0.60	-0.66
Agricultural, income class II	19.50	19.78	-0.69	100.00	-0.86
Agricultural, income class III	69.21	68.22	-1.49	-1.75	100.00
Others, income class I	-46.71	-21.53	-19.54	-19.15	-19.20
Others, income class II	-36.59	-26.07	-24.52	-24.28	-24.41
Others, income class III	-16.69	-52.40	-53.77	-54.22	-54.88

Table 6. Re-Distributive Effects of Different Agricultural Policies (Elasticities), Italy (1990)

Households	Support measures				
	Agricultural prices	Agricultural self-empl. incomes	Agricultural HHs incomes		
			Class I	Class II	Class III
Agricultural, income class I	0.007	0.029	0.315	-0.002	-0.002
Agricultural, income class II	0.006	0.027	-0.001	0.176	-0.001
Agricultural, income class III	0.010	0.043	-0.001	-0.001	0.080
Others, income class I	-0.038	-0.072	-0.085	-0.083	-0.082
Others, income class II	-0.017	-0.051	-0.063	-0.062	-0.061
Others, income class III	-0.004	-0.053	-0.070	-0.071	-0.070