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Cahiers d'économie et sociologie rurales, n° 77, 2005

Benedetto ROCCHI *, Donato ROMANO *, Gianluca STEFANI *

Impacts redistributifs de différentes politiques agricoles : analyse pour l'Italie à partir d'une matrice de comptabilité sociale

Résumé – En utilisant une matrice de comptabilité sociale adaptée à l'économie italienne et au secteur agricole en particulier, une analyse des effets multiplicateurs et des impacts redistributifs de différentes politiques sectorielles a été menée.
Les principaux résultats sont les suivants : (i) le découplage complet du soutien aux revenus agricoles se révèle être l'option la plus équitable, car elle offre la possibilité de déterminer les secteurs institutionnels cibles des effets recherchés ; (ii) les formes de soutien partiellement découplé, telles celles qui sont mises en place dans le cadre de la Politique agricole commune avant la révision à mi-parcours, sont plus efficaces que les autres en raison de leur action par l'intermédiaire des effets multiplicateurs ; (iii) les politiques de soutien par les prix se révèlent avoir des effets redistributifs pervers au détriment des ménages à bas revenu des secteurs agricole et non agricole.

Mots-clés : matrice de comptabilité sociale, répartition du revenu, Politique agricole commune

Distributive impacts of alternative agricultural policies: A SAM-based analysis for Italy

Summary *– This paper assesses the distributive impacts of alternative agricultural policies in a SAM (social accounting matrix) framework. A SAM of the Italian economy has been properly modified in order to focus on agriculture. In doing so, a new method for disaggregating the institutional sectors and the production factors in a SAM framework has been proposed. Two types of analysis have been carried out: (i) a multiplier analysis, and (ii) an assessment of the distributive impacts of different sector policies.*
The main results can be summarised as follows: (i) 'fully' decoupled agricultural household income supporting schemes (transfers to agricultural households) are the most equitable interventions and determine a perfect target of the distributive effect on the relevant institutional sectors; (ii) 'partially' decoupled income supporting interventions, such as the ones implemented under the CAP before the Mid Term Review, are more effective than others (i.e., through multiplier effects) in indirectly 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 (SAM), income distribution, Common Agricultural Policy*

* *Department of Agricultural and Resource Economics, University of Florence, P.le delle Cascine 18, 50144 Florence (Italy)*
e-mail: benedetto.rocchi@unifi.it
donato.romano@unifi.it
gianluca.stefani@unifi.it

A NEW FRAMEWORK of the Common Agricultural Policy (CAP) has come into force at the beginning of 2005: The so-called Mid Term Review represents a fundamental step from the 'traditional' CAP that was mainly grounded on price support, towards a more decoupled system of direct payments to farmers. Since the 1992 McSharry reform, the rationale for a progressive decoupling of agricultural policy has been widely discussed and substantially accepted for several reasons. First of all, the shifting towards a system of decoupled direct payments to farmers was meant as a tool to keep support and stabilise farmers' income, while providing incentives for agricultural competitiveness (OECD, 2002). In recent years further arguments have been proposed in favour of more decoupled policies from the point of view of their effectiveness in terms of income transfers. Income support has gained prominence among agricultural policy objectives, the relative efficiency of alternative schemes of income transfers from taxpayers to farmers have became a relevant criterion for policy assessment [1]. More decoupled measures could increase the income transfer efficiency of agricultural policy, while improving the targeting of support to the relevant institutional sector (*i.e.* agricultural households). Finally, a third argument for adopting a system of direct payments derived from the international commitment of the EU in the current round of negotiations under the WTO. In the last decade, the agricultural support under the CAP has been reshaped in order to be classified as much as possible within the 'green box' of the Agriculture Agreement of the Uruguay Round.

However, the acceptability of farm support has been increasingly challenged. On one hand, the failure of WTO negotiation in Cancun showed that for many developing countries the absolute level of support must be reduced, rather than operating a mere 'box switching' towards less distorting measures (Josling, 2003). On the other hand, the EU enlargement showed that there is a need for better targeted policies in order to promote the convergence between very different agricultures. Moreover, in a context of tightening EU budget, the burden of supporting agricultural incomes requires better justification on the ground of equity criteria.

Despite its general focus towards decoupled payments, the Mid Term Review allows a greater flexibility in the application of CAP measures at a national level, both in terms of the level of decoupling (partial *vs* totally decoupled schemes) and of the allocation to different groups of farmers (flat rate *vs* historical entitlement schemes). It is likely that different options imply different effects from a distributive point of view. Therefore, a framework to assess the distributive impacts of alternative agricultural policies would seem to be very welcome.

This article presents the main results of an exercise aimed at assessing the distributive impacts of agricultural policies characterised by a different degree of decoupling in a Social Accounting Matrix (SAM) framework. The Italian agricultural system is used as a case study, modifying a SAM of the Italian economy to analyze the distributive flows within the economy, with emphasis on agriculture.

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[1] For example, OECD (2003) estimates show that even in the case of subsidies to factor use, as it was the case for area payments under Agenda 2000, the efficiency of income transfer to farmers was less than 50% of intervention costs.

The number of studies that analyse the linkages between agriculture and the rest of the economy using a SAM framework has noticeably increased over the recent years. A SAM can be used as a basis for an economy-wide model with several appealing features. It represents a very general accounting model, which subsumes all possible 'real-life' national accounting systems [2]. Moreover, the SAM framework is characterised by great flexibility in depicting the flows within the economy [3]. Therefore, building a SAM is often the first step towards the economic analysis of both sector and economy-wide issues as well as of the interactions between a sector and the whole economy, because the resulting model is theoretically consistent as well as 'fine-tuned' with respect to the needs of empirical analysis. As a consequence in the last decade the analysis of agriculture using a SAM framework has received a growing attention, both in less and more developed countries (Pyatt and Round, 1985). This paper, though in the same methodological vein (Stone, 1985; Roberts and Russell, 1996), proposes a new way for disaggregating the institutional sectors and the production factor accounts aiming at analysing income distribution within the economy, with special emphasis on the agricultural sector.

The paper is structured as follows. The next section presents a brief overview of a novel SAM analysis as applied to agriculture in developed economies. Then, we introduce the features of the model used in this analysis. The model will then be used to carry out a multiplier analysis as well as some policy simulations with emphasis on the distributive effects of alternative sector policies. Finally, we summarize the main findings and discuss further developments.

Social accounting matrices for the analysis of distributive issues in developed agricultures

The analysis of the agricultural sector of less developed country (LDC) economies through SAMs is quite widespread, 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 agriculture in more developed economies. However, in the last decade, following the seminal work of Adelman and Robinson (1986), several studies focussing on agriculture of developed countries have been published: this review will focus on these recent contributions, with a particular emphasis on distributive issues.

Several studies use the SAM to analyse the structural interdependencies between the agricultural sector and the rest of the economy and/or the estimates of sector policy

[2] In the last revision of the System of National Accounts (United Nations *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 the 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 purposes.

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

impacts. In these studies, particular effort is usually devoted to the building of the database through the extension of input-output tables which accounts for distributive flows in the economy. This operation is carried out with different degrees of completeness and detail, given the availability of relevant information. Many studies apply indirect techniques for the estimate of regional tables from national ones (Bernat and Johnson, 1991; Leatherman and Marcoullier, 1996; Waters *et al.*, 1999; Holland, 1999), while in others, as those carried out by Roberts (1998, 2000), complete bi-regional models which are built and used to analyse the rural-urban spillover effects in particular regions. SAM based models are used to investigate the linkages between agriculture and the rest of the economic system (Roberts, 1995), the impact of change in the overall economy on a particular subset of firms (Cardenete and Sancho, 2004), and the economic base of rural areas (Roberts, 2003).

Social accounting matrices are also used to assess the potential distributive effects of sectoral policies. In Roberts and Russell (1996) 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 distribution were also disaggregated into five income classes. Hypothesising different exogenous shocks on the economy, the study showed how the SAM framework could have been used to simulate the impact of agricultural policies. The potential distributive effects of sectoral policies were also analysed in two studies concerning the forestry sector. A SAM of McCurtain county, in Oklahoma, was used to analyse the impact of intensive timber production (Marcoullier *et al.*, 1995). The model was built with a specific classification of institutional sectors, *i.e.* households were divided by income level and a four-item classification for the firms of the timber production chain was adopted. Another SAM model was employed to analyse the distributive effects of alternative policies for timber management in Alberta (Alavapati *et al.*, 1999). Finally, Nokkala and Kola (1999) analysed the impacts of structural and agricultural policies in rural areas with reference to two Finnish provinces with different economic structures, using specific SAM-based models. The authors considered three different scenarios in the evolution of CAP: extension to the next period of the current support level, Agenda 2000 reform, and the shift to a non-cohesion structural policy. The comparison of outcomes for the two regions highlighted the potential conflict between policy making at a local level and the European-wide CAP framework.

Common features of all these studies are that the estimation databases were pursued through non-survey methods to break down more aggregated models and that all studies focused on the agricultural production sector following either one of the following disaggregation strategies: a) they introduce a more detailed classification of agricultural business in the inter-industry part of the SAM; b) they build up bi-regional urban-rural models.

Moreover, no specific disaggregation is provided for the household sector, which is usually partitioned by income classes. In particular, households are not classified by the sector of activity they represent but the main source of income. This severely constrains the analysis of the distributive impacts of sectoral policies. In fact, if agricultural households and their distribution by income levels are not explicitly represented in the model, the effects of alternative measures on their income can only be inferred by relying on secondary information. This could be difficult if the distribution of farming households by income level is different from the distribution of households in the overall economy.

In principle, urban-rural models can overcome this problem in so much so agricultural households can be mapped into the 'rural' region. Unfortunately, this is not the case for Italy where development patterns are often characterised by a spatial mix of agricultural and non-agricultural activities in rural areas [4] (Saraceno, 1992).

As this study deals with the distributive impacts of different agricultural policy packages, an alternative disaggregation strategy has been pursued focussing on the breakdown of the household sector into agricultural and non-agricultural households rather than on the disaggregation of the agricultural industry. This means that, while the assessment of the distributive effects of agricultural policies on target households will be fully accounted for, a more fine-tuned modelling of sectoral policy interventions (*i.e.* cereals, milk, etc.) is prevented. As a consequence, only three policy packages – characterised by progressively increasing decoupling – are considered: a price support intervention, an 'Agenda 2000'-type reform, and a direct income support scheme.

The model

A SAM is basically a representation of the circular flow within an exchange economy in a matrix form. While an input-output matrix captures only interdependencies between sectors in a disaggregated production account, a SAM accounts for the interrelationships among production activities, production factors, income, consumption and capital formation.

Each row of the SAM shows the receipts for a specific sector while the corresponding column lists the sector expenditure. We can find several types of accounts in the rows of the matrix: a) production activities, b) factors of production, c) institutions' current accounts, 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 totals must balance. The economic meaning of this balancing condition is that: a) costs must be equal to revenues in each production sector; b) expenditure must be equal to income for each institutional actor; c) total saving must be equal to total investments plus financial capital accumulation.

[4] The process of economic development in Italy has been – as compared to other industrialised countries – highly specific and more spatially differentiated. As a consequence, rural areas do not only play the classical function of foodstuff production, but they have evolved as mixed economies (diffused industrialisation). Therefore, the rural/urban dichotomy does not seem to be consistent with the agricultural/non agricultural dichotomy as the Italian countryside is characterised by increasingly diversifying economic activities.

The model used in this work is based on a SAM of the Italian economy properly modified to better represent distributive flows generated by agricultural production activities. Details on the nature of the data set and on the data sources are reported in the Appendix. In this section, we will discuss only (i) the criteria adopted to make the model suitable for the analysis of distributive issues, and (ii) how to close the model for analytical purposes.

One fundamental objective of the study was to disaggregate the income account of **agricultural** households, *i.e.* households whose main source of income is farming. For this purpose, a major issue is that the exact definition of the relevant institutional sector is needed. Standard accounting rules suggest that a household must be classified as agricultural according to the prevalence of the agricultural share of its income (Eurostat, 1996). But this would rule out a large number of part-time and pluri-active agricultural households that significantly contribute to the sector in the framework of multifunctional agriculture. These two views are taken following the two different definitions of agricultural households in the economic accounting literature (Hill, 1998), namely: a) a 'narrow' definition based on the main source of income [5], and b) an 'extended' definition that considers "agricultural" households to be all households where, at least, some income is derived from agriculture self-employment [6].

In this study, according to the Eurostat (1996) approach, the narrow definition is used [7]. However, as the original dataset already provided a distinct account for self-employed agricultural labour earnings, the final SAM model used in this study can explicitly keep records of income flows from agriculture (as a production sector) **both** to agricultural and non agricultural households. This is particularly suitable to the Italian context where a non-trivial share of agricultural activities is characterized by pluri-activity and/or part-time farming.

Table 1 reports the agricultural value added and its distribution to factor earnings according to the final SAM used in the analysis. Agricultural gross production amounts to 44.8 billion € including net subsidies of 545 million €. Subtracting intermediate consumption (15.7 billion €) yields a value-added amount of 29.2 billion € that is distributed to different factors of production. Interestingly

5 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 source, will not be included in the agricultural household sector*" (Hill, 1998, p. 372).

6 The Total Income of Agricultural Household Survey of the Italian Statistical Institute (ISTAT, 1998) adopted this extended definition.

7 As in the Total Income of Agricultural Households Survey, the prevalence criterion has been applied to the income of the 'reference person' which for practical reasons is defined as "*… the head of the family or the larger contributor to the family budget*" (Eurostat, 1996, p. 12). The reference person criterion yields a complete and consistent classification but results in occupation groups of households only partially overlapping with those resulting from the 'total household income criterion': in particular a household can be considered as agricultural even if the main source of total income is not from self-employed agricultural activity. For a thorough discussion of the classification of agricultural households, see Eurostat (1996).

self-employment, which accounts for 39% of all agricultural incomes, accrues for one fourth (2.7 billion €) of production activities carried out as a secondary income source. This peculiar feature of Italian agriculture is also reflected by the distribution of agricultural income between different groups of households. Table 2 shows that about 30% of the income of self-employed farmers accrue to households in which farming is only a secondary source of income. Moreover, agricultural income flows are markedly concentrated towards the richer third (more than 50% of total considering both agricultural and non-agricultural households).

Table 1. **Value added formation and distribution for agriculture, Italy, 1998 (millions €)**

Output	44 832
Net subsidies on product	*545*
Intermediate consumption	15 660
Value added (at market prices)	29 171
employed labour income	*7 140*
self-employed labour income (main activity)	*8 523*
self-employed labour income (secondary activity)	*2 720*
Rents	*10 788*

Source: Caramaschi, 2004

Table 2. **Distribution of agricultural income between households**

Households	**Agricultural self-employed labour income**	
	(abs. val.)	**(%)**
Agricultural, income class I	848	7.5
Agricultural, income class II	2.707	24.1
Agricultural, income class III	4.357	38.7
Others, income class I	59	0.5
Others, income class II	1.222	10.9
Others, income class III	2.052	18.2
Total	**11.245**	**100.0**

Source: own results

A breakdown of incomes of agricultural households is shown in table 3. Not surprisingly, agricultural self-employment income accounts for the greatest share (52.9%) in the budget. Other relevant sources of income are employees' incomes (12.3%) and other types of income (33.5%) that include transfers from Government and firms.

The modified SAM provides the basis for a model that can be used in policy simulation exercises. As the main objective of this work was the evaluation of the distributive effects of agricultural policies, and given the single-country nature of the dataset, the model has been closed considering the accounts for government, capital and rest of the world as exogenous. This leads to a (40×40) matrix of direct coefficients **B** (*i.e.*, 28 activities, 4 factors, and 8 institutions) made up by five sub-matrices as follows:

$$\mathbf{B} = \left[\begin{array}{c:c:c} \mathbf{A} & & \mathbf{C} \\ \hdashline \mathbf{V} & & \\ \hdashline & \mathbf{D} & \mathbf{S} \end{array}\right]$$

where $\mathbf{A}_{(28 \times 28)}$ is the matrix of input-output coefficients, $\mathbf{V}_{(4 \times 28)}$ is the matrix of value added coefficients per each factor, $\mathbf{D}_{(8 \times 4)}$ is the matrix of distribution coefficients of factor earnings to institutions, $\mathbf{C}_{(28 \times 8)}$ is the matrix of average consumption propensities [8] of institutions and $\mathbf{S}_{(8 \times 8)}$ is the matrix of transactions between institutions, while the remaining are zero blocks.

Table 3. **Agricultural households income composition, Italy, 1998 (millions €)**

Agricultural self-employed labour	7 912
Non agricultural self-employed labour	187
Employed labour	1 838
Other	5 007
Total	**14 945**

Source: Caramaschi, 2004

Given the matrix **B**, the model can be represented in a compact form as a set of equations representing the balance of the accounts for the endogenous components (production activities, factors of production, households and firms):

$$\mathrm{y} = \mathbf{B}\mathrm{y} + \mathbf{x}, \qquad (1)$$

where **x** is the vector of nominal income for endogenous accounts (output of production activities, factor earnings and available income for institutions), and y is the vector of exogenous flows (foreign exchange, savings and capital formation, transactions between institutions and the government). The solution of the system

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

(1) maps the vector **x** of exogenous component of the system to the vector **y** of totals through the matrix $\mathbf{M} = (\mathbf{I} - \mathbf{B})^{-1}$ of SAM multipliers:

$$\mathbf{y} = (\mathbf{I} - \mathbf{B})^{-1}\, \mathbf{x}. \tag{2}$$

Likewise to the standard input-output model, the column totals of the matrix **M** represent the total impact on different endogenous components of the model given a unity exogenous inflow towards the relevant sector. Given the closure imposed on the model, in the case of production activities the SAM, the total multiplier is equivalent to the Keneysian multiplier of output.

Multiplier analysis

A simple methodology for the decomposition of the SAM multipliers can be used to get some insights into the distributive structure of the Italian agricultural system, as it emerges from the model. Following Stone (1985), the multiplier matrix **M** can be decomposed into four additive terms according to the following relation:

$$\mathbf{M} = \mathbf{I} + \mathbf{M}_1 + \mathbf{M}_2 + \mathbf{M}_3, \tag{3}$$

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

a) direct effects on a given account (represented by the identity matrix **I**),

b) indirect effect due to linkages within the same group of accounts [9] ('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-ones [10] ('inter-group' effect), and

d) impact of the initial shock on the groups of accounts other than the initial-one ('extra-group' effect).

Table 4 shows the decomposition of the total multiplier of the agricultural sector (*i.e.*, the sum of the agricultural column of **M**). One euro of exogenous demand for the agricultural sector generates an increase of total output due to the inter-industry multiplier effect of 0.548 € (0.123 € in the agricultural sector itself and 0.425 € in non-agricultural sectors). The production increase generates new income inducing more consumption which in turn stimulates new output and so on, resulting in a total inter-group effect equal to 1.070 €. Finally the extra-group effect amounts to 2.848 €.

Final impacts on factor earnings and on household incomes (extra-group effects) provide a 'first-glance' assessment of distributive consequences of an increase in demand for agricultural products. Agricultural self-employed income receives an inflow roughly equal to 27% of the initial shock. More interesting is the analysis of

[9] The sum of direct and intra-group effects for productive sectors is equal to the Leontievian multiplier in standard input-output analysis.

[10] The sum of direct, intra-group and inter-group effects for productive sectors is equal to the Leontievian-Keynesian multiplier in the standard input-output model.

the impacts on the households' accounts: the income increase is higher in non-agricultural households than in agricultural ones. Moreover it is consistently higher the richer the household is.

Table 4. **SAM multiplier decomposition for agriculture, Italy, 1998**

	Effects			
	Direct	Intra-group	Inter-group	Extra-group
Sectors				
Agriculture and fisheries	1.000	0.123	0.037	0.000
Other product sectors	0.000	0.425	1.033	0.000
Factors				
Employed labour	0.000	0.000	0.000	0.391
Agricultural self-employed labour	0.000	0.000	0.000	0.266
Other self-employed labour	0.000	0.000	0.000	0.145
Capital	0.000	0.000	0.000	0.445
Households				
Agricultural, income class I	0.000	0.000	0.000	0.021
Agricultural, income class II	0.000	0.000	0.000	0.065
Agricultural, income class III	0.000	0.000	0.000	0.108
Others, income class I	0.000	0.000	0.000	0.132
Others, income class II	0.000	0.000	0.000	0.251
Others, income class III	0.000	0.000	0.000	0.487
Non-corporate firms	0.000	0.000	0.000	0.417
Corporate firms	0.000	0.000	0.000	0.119

Source: own results

The model can be also used to analyse the distributive effects of the impacts generated on household incomes by different exogenous shocks. This can be done by comparing the coefficients of sub-matrices in **M** corresponding to institutions accounts. 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), a) price support schemes exogenously increase the nominal value of output, as a consequence can be simulated as a shock on final demand of the relevant sector; b) income supporting schemes linked to the level of factor use can be simulated by increases of factor earnings, and c) fully decoupled household income supporting schemes (*i.e.*, transfers to agricultural households) can be simulated in a SAM framework as a positive shock on the accounts referring to household groups. Agenda 2000 'partially' decoupled measures (before the Mid Term Review), 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.

Table 5 reports the results of such an exercise. The splitting between agricultural and non-agricultural households is crucial to single out the impacts of household income supporting schemes implemented as part of **sectoral** policies. The figures of table 5 show that the transmission mechanisms of income support schemes are quite diversified. First of all, as expected (OECD, 2003), price support schemes show a lower income transfer efficiency: indeed for such a support measure the impact on agricultural incomes accounts only for 18% of total, while the other policies show percentages between 45% and 68%. The higher impact on agricultural households is given by a direct exogenous injection into the account itself, *i.e.*, a fully decoupled income support scheme. However, if we focus on the indirect impact generated by the circular redistribution process, we can notice that partially decoupled measures (*i.e.*, Agenda 2000 type) 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 effect, of direct income transfers: directly supporting the income of poorer households determines an incremental impact of 1.114 *vis-à-vis* 0.477 impact on richer households. This effect can be related to the greater share of income saved by richer households increasing the leakages of the system. In both cases, however, **non**-agricultural households capture most of the additional impacts generated by multiplier effects.

Table 5. **Household income nominal multiplier of different agricultural policies, Italy, 1998**

Households	Support measures				
	Agricultural prices	Agricultural self-empl. incomes	Agricultural HHs incomes		
			Class I	Class II	Class III
Agricultural, income class I	0.021	0.077	1.004	0.002	0.001
Agricultural, income class II	0.065	0.244	0.009	1.004	0.003
Agricultural, income class III	0.108	0.395	0.018	0.008	1.006
Others, income class I	0.132	0.096	0.174	0.090	0.075
Others, income class II	0.251	0.268	0.304	0.157	0.131
Others, income class III	0.487	0.500	0.607	0.311	0.261
Total	**1.064**	**1.581**	**2.114**	**1.572**	**1.477**

Source: own results

Distributive effects of single support measures

While multiplier estimates provide an assessment of the total effect induced by an external shock on a specific economic account, and multiplier decomposition helps to explain how the total effect accumulates through the economic system, neither provides an analysis of the changes induced in the distributional structure of the economy. It is interesting to analyse how the multiplier effects are distributed across households by type (agricultural *vs* non-agricultural) and by income tertile so that the equity implications of alternative policies can be assessed.

Alternative techniques have been proposed to analyse the distributive 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, based on absolute value calculation of redistributive effects, has been preferred, as it is more suitable for the aims of this analysis.

To illustrate this approach, let us consider again the standard linear model of endogenous income determination:

$$\mathrm{y} = (\mathbf{I} - \mathbf{B})^{-1}\ \mathbf{x} = \mathbf{M}\mathbf{x}. \tag{4}$$

As the analysis focuses on distributive effects a normalized measure of income shares ($\hat{\mathbf{y}}$) is required:

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

where $\mathbf{y}$ is the vector of incomes for the group of institutions considered in the analysis and $\mathbf{i}'$ is the unit vector. Following Roland-Holst and Sancho (1982), the change in $\mathbf{y}$ induced by an exogenous injection $d\mathbf{x}$ is given by:

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

where $\mathbf{M}^{inst}$ $(n \times m)$ is the submatrix of $\mathbf{M}$ corresponding to income multipliers of the n institutions considered for m different exogenous shocks [11] (on sectors, factors and institutions) [12]. $\mathbf{R}(\mathbf{x})$ can be interpreted as a **redistribution matrix** that shows the impact of a change in $\mathbf{x}$ on the account income shares $\mathbf{y}$. The expression for a generic element of $\mathbf{R}$ is:

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

where $\mathbf{M}_{.j}^{inst}$ denotes the elements of the j-th column of $\mathbf{M}^{inst}$. After some rearrangement, it can be written in the form:

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

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[11] That is, exogenous injection on a given account.

[12] Obviously the same analysis can be applied also on sectors and factor of production accounts; for the former, figures in **R** express relative variations in **output** shares.

which singles out the two elements in brackets that affect the sign of $\mathbf{R}_{ij}$. If the share of the *i*-th account in the total multiplier effect $(M_{ij}^{inst}/i'\mathbf{M}_{.j}^{inst})$ for the group of institutions is greater than its initial income share (y_i), then a positive link is established with the *j*-th institution (or sector, or factor of production) to the *i*-th institution. In other words, the relative position of the *i*-th institution, measured by its income share, is improved when an exogenous inflow affects the account represented in the *j*-th column [13]. Thus, the elements of **R** capture the institutional asymmetries determined by how the economic structure transmits income effects.

Several empirical implementations of transformations of the distribution matrix **R** have been suggested by Roland-Holst and Sancho (1982). First of all, a matrix of non-normalised effects **R*** can be calculated to yield the value of the redistribution induced by an additional unit of exogenous inflow while total income is held constant at its initial level:

$$\mathbf{R}^* = \mathbf{i}'\mathbf{y}\mathbf{R} = \{\mathbf{I} - \hat{\mathbf{y}}\mathbf{i}'\}\mathbf{M}^{inst} \tag{9}$$

where **R*** is a sign-preserving transformation of **R** and the elements of each column sum to zero, as in the case of the original matrix, since only redistributive effects are accounted for. The sum of the positive elements of each column shows the overall extent of income redistribution, while the sign of each element indicates the direction of the change.

It is interesting to compare alternative income support options for agricultural households. Table 6 has the same structure as table 5, but in this case the figures represent the elements of the **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 greater its impact on income distribution: while in the case of an agricultural price support policy the total income re-distribution effect is only 0.179 € for every one euro price increase. Income-oriented decoupled policies generate 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 model shows the relative distributive 'sectoral consistency' of each policy. To this purpose, distributive impacts are shown as percentages in table 7 [14]. In the case of direct transfers to

[13] Cohen (1996) assessed the redistributive impacts in a similar way, through the so-called Relative Distributive Measure, *i.e.* the ratio $\mathbf{RDM} = (M_{ij}^{inst}/\mathbf{i}'\mathbf{M}_{.j}^{inst})/(\hat{y}_i)$: when $RDM_{ij} > 1$, exogenous shocks on the j-th institution affects income share of the i-th institution in a positive way.

[14] Figures in table 7 are elements of the matrix of redistribution shares that are obtained by dividing each element of $\mathbf{R}^*$ by the sum of absolute values of the relevant column. The generic element of this matrix is given by: $R_{ij}^{**} = R_{ij}^*/\frac{1}{2}\sum_i |R_{ij}^*|$.

agricultural households, the nature of the proposed policy determines a perfect targeting of the distributive effect on the relevant institutional sectors. The other two policies are characterised by similar profiles for the incomes of "agricultural" households, improving more the position of higher income households.

Table 6. **Re-distributive effects of different agricultural policies (absolute values), Italy, 1998**

Households	Support measures				
	Agricultural prices	Agricultural self-empl. incomes	Agricultural HHs incomes		
			Class I	Class II	Class III
Agricultural, income class I	0.019	0.074	1.000	– 0.001	– 0.002
Agricultural, income class II	0.061	0.239	0.001	0.998	– 0.003
Agricultural, income class III	0.099	0.382	0.000	– 0.005	0.994
Others, income class I	– 0.084	– 0.225	– 0.256	– 0.229	– 0.225
Others, income class II	– 0.077	– 0.219	– 0.348	– 0.327	– 0.324
Others, income class III	– 0.018	– 0.251	– 0.397	– 0.435	– 0.440
Total	0.179	0.695	1.001	0.998	0.994

Source: own results

Table 7. **Re-distributive effects of different agricultural policies (percentages), Italy, 1998**

Households	Support measures				
	Agricultural prices	Agricultural self-empl. incomes	Agricultural HHs incomes		
			Class I	Class II	Class III
Agricultural, income class I	10.6	10.6	99.8	– 0.1	– 0.2
Agricultural, income class II	34.1	34.4	0.1	100.0	– 0.3
Agricultural, income class III	55.4	55.0	0.0	– 0.5	100.0
Others, income class I	– 46.6	– 32.3	– 25.5	– 23.0	– 22.6
Others, income class II	– 43.0	– 31.6	– 34.8	– 32.8	– 32.6
Others, income class III	– 10.3	– 36.1	– 39.7	– 43.6	– 44.3

Source: own results

Alternatively, the impact of the three policies on non-agricultural households is more distinct. The income effect of price support policies is more concentrated on lower income classes (– 46.6%), while the other two policy options focus more on higher income non-agricultural households. Therefore, this is another justification to reform the CAP switching to decoupled policies: besides the usual efficiency-based criticisms of price support schemes, there is also a strong equity-based justification for abandoning these policies, as they impact negatively the income position of poorer households, in agricultural as well as non-agricultural sectors, through multiplier effects.

Finally, we computed the elasticities of distributive effects, *i.e.* the importance of the effect relative to the initial position of the relevant institutional sector [15]. The figures in table 8 show progressive distributive effects as we move from price supports to more decoupled policy interventions. This can be explained by taking into account the fact that the exogenous shock is 'closer' 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, while the income effect of direct income support schemes influence 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 targeted household.

Table 8. **Re-distributive effects of different agricultural policies (elasticities), Italy, 1998**

Households	Support measures				
	Agricultural prices	Agricultural self-empl. incomes	Agricultural HHs incomes		
			Class I	Class II	Class III
Agricultural, income class I	0.002	0.009	0.119	0.000	0.000
Agricultural, income class II	0.004	0.014	0.000	0.058	0.000
Agricultural, income class III	0.005	0.018	0.000	0.000	0.048
Others, income class I	– 0.027	– 0.072	– 0.082	– 0.074	– 0.072
Others, income class II	– 0.018	– 0.050	– 0.079	– 0.075	– 0.074
Others, income class III	– 0.002	– 0.031	– 0.049	– 0.054	– 0.054

Source: own results

Distributive effects of alternative policy mixes

Thus far the analysis has focused only on single policies, *i.e.* price support schemes, 'partially' decoupled agricultural household income supporting schemes (such as the ones

[15] The generic element (E_{ij}) of the elasticity matrix is given by the ratio of the percentage change in the income of the i-th endogenous institution to the percentage change of the j-th exogenous accounts: $E_{ij} = \frac{R^*_{ij}}{y_i} / \frac{dx_j}{x_j}$.

under the CAP before the Mid-Term Review), and 'fully' decoupled agricultural household income supporting schemes (transfers to agricultural households). In reality, agricultural policies are a mix of different measures as in the case of CAP, where interventions characterised by a different degree of decoupling are still operating in many common market organisations. It is therefore interesting to analyse the distributive impacts of different policy mixes. Operationally, this means pre-multiplying the multiplier matrix, $\mathbf{M}$, or the redistribution matrix, $\mathbf{R}^*$, by a vector whose elements are all zeros except the ones that refer to the accounts which are impacted by the measures that enter into the policy mix: in this case, the non-zero elements are weights that reflect the relative importance of each measure in the policy mix.

To build these vectors representing the alternative policy options, the 'Producer Support Equivalent' (PSE) estimates were used. In the appendix some details about data used and hypotheses assumed to represent policy mixes are given.

Two different estimates of the shares of different measures in the total support to Italian agriculture were calculated with reference to years 1990 and 1998, as years which are representative of the situations before and after the McSharry reform. In the early 1990s, 88% of total support was characterised by price support schemes and only 12% by partially decoupled measures; after the McSharry reform the former dropped to 74%, while the latter accounted for one quarter of total support [16]. Table 9 shows the income support impacts of the proposed policy mixes in the two reference years in terms of multipliers as well as re-distribution [17]. The multiplier effect is largely unaffected by the change towards a more decoupled policy mix, while it translates into a significantly higher re-distribution to agricultural households, from 0.241 € to 0.313 €. Moreover, the change implies a less regressive distributive impact on non-agricultural households: the relative loss of low-income non-agricultural households decreases from – 41.69% to – 38.38%.

An alternative analysis, based on the notion of 'distributive neutrality' of a given policy mix, could contribute to a better understanding of distributive implications of alternative policy mixes. For example, consider a policy mix based only on fully decoupled direct payments to households (both agricultural and non-agricultural) with the same redistributive impacts on households incomes as the actual one. This means that we have to find a vector $\mathbf{p}$ representing the 'substituting' direct payments to households such as

$$\mathbf{r}^{a} = \mathbf{p}\mathbf{R}_{h}^{*}, \tag{10}$$

[16] However, given the output composition of the Italian agriculture, the change in relative weights was less important than at EU level, where on average the McSharry reform determined an increase of partially decoupled support share from 8.5% up to 33% of total support.

[17] Recalling that the simulation consists in pre-multiplying two alternative policy mixes to the same multiplier matrix, the outcome of the exercise cannot by no means be interpreted as a comparison between two actual impacts in two different years. Figures referred as 1990 in table 9 represent the redistributive impact that the pre-McSharry policy mix would have had if adopted with the structure of the economy in 1998.

where $\mathbf{r}^a$ is the redistributive impact vector of the actual policy mix and $\mathbf{R}_h^*$ is the (6×6) income redistribution matrix (absolute values) for exogenous injections to different households groups. The policy mix represented by $\mathbf{p}$ can be defined as **neutral** from a distributive point of view, *i.e.* shifting supporting measures from the actual mix to $\mathbf{p}$ would have no distributive impacts.

Table 9. **Households' income multiplier and re-distributive effects of the CAP for different years (absolute and percentage values)**

	1990			1998		
	Income Multiplier	Re-distribution effects		Income Multiplier	Re-distribution effects	
		(€)	(%)		(€)	(%)
Agricultural, income class I	0.028	0.026	10.59	0.036	0.033	10.61
Agricultural, income class II	0.086	0.082	34.19	0.111	0.107	34.25
Agricultural, income class III	0.143	0.133	55.23	0.183	0.173	55.14
Others, income class I	0.128	– 0.100	– 41.69	0.123	– 0.120	– 38.38
Others, income class II	0.253	– 0.094	– 39.06	0.255	– 0.114	– 36.42
Others, income class III	0.488	– 0.046	– 19.25	0.490	– 0.079	– 25.20
Total	1.126	0.241		1.198	0.313	

Source: own results

Table 10 shows four different scenarios built according to such a 'distributive neutrality' criterion. They are vectors of exogenous injections to households' income accounts with the same overall distributive impacts of the original policies as row headings. As $\mathbf{R}_h^*$ is singular by construction [18], the four vectors were estimated via numeric optimisation. These estimates are not unique solutions, but this does not represent a limitation as, for the purpose of our analysis, it is sufficient to determine **at least** one 'substituting' solution for each policy mix [19].

The figures in table 10 are consistent with the analysis carried out in the previous section. For example, price supporting schemes are clearly distorted in favour of non-

[18] Indeed, from equation (9), $\hat{\mathbf{y}}$ being a vector of income shares, by definition $\sum_i y_i = \mathbf{i}'\mathbf{y} = 1$. As a consequence is $\mathbf{y}\mathbf{i}'$ a square matrix with unit eigenvalue and eigenvector $\mathbf{i}$. This implies that the matrix into braces of equation (9) is singular.

[19] With infinite solutions, the problem represented in equation (10) has some interesting analytical features: in fact, since $\mathbf{R}_h^*$ is a $(n \times n)$ matrix with rank equal to $(n-1)$, the set of solutions for (10) is an affine space of dimension 1. This means that all solutions are on a straight line in the n–dimensional space, i.e. given two solutions, all other solutions are linear combinations of the first two solutions. This implies, in our case, that the ratio between payments directed to two given groups of households is the same in all possible solutions.

Table 10. **Fully decoupled support policy mix with neutral distributive effects (€)**

Substituted support measures	Equivalent direct income payments to households						
	Agricultural			Others			Total
	Class I	Class II	Class III	Class I	Class II	Class III	
Agricultural prices	0.019	0.062	0.101	0.001	0.044	0.141	0.369
Agricultural self-empl. incomes	0.075	0.241	0.388	0.013	0.119	0.196	1.032
CAP mix 1990	0.026	0.083	0.135	0.000	0.050	0.143	0.438
CAP mix 1998	0.034	0.108	0.176	0.004	0.064	0.156	0.542

Source: own results

agricultural households (more than 50% of 'substituting' direct payments to households accrue to non agricultural ones) and higher-income classes. In terms of income support, partially decoupled measures are much more effective than price support schemes, while the substituting vectors that refer to pre- and post McSharry reform lie in between.

Finally, table 11 compares the total multiplier effects of the four supporting policy mixes with those of the substituting mixes with neutral distributive impacts [20] in order to assess what can be called a 'multiplier efficiency'. A simple index of this efficiency is the ratio between the household income increase due to multiplicative effects and the value of the required exogenous injections, as shown in the last row of table 11. Price support schemes show the lowest efficiency with only 6% of income increase due to multiplier effects: this means that if used through different supporting schemes with the same distributive impacts, the same amount of resources will result in much higher **total** impact on household incomes. Conversely, partially decoupled measures show a multiplier efficiency with the same order of magnitude of the relevant substituting supporting vector. Finally, the columns referring to the policy mixes in early and late 1990s consistently show that the more decoupled a policy is, the higher its multiplier efficiency. However, the multiplier efficiency of pre- and post-McSharry CAP are lower than the ones accruing from policies based only on direct payments to households.

Discussion

The main results of the analysis can be summarized as follows: 'Fully' decoupled income supporting schemes (direct transfers to agricultural households) are the most equitable interventions (*i.e.* non regressive) and determine a perfect targeting of the

[20] It must be emphasised that the four policy mixes imply different levels of total exogenous injections across the different income classes, since they are neutral **only** with reference to distributive impacts.

distributive effect on the relevant institutional sectors. 'Partially' decoupled income supporting interventions, such as the ones implemented under the CAP before the Mid-Term Review, are more effective than others in indirectly (*i.e.*, through multiplier effects) generating positive impacts on the income of agricultural households: this is likely to be so because the subsidies to specific factors (such as land and livestock) increase the income of non-agricultural households (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 a policy to support the income of agricultural households and their distributive impacts are biased against poorer households both in agricultural and non-agricultural sectors. Each policy shows a different 'multiplier efficiency', that is if the same amount of resources would be used through a different supporting scheme ('neutral' from a distributive point of view), they will result in a different **total** impact on households' incomes. Among the support schemes actually implemented the CAP, only partially decoupled policies show a multiplier efficiency comparable to the one of fully decoupled policies; conversely, price support schemes have the lowest efficiency.

Table 11. **Impact on households' incomes of alternative support measures, original and fully-decoupled substitutive mix comparison**

	Support measures							
	Agricultural prices		Agric. self-empl. incomes		CAP mix 1990		CAP mix 1998	
	Original	Substitut.	Original	Substitut.	Original	Substitut.	Original	Substitut.
Agricultural, income class I	0.021	0.020	0.077	0.077	0.028	0.027	0.036	0.035
Agricultural, income class II	0.065	0.063	0.244	0.245	0.086	0.085	0.111	0.110
Agricultural, income class III	0.108	0.104	0.395	0.396	0.143	0.139	0.183	0.180
Others, income class I	0.132	0.035	0.096	0.107	0.128	0.040	0.123	0.054
Others, income class II	0.251	0.103	0.268	0.284	0.253	0.120	0.255	0.150
Others, income class III	0.487	0.259	0.500	0.524	0.488	0.283	0.490	0.328
Total	1.064	0.585	1.581	1.632	1.126	0.694	1.198	0.857
Total exogenous injections	1.000	0.369	1.000	1.032	1.000	0.438	1.000	0.542
Multiplicative efficiency	6.4%	58.5%	58.1%	58.1%	12.6%	58.4%	19.8%	58.3%

Source: own results

The driving forces of the re-distributive process emerging from the model can be traced back to two structural features of agriculture within the Italian economy, namely:

a) The distribution of agricultural income (table 2), that is most income from farming is directed towards richer households and a relevant share of agricultural production activities is managed as a secondary source of income by households whose overall income is often high;

b) The pattern of consumptions, which is differentiated between agricultural and non-agricultural households, with the latter showing a lower propensity to consume food and agricultural commodities under the same level of income.

These two features jointly contribute to determine multipliers of Italian agriculture and, consequently, to shape its re-distributive pattern. In fact, as a remarkable share of the sector's income is directed towards households with a lower propensity to consume agriculture or food industry goods, positive shocks on final demand, on agricultural prices and on the income of agricultural factors tend to increase the "*leakage of benefit from farming to the wider economy*" (Roberts, 1995, p. 509). For instance, consider the effect of partially decoupled measures of support. They can be represented as an exogenous positive flow directly increasing the income of agricultural self-employed labour. The new demand induced by this shock is for a great extent directed towards sectors other than agriculture; this in turn leads to a second round of increases in incomes skewed towards non-agricultural/richer households; and so on. As a consequence the final distribution of the total increase of income generated in the economic system by the multiplicative process tends to make the relative position of agricultural/poorer household worse. This example highlights a second advantage of classifying households both at a level and **source** of income. This approach not only leads to a representation of beneficiaries of income support more suitable for the analysis of **sectoral** policies, but also the disaggregation of consumption patterns between agricultural and non-agricultural households, together with classification by income class, enhances the ability of the model to represent the multiplicative process generated by the circular flow in the economy.

However, the proposed model has two major limitations. First of all, its linearity. The derivation of the matrix of multipliers at the basis of the proposed analysis extends to all the endogenous accounts the assumption of fixed coefficients of expenditure that characterise the standard input-output model. The implied assumption of unity income elasticity of consumption appears to be questionable (Adelman and Robinson, 1986). As discussed above, the disaggregation of the average propensity to consume between agricultural and non-agricultural households probably reduces the shortcomings of this assumption. Nevertheless, a more accurate description of the impacts could be achieved substituting marginal for average propensity to consume, following the 'fixed price' approach proposed by Pyatt and Round (1979). As the income elasticity of demand for food and agricultural products decreases with income, the use of average propensity probably leads to an overestimate of the redistributive effects. This is especially true in the case of totally decoupled measures, as the correct representation of the first round of impacts directly depends on the consumption behaviour underlying the model coefficients. However the **direction** of re-distributive effects, which represent the main information that can be obtained from the model to assess the equity content of alternative policies, remains unaffected by the use SAM multipliers. Only the relaxation of other major restrictions implied by the 'fixed price' version of the model, that is price stability and constant returns to scale, would really change the nature of the results. However, this would only be possible within a different framework, *e.g.* a computable general equilibrium analysis.

A second major limitation depends on the level of aggregation of production activities. In the model, agriculture is represented by only one industry. This limitation suggests a particular caution in the interpretation of results referring to price support measures, which are simply represented as an exogenous positive shock on the aggregated agricultural sector: it is indeed the bias in the first round of impacts that affects the final results. All the more so because the assumptions on technology, implicit in any input-output model (although extended to distributive flows in this case), do not take into account any supply constraints. The combination of linearity and aggregation in modelling agricultural production activities could probably lead to an overestimate of impacts (Midmore, 1996). Moreover, the level of aggregation of agriculture doesn't allow for a more complete representation of alternative mixes of support measures, perfectly legitimate within the framework of mid-term review at national level. It is true that, as the purpose of the study was the analysis of distributive effects in agriculture and since Italian agriculture is dominated by family farms, this limit does not seem too constraining in this specific case. All the same, further disaggregation of these accounts would have provided a more realistic picture and a more detailed analysis (*e.g.* sub-sectoral policy simulations like cereals, milk, etc.) could have been carried out.

Two minor points to conclude this discussion of results. First, further improvement of the analysis could be carried out from the point of view of policy simulations: for example taking into account the increase in administrative and other implementation costs implied by more decoupled or direct payment schemes. In our analysis, the exogenous inflows representing support measures affected only accounts referring to agriculture, in the different phases of the process of income formation and distribution (sector, factor of production, institutions). Even if this approach allows for a more transparent comparison of the 'pure' re-distributive effect of different tools for supporting agricultural income, at the same time the resulting impacts can hardly be considered as an estimate of actual ones. The latter was not the objective of our analysis; nevertheless, the use of relevant information on the implementation costs of alternative measures could also affect the changes in the **relative** position of institutions.

Finally another way to improve the model could be a further improvement in the disaggregation of factor earnings. In our model, in order to achieve a suitable representation of distributive process linked to agriculture, both factor of production (agricultural self-employment labour) and institutions (agricultural households) have been disaggregated. However, a further disaggregation in the representation of factor earnings could probably improve the quality of results and the ability of the model to accurately depict the effect of different policy mixes. A natural candidate for this improvement is the identification of the rental value of land.

Conclusions

This paper analyses the distributive effects of alternative agricultural policy interventions using a SAM model of the Italian economy properly adapted to analyse the agricultural sector. From the methodological point of view what is novel in this study is the disaggregation of accounts for institutions. In fact, the distinction between agricultural and non-agricultural households has usually been done building a bi-regional SAM model based on the location of institutions, *i.e.* rural *vs* urban (Roberts, 1998 and 2000). However, this does not fit the Italian development pattern, which is not characterised by spatial segregation of economic activities. Instead the disaggregation was carried out with reference to the 'main' income source approach (Eurostat, 1996), *i.e.* only the households for which farming is the main source of income were considered as 'agricultural'. Moreover, the factor accounts were disaggregated to distinguish incomes accruing to self-employed agricultural labour from other self-employed incomes. Therefore, the SAM explicitly keeps records of income flows from agriculture to agricultural **and** non-agricultural households. This feature is particularly important in the context of countries like Italy, where most agricultural activities are characterised by pluri-activity and/or part-time farming.

Two types of analyses were carried out: (i) a multiplier analysis, to highlight the 'distributive structure' of Italian agriculture; and (ii) a simulation of the distributive impacts of alternative agricultural policies. The results of the analysis seem to provide another justification to reform the CAP by moving towards more decoupled policies as agreed by the EU Council on the Mid-Term Review meeting in June 2003: besides the usual efficiency-based criticisms to price support schemes, there is also a strong equity-based justification to move away from these policies, since through multiplier effects they impact negatively the income position of poorer households, in agricultural as well as non-agricultural sectors.

The main limitations of these results, which derive from the nature of the model, have been discussed. The SAM used in the analysis has some of the limits of the original model from which it has been derived. For example, the model does not allow the agricultural production account to be investigated in further detail. Besides the bias of aggregation deriving from the summing up in a single sector of technically different production activities, this feature severely constrains the representation of alternative policy mixes. A more realistic description of consumption behaviour would also have proved useful. Our SAM model is characterised by average consumption propensities, where marginal and average expenditure equate: this shortcoming could be addressed by substituting marginal for average propensities.

Acknowledging these limits does not mean, however, that the results we present here are not significant in (i) proving the usefulness of SAM as a flexible framework for agricultural policy analysis, and (ii) describing the relative effectiveness of alternative sector policies in terms of their income distribution impacts.

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APPENDIX

The model used in this study was built by modifying an experimental SAM of the Italian economy estimated with reference to year 1998 (Caramaschi, 2004). The original table was characterised by a very detailed breakdown of accounts (110 × 110) including an explicit representation of household accounts by equivalent income deciles, different tax accounts and several consumption accounts for both resident and non-resident consumers. Equivalent income is a *per capita* income that has been modified to account for the different weight of each household component in consumption: in estimating *per capita* income, each household member is weighted according to its position in the income formation of the family (1 being the weight of the head of the family, 0.7 that of other adult members and 0.5 the weight for children). The weights are consistent with a standard set of coefficients adopted by most EU member states in household income statistics (Eurostat, 1996). The main limitation of the original model was the representation of agriculture by only one consolidated account within the inter-industry part of the SAM. However, income from self-employment in agriculture was estimated as a distinct account among factor earnings.

The original SAM was modified to obtain a suitable model for agriculture policy simulation as follows. Firstly, the original table has been aggregated in order to obtain a 40 × 40 SAM including: 28 industries, 4 factors of production (employed labour, self-employed agricultural labour, self-employed non-agricultural labour, capital), 6 institutional sectors (low, medium and high income households, non-financial corporations, financial corporations and Government), 1 capital account, and 1 residual account (the rest of the world).

Subsequently, each of the three household accounts has been subdivided according to the main source of income that is agricultural *vs* non-agricultural (yielding a total of six household accounts). Disaggregated accounts for households were estimated following a downward approach, using microeconomic information to breakdown the aggregates of each income class. Consumption shares for agricultural and non-agricultural households for each income level were derived from the national household budget survey (ISTAT, 2000); income shares were derived from the Bank of Italy households' budget survey (Banca d'Italia, 2000). Using these shares, incomes and consumptions accruing to groups of households with different levels of income have been split between agricultural and non-agricultural ones. The equilibrium of the accounts for the resulting 6 groups of households (agricultural and non-agricultural low, medium and high income) has been obtained by adjusting figures referring to savings, the total of which remains unchanged.

To build vectors of impacts representing different policy mixes applied under the CAP, estimates of producer support have been used (OECD, 2003). OECD publishes PSE broken down according to different agricultural supporting interventions. Therefore, the first step of the analysis was the re-classification of the whole array of supporting measures into the three typologies considered in this study. In our analysis, price support measures include the following items of the OECD classification of support: market price supports, output-based payments, input-based payments (except the ones for fixed inputs); partially decoupled measures include: payments based on cultivated area/number of animals, payments based on the use of fixed inputs, payments based on input constraints; fully decoupled measures include: payment based on historic entitlements, payments based on overall farming income, national and sub-national payments.

Moreover, as PSE estimates are computed for the EU as a whole, the relative weight of different support measures reflects the composition of EU agricultural output. As a consequence they were adjusted to reflect the current structure of the Italian agricultural system: first, for each agricultural product (cereals, milk, meat etc.) the EU average compositions of PSEs in term of different support measures were calculated; then PSE composition for Italian agriculture were estimated as the average of EU sectoral PSE compositions weighted for the relative importance of each product in Italian agricultural output.

Finally, OECD data does not include PSE estimates for some important Italian agricultural products, like olive oil, wine, fresh vegetables and fruits. These products represent a non-trivial part of Italian agriculture, accounting for 40% of total agricultural output in 2001. This informative gap was filled using PSE estimates directly computed for Italy by Nucifora *et al*. (1997) for years 1989 through 1994.