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**MICROSIMULATION OF THE DISTRIBUTIONAL IMPACT
OF REFORMED FARM SUPPORT***

Supporting paper submitted by Italy

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Introduction

One of the objectives of the agricultural policies in developed countries is to ensure a fair standard of living to the agricultural community.

Given that for long time the comparison of incomes arising from agricultural production to those gained in off-farm sectors indicated farmers as a disadvantaged group, many countries have used agricultural policies, particularly in the form of commodity programs, to support farm earnings and in order to increase farmers ability to consume and to achieve an equitable standard of living.

The growth of diversification within the farm sector experienced during the past decades has contributed to modify the overall economic and social situation of the agricultural community, while making new problems arise for the policy analyst.

Given the increasing participation of agricultural family members in off-farm occupations and the greater incidence in the firm-farm income of sources different from agricultural receipts, for instance agro-tourism, it is no longer possible to rely on farm income as a proxy of the standard of living of the agricultural households. An alternative is to use the global income of agricultural households, that is the sum of all incomes, either from farming and non-farming activities, earned by the members of agricultural households. Though for the full assessment of the economic situation of farm households (Hill, 1996a), farm and household assets should be taken into account, in this study the attention is focussed only on household incomes.

In addition, it has been widely recognized that while the traditional farm problem, that is the persistence in the agricultural sector of incomes lower than those gained in the rest of the economy, has been overcome on average, still pockets of low income survive within the agricultural sector (Gardner, 1992). The first consequence of such an evidence is that the policy analyst needs new informational instruments that allow her to identify those individuals or households groups, within the agricultural community, which have a too low standard of living and who are potential beneficiaries of income redistributive rural and agricultural policies¹. In this respect microdata collected in household surveys are the best possible source of information. The second consequence is that new methodological tools are needed to select those policy measures that perform best in distributive terms.

Fiscal reform in agriculture is in the top of the agenda of the European Community policy makers. European fiscal reforms in agriculture are increasingly oriented towards a budget based reform which would have the invaluable advantage to be comparable across countries and across production sectors so that uniform taxation schemes can be applicable. Our micro-simulations are budget based in order to reproduce the feasibility of a future implementation of the reform. The main objective of the simulation is to evaluate the equity-efficiency trade-off incorporated

¹ In this respect the OECD (1999, 2003) has repeatedly invited countries to adopt informational instruments capable of guaranteeing a better identification of the potential beneficiaries and a better targeting of agricultural and rural policies.

in the scheme that have been proposed at the beginning of 2003 by the Ministry of Agriculture and to establish a social ranking between the old and new scheme.

The aim of this paper is to show how the analysis of the distribution of income can be used to identify those layers of the agricultural households who are disadvantaged, that is the beneficiaries of rural policy, and to assess the distributional impact of alternative policy measures. The rest of the paper is organized as follows: the first section reviews the tools used in the analysis of the distribution of income; the second section describes the data and provides the definitions of incomes used and the policy scenarios under analysis. The subsequent section presents the results that are summarized in the conclusive section along with our considerations about the social ordering of the fiscal policy prospects that have been evaluated.

Analysis of the distribution of farm, global and extended incomes for each scenario of fiscal reform

This section describes the distributive analysis of farm, global and extended incomes conditional upon the fiscal scenarios of interest. It first introduces the methods adopted in the analysis, then describes the main features of the data and discusses the results along with the related implications in terms of fiscal policy.

Methods

Incomes are reported at the household and per capita level. Per capita incomes attribute the same weight to each family member. This is a gross way to account for inter-household heterogeneity, but at this stage of the analysis we preferred to present the result in per capita terms not to incur in the error of choosing inappropriate equivalence scales. The analysis implicitly assumes an unitary model of the household where resources are distributed uniformly within the household.

The distributive analysis measures both the equity and poverty dimension of Italian agricultural incomes given the fiscal policy scenarios of interest. The analysis compares the measures of inequality and poverty associated with farm incomes obtained from the farming business, global incomes derived both from farming and from selling the household's members time in the off-farm labour market and in the household market and extended incomes which is obtained summing global incomes to the evaluation of the unpaid work for the household chores undertaken. This approach allows us to evaluate how the different household organizations generating the different income types can effectively cope with the risk of falling in a poverty trap or may reduce the relative distance across deciles of the distribution. Our micro-simulation experiment implement this comparison for the economic states described by the two selected fiscal policy scenarios which are ranked in terms of the highest level of social welfare achieved and the dominance relations across income distributions.

The measures used in the analysis are formally defined as follows.

Measures of Inequality and Polarization

Atkinson's Inequality Measure

The Atkinson's inequality measure starts from the additive social welfare function

$$W = \frac{1}{N} \sum_{i=1}^n \frac{x_i^{1-\varepsilon}}{1-\varepsilon}, \varepsilon \neq 1,$$

$$\ln W = \frac{1}{N} \sum_{i=1}^n \ln x_i, \varepsilon = 1,$$

where x is the per capita income, $N = 1, \dots, n$ is the number of people, and the parameter $\varepsilon \geq 0$ controls the degree of inequality aversion. The inequality measures then associated with the additive social welfare function are

$$I = 1 - \left[\frac{1}{N} \sum_{i=1}^n \left(\frac{x_i}{\mu} \right)^{1-\varepsilon} \right]^{\frac{1}{1-\varepsilon}}$$

when $\varepsilon \neq 1$, and

$$I = 1 - \prod_{i=1}^n \left(\frac{x_i}{\mu} \right)^{\frac{1}{N}}$$

when $\varepsilon = 1$. In our analysis the coefficient of aversion to inequality ε takes the value of $\varepsilon = \{0.5, 1, 2\}$ to control for the dependence of the results upon the researcher's subjective choice about society's dislike of inequity. Atella, Coggins and Perali (2003) have shown that in 1995 Italy's degree of aversion to inequality lies between a minimum and a maximum evaluation of aversion to inequality. Therefore, we adopt as the reference Atkinson's measure of inequality the index $I | \varepsilon = 1$.

The adopted measure of Polarization is obtained by constructing the ratio between the median of the highest and lowest percentile of the distribution.

Gini Coefficient

The Gini coefficient is obtained as the ratio to the mean of half the average over all pairs of the absolute deviations between people, and is derived as follow

$$G = \frac{1}{\mu N(N-1)} \sum_{i>j} \sum_j |x_i - x_j|,$$

where μ is the mean of the income. If N is large, the double sum can be expensive to calculate, thus an equivalent form is

$$G = \frac{N+1}{N-1} - \frac{2}{N(N-1)\mu} \sum_{i=1}^n \rho_i x_i,$$

where ρ_i is the rank of individual i in the distribution of x , counting from the top so that the richest has rank 1.

The Gini coefficient is often defined from the Lorenz curve (Figure A1.1), a cumulative frequency curve that compares the distribution of income with the uniform distribution that represents equality.

The Gini coefficient is independent of the mean, therefore if all incomes were doubled, the measure would not change. It is also independent of the population size, for instance if the population were to change, the measure of inequality should not change, *ceteris paribus*. Moreover, it satisfies symmetry and the Pigou-Dalton transfer sensitivity. The latter criterion states that the transfer of income from rich to poor reduces inequality. On the other hand, the Gini coefficient is not decomposable or additive across groups, that is the Gini of the total sample is not equal to the sum of the Gini for the subgroups of the population. Finally, the Gini coefficient suffers from the presence of a high proportion of negative values of x . For this case, Chen, Tsaur, and Rhai (1982) and Berrebi and Silber (1985) suggest to use the adjusted Gini index that mitigate the possibility of overstating inequality when the data contain a large number of observation with negative values. In our analysis we deal with this problem imputing total expenditure to negative values of global and extended incomes, and zero to net incomes.

Measures of Poverty

Headcount Ratio

The headcount ratio is defined as the fraction of the population below the poverty line. Denoting the poverty line by z , then the headcount ratio is

$$P_0 = \frac{1}{N} \sum_{i=1}^n 1(x_i \leq z),$$

where $1(\cdot)$ is an indicator function that takes the value of 1 if its argument is true and 0 otherwise. The sum of the indicators on the right-hand side of the equation is the number of people in poverty, so that P_0 is the fraction of people in poverty. This ratio is affected by the definition of the poverty line and does not measure the intensity of poverty experience by the poor.

Poverty Gap

The poverty gap is a per capita measure of the total deficit of individual welfare levels below the poverty line, indeed it is the sum of all the deficit divided by the population and expressed as ratio of the poverty line itself. Formally, it is defined as

$$P_1 = \frac{1}{N} \sum_{i=1}^n \left(1 - \frac{x_i}{z}\right) 1(x_i \leq z).$$

This function will be increased by transfers from poor to nonpoor, or from poor to less poor. However, transfers among the poor have no effect on measure of poverty.

Sen's Measure of Poverty

The Sen's (1976) measure is the average of the headcount and poverty gap measures weighted by the Gini coefficient of the poor

$$P_s = P_0 \left[1 - (1 - G^p) \frac{\mu^p}{z} \right],$$

where μ^p is the mean of x among the poor, and G^p is the Gini index of inequality among the poor, calculated by treating the poor as the whole population. Sen's measure shares the inconveniences of Gini's coefficient. First, both the two indexes are not differentiable. Moreover, Sen's measure cannot be used to decompose poverty into contributions from different subgroups.

Foster, Greer, and Thorbecke's (FGT) Measure of Poverty

This measure of poverty is a generalization of the headcount measure. For some positive parameter α , is defined as

$$P_\alpha = N^{-1} \sum_{i=1}^n \left(1 - \frac{x_i}{z}\right)^\alpha 1(x_i \leq z),$$

thus P_0 (the headcount) and P_1 (the poverty gap) are special cases corresponding to values for α of 0 and 1, respectively. When α is 2 then the FGT measure of the severity of poverty is obtained.

Dagum, Gambassi, and Lemmi's Measure of Poverty

The measure of poverty suggested by Dagum, Gambassi, and Lemmi (1992) is obtained by a number of poverty measures, formally is defined as

$$P_{DGL} = P_0 \left[I + D + a | G^p - bG^{np} | \right],$$

$$a > 0, 0.5 \leq b \leq 0.8,$$

where G^p is the Gini coefficient of the poor, and G^{np} of the nonpoor. I is the income gap defined as ratio between the average income gap of the poor and its poverty line

$$I = \frac{\sum_{i=1}^g g_i}{q} \frac{1}{z},$$

where q is the proportion of poor. Finally, D is the directional income distance ratio

$$D = \frac{\bar{x}^{np} - \bar{x}^p}{\bar{x}^{np} + \bar{x}^p},$$

where \bar{x}^r is the mean of the income, np stand for the proportion of nonpoor and n for the proportion of people below the poverty line.

Ranking of Economic States

Abbreviated Social Welfare Function and Stochastic dominance

In our analysis we have used the following abbreviated social welfare function for ranking two different economic states introduced by Sen (1976):

$$V(\mu, G) = \mu \exp(-G),$$

where V is a function of the mean of per capita income and G is the Gini's coefficient of inequality. This measures summarizes both equity, as captured by the mean, and efficiency information, as described by the Gini measure of income dispersion.

Economic states are also ranked using first and second degree stochastic dominance results.

The next section illustrates the main features of the data.

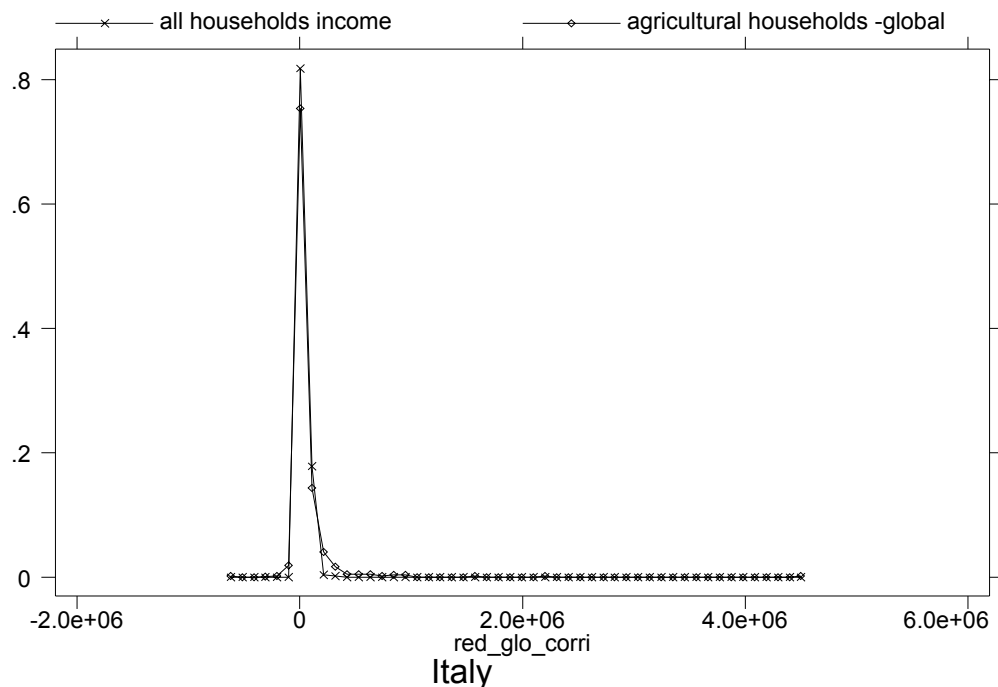
Data: Incomes of the Italian farm-households

The data set used in this study is the Survey of the socio-economic characteristic of Italian agriculture conducted in 1995 by Ismea. This is the most comprehensive survey of micro data on income of Italian agricultural households. It covers information about the farm (comparable to those collected by the RICA-FADN surveys), socio-economic status of the farm household, labor allocation, inter and intra-household transfers, family decision making, labour and non-labour incomes and time budget of the family members. The nation-wide survey collected data in 1996 on a sample of 1881 farms, representative of the whole Italian agricultural sector, 1777 of which are family farms.

Table 1 shows the descriptive statistics of the data used in the analysis. Incomes have been adjusted to account for negative observations by rescaling negative observations to zero. Incomes refer to the tax scheme A with the tax on productive activities and tax scheme B which does not contemplate it. In general, global incomes are higher than total expenditures recorded in the Ismea sample.

In figure 1 the density functions of global incomes of agricultural households and that of the global incomes for the entire economy collected by the Bank of Italy are reported. Both the distributions are unimodal, have similar means and the tail spike off towards zero in both directions. In addition, a significant level of symmetry can be observed. The similarities observed between the two samples allow us to make comparisons between the agricultural community and the overall economy. The Ismea survey, though, has the big advantage to provide the necessary information to calculate the farm income, as well as all the structural and economic data needed to calculate the balance sheet of the firm, to simulate the impact of policy measures and also to estimate the behaviour of the agricultural household in respect to production and consumption.

FIGURE 1: Kernel density of the overall and agricultural households



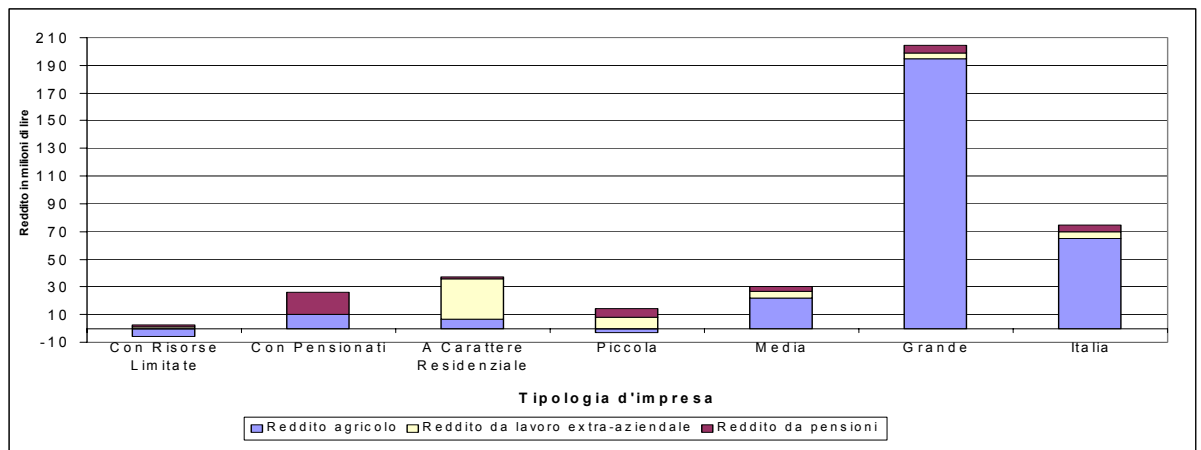
Sources of income by type of household farm. The data collected by the survey on agricultural households have been used, *inter alia*, to calculate the farm income by making use of information about gross receipts and cash expenses. In addition, the global household income has been calculated as the sum of the farm income and of the collected off farm incomes. Finally, by making use of information about the time budgets of the members of the family, the monetary value of the domestic work done by the family members has been estimated (Castagnini and Perali, 1999) and, by adding this estimate to the global income, the extended household income has been calculated.

As shown in figure 2 there are wide differences in the composition of the global household income among different types of farm households. The sign and the weight of the three types of income are highly differentiated among farm types. Regarding the weights assumed by the three components, one observes that the farm income represents the main share—negative in one case and positive in the other—of the global household income only in the firms with limited resources and in the medium and large commercial farms.

The distributive impact

In March 2003, the Italian Government has launched a reform of the fiscal regime that will be implemented starting from 2004. The plan is based on a major revision of the progressive income tax (IRPEF – Imposta sul Reddito delle Persone Fisiche) which represents the main source of revenue in the Italian tax system. The reform consists in the flattening of the personal income tax function, this tax will in future be based only on two rates (23% up to 100.000 euros; 33% over), and on the replacement of the credit system presently in use by a simplified structure of allowances, vanishing with

FIGURE 2: Composition of global income per type of farm household.



income, whose precise schedule has not been announced yet. In addition to the revision of the personal income tax function, the approved reform establishes the end of the tax on productive activity introduced in 1998 (IRAP - Imposta sul Reddito delle Attività Produttive).

In this paper we present some preliminary result about the distributional assessment of this fiscal reform on the agricultural sector community. Given the lack of information about the new structure of the progressive income tax, it is not possible at the moment to simulate the overall impact of the reform. The analysis takes into account only the removal of IRAP and its consequences on farm, global and extended income net of the progressive income tax codes presently in use. The results of the analysis are presented in tables from A2.1 to A4.3

Table 1 Descriptive Statistics, No. of Farms 1,777

Variables	Mean	Std. Dev.	Min.	Max.
Male head of hh	0.954		0	1
Age of head	51.122	13.0113	18	89
Family size	3.468	1.4617	1	11
No. of adults	2.945	1.2207	1	10
No. of children 0-5	0.111	0.3776	0	3
No. of children 6-14	0.245	0.5920	0	4
No. of children 15-17	0.117	0.3612	0	2
No. of children >18	0.693	0.9293	0	6
North	0.383		0	1
Centre	0.221		0	1
South	0.396		0	1
PC global income	21143.93	56510.55	-315.27	997827.20
PC extended income	18349.74	56442.00	-315275.40	997.83
PC net income	30730.07	56744.16	-303668.30	1002494.00
Adjusted PC global income – A	22083.34	51907.10	38.15	951315.70
Adjusted PC global income – B	22337.77	52620.66	38.15	968762.70
Adjusted PC extended income - A	30884.69	52469.00	76.83	955982.30
Adjusted PC extended income - B	31145.89	53176.16	76.83	973429.30
Adjusted PC net income – A	19839.31	51903.57	0	951109.70
Adjusted PC net income – B	20091.72	52620.02	0	968556.70
IRPEF98-f	2624.54	5336.68	-2500.66	59559.36
IRPEF-az-98	1219.44	2916.20	2.39	60377.36
ICI98	105.63	466.82	0	7524.75
IRAP19	926.63	3155.29	0	87234.93
VAT	4767.78	16820.78	-78649.77	491493.10

Note: Negative values have been adjusted replacing total expenditure for global and extended incomes, and zero for net incomes. Incomes and taxes are in thousands of lire per year. Letters A and B are for the two tax regimes.

Results

The microsimulations compare farm net incomes and global incomes conditioning on geographic location, family types, farm-household types, and farm types by common market organization. The main results can be outlined as follows.

Farm net incomes are more unequal in the south of Italy and in households formed by singles and couples with children; farm net incomes are more evenly distributed in large and very large farms and in farms producing mainly grapes and fruits in general. Fiscal scenarios A and B are not significantly different (Tables 2 and 3).

Household global incomes are more equalized across geographical regions but the distance between singles and couples with children remains marked; the levels of inequality across household types in terms of household global incomes do not vary significantly while differences remains significant across farm types characterized by the main production as expected since the differences comes from the farm rather than the household source of income. Fiscal scenarios A and B are virtually the same since the change in fiscal scenario affects farm not household incomes (Tables 4 and 5).

Figure 3 and 4 show that the shadow income earned for the unpaid domestic activities has an important effect in equalizing incomes across the North and the South and making extended incomes of the farm-households in central Italy even more equal.

Table 6 and 7 show that if farm income were the single source of income, then poverty by all measures of poverty would be very high in rural Italy, especially in the South. The tax exemption incorporated in scenario B would not be effective in ameliorating the situation. The risk to be trapped into poverty is particularly high for Limited-resource, Retirement, Residential/lifestyle, Farming occupation/lower sales and for farm types producing mainly olives which are mostly located in the South of Italy.

Inspection of Table 8 and 9 reveals that the opportunity to work off-farm has a strong equalizing effect independently of the fiscal innovation proposed by the government. The household with limited resources do not move out of poverty because do not have the capability to take advantage of outside opportunities. This group of rural household is the most vulnerable. The risk of poverty is larger in the centre and south of Italy and is everywhere well above the national average risk and level of poverty. Poverty levels in terms of extended incomes are presented in Tables 10 and 11. In agricultural household incomes from domestic activities have a strong equalizing effect. The organizational model of the rural household is very effective in reducing the risk of poverty.

Table 12 reports the levels of the abbreviated social welfare functions of global incomes. In the north the level of welfare of agricultural households is much higher but more polarized. Similarly in households whose head is a single at the expenses of lower equality. As it is reasonable to expect large farms outperform the small ones. Higher level of welfare are attained by those farms producing vegetables, beef, dairy and flowers. Table 13 shows that the fiscal scenario without the tax on productive activities is a preferable economic states for all farm and household types. The effect is slightly mitigated when considering global incomes.

TABLE 2 Inequality Measures for Adjusted PC Net Income - Scenario A. No. of Farms 1,777

	% of farms	Coef. Of var.	S. d. log	Gini	Atkinson		
					0.5	1	2
Total sample		2.616	1.408	0.729	0.498	0.423	0.856
<i>Macro region</i>							
North	0.38	1.835	1.441	0.689	0.915	0.462	0.771
Centre	0.22	1.414	1.156	0.626	0.831	0.336	0.666
South	0.40	3.605	1.431	0.748	0.972	0.548	0.928
<i>Family typology</i>							
Singles	5.35	2.722	1.332	0.796	0.942	0.323	0.880
Singles with relatives	6.87	2.468	1.484	0.757	0.932	0.551	0.858
Singles with children	3.49	1.869	1.175	0.664	0.888	0.443	0.775
Singles with relatives & children	1.91	3.039	2.085	0.859	0.927	0.820	0.900
Couples	17.33	1.727	1.245	0.673	0.886	0.287	0.748
Couples with relatives	4.5	1.365	1.385	0.625	0.763	0.399	0.648
Couples with children	46.26	2.260	1.455	0.711	0.948	0.501	0.836
Couples with relatives & children	14.29	1.590	1.296	0.670	0.831	0.459	0.716
<i>Farm typology</i>							
Limited-resource	7.93	1.673	1.004	0.753	0.829	-0.676	0.735
Retirement	2.48	1.513	1.457	0.708	0.759	0.356	0.691
Residential/lifestyle	2.36	1.403	0.984	0.652	0.796	0.001	0.658
Farming occupation/lower sales	12.94	1.730	1.203	0.699	0.885	0.046	0.749
Farming occupation/higher sales	45.86	1.689	0.919	0.523	0.956	0.179	0.740
Large	24.54	0.848	0.854	0.431	0.644	0.184	0.418
Very large	3.88	1.097	0.795	0.440	0.751	0.281	0.542
<i>Farm type by Common Market Organization</i>							
Cereal	30.22	1.657	1.398	0.680	0.859	0.453	0.733
Industrial crops	2.48	1.667	1.180	0.657	0.853	0.346	0.731
Vegetable	8.78	2.595	1.425	0.744	0.944	0.568	0.870
Fruit	9.23	1.605	1.405	0.669	0.886	0.300	0.719
Olives	3.71	2.461	1.261	0.785	0.913	0.310	0.856
Grapes	9.68	1.318	1.018	0.621	0.769	0.169	0.633
Floriculture	2.87	2.706	1.681	0.842	0.925	0.619	0.878
Beef	5.63	1.458	1.131	0.637	0.789	0.346	0.678
Dairy	17.84	1.687	1.357	0.635	0.902	0.490	0.739
Other livestock	9.57	3.779	1.703	0.820	0.961	0.689	0.934

TABLE 3 Inequality Measures for Adjusted Per Capita Net Income – Scenario B. No. of Farms 1,777

	Coef. of var.	S. d. log	Gini	Atkinson		
				0.5	1	2
Total sample	2.619	1.435	0.729	0.497	0.434	0.874
<i>Macro region</i>						
North	1.840	1.459	0.689	0.915	0.468	0.772
Centre	1.412	1.155	0.625	0.831	0.336	0.665
South	3.607	1.466	0.748	0.972	0.561	0.929
<i>Family typology</i>						
Singles	2.725	1.437	0.796	0.942	0.371	0.880
Singles with relatives	2.473	1.623	0.757	0.933	0.581	0.858
Singles with children	1.876	1.170	0.664	0.889	0.441	0.776
Singles with relatives & children	3.046	2.090	0.859	0.927	0.821	0.900
Couples	1.730	1.301	0.672	0.887	0.317	0.749
Couples with relatives	1.365	1.387	0.626	0.763	0.399	0.648
Couples with children	2.254	1.469	0.711	0.947	0.507	0.835
Couples with relatives & children	1.588	1.297	0.670	0.831	0.459	0.715
<i>Farm typology</i>						
Limited-resource	1.673	1.006	0.754	0.829	-0.675	0.735
Retirement	1.518	1.461	0.709	0.761	0.359	0.693
Residential/lifestyle	1.401	1.081	0.652	0.794	0.067	0.657
Farming occupation/lower sales	1.727	1.204	0.699	0.885	0.046	0.748
Farming occupation/higher sales	1.676	0.945	0.522	0.956	0.187	0.737
Large	0.848	0.923	0.430	0.645	0.208	0.418
Very large	1.099	0.793	0.440	0.752	0.280	0.543
<i>Farm type by Common Market Organization</i>						
Cereal	1.658	1.398	0.680	0.859	0.453	0.733
Industrial crops	1.663	1.181	0.657	0.852	0.347	0.730
Vegetable	2.589	1.416	0.743	0.944	0.565	0.869
Fruit	1.601	1.448	0.668	0.885	0.333	0.718
Olives	2.449	1.337	0.784	0.912	0.350	0.855
Grapes	1.314	1.026	0.620	0.767	0.182	0.632
Floriculture	2.703	1.636	0.841	0.926	0.609	0.877
Beef	1.467	1.153	0.637	0.793	0.361	0.681
Dairy	1.690	1.396	0.636	0.903	0.499	0.740
Other livestock	3.783	1.768	0.820	0.962	0.704	0.934

TABLE 4 Inequality Measures for Adjusted Per Capita Global Income – Scenario A. No. of Farms 1,777

	Coef. of var.	S. d. log	Gini	Atkinson		
				0.5	1	2
Total sample	2.351	1.462	0.662	0.377	0.623	0.882
<i>Macro region</i>						
North	1.686	1.551	0.635	0.906	0.615	0.740
Centre	1.170	1.249	0.530	0.788	0.460	0.577
South	3.228	1.419	0.678	0.968	0.634	0.912
<i>Family typology</i>						
Singles	2.543	1.598	0.750	0.937	0.729	0.865
Singles with relatives	2.289	1.708	0.704	0.926	0.698	0.839
Singles with children	1.721	1.356	0.621	0.876	0.557	0.745
Singles with relatives & children	2.927	2.010	0.833	0.923	0.860	0.893
Couples	1.443	1.313	0.576	0.859	0.516	0.675
Couples with relatives	1.174	1.270	0.541	0.725	0.467	0.576
Couples with children	2.042	1.468	0.648	0.942	0.612	0.806
Couples with relatives & children	1.388	1.365	0.591	0.805	0.531	0.657
<i>Farm typology</i>						
Limited-resource	0.878	0.893	0.441	0.654	0.299	0.434
Retirement	0.993	1.169	0.502	0.631	0.414	0.491
Residential/lifestyle	0.661	0.727	0.356	0.490	0.206	0.299
Farming occupation/lower sales	0.867	1.162	0.460	0.634	0.389	0.428
Farming occupation/higher sales	1.352	1.084	0.439	0.942	0.360	0.646
Large	0.801	1.153	0.407	0.623	0.344	0.390
Very large	1.084	0.844	0.436	0.747	0.294	0.537
<i>Farm type by Common Market Organization</i>						
Cereal	1.443	1.397	0.598	0.838	0.549	0.675
Industrial crops	1.271	1.281	0.531	0.798	0.468	0.612
Vegetable	2.434	1.530	0.701	0.939	0.670	0.855
Fruit	1.331	1.416	0.572	0.854	0.534	0.638
Olives	1.796	1.613	0.647	0.871	0.643	0.761
Grapes	0.998	1.146	0.488	0.690	0.404	0.498
Floriculture	2.577	1.691	0.802	0.921	0.797	0.867
Beef	1.293	1.441	0.576	0.759	0.535	0.623
Dairy	1.585	1.338	0.595	0.894	0.532	0.715
Other livestock	3.516	1.550	0.771	0.958	0.747	0.925

TABLE .5 Inequality Measures for Adjusted Per Capita Global Income - Scenario B. No. of Farms 1,777

	Coef. of	S. d. log	Gini	Atkinson		
	var.			0.5	1	2
Total sample	2.356	1.459	0.662	0.377	0.623	0.881
<i>Macro region</i>						
North	1.692	1.548	0.636	0.906	0.615	0.741
Centre	1.170	1.246	0.530	0.789	0.460	0.577
South	3.234	1.416	0.678	0.968	0.634	0.913
<i>Family typology</i>						
Singles	2.548	1.600	0.750	0.937	0.730	0.865
Singles with relatives	2.296	1.710	0.704	0.927	0.699	0.839
Singles with children	1.729	1.356	0.621	0.878	0.557	0.746
Singles with relatives & children	2.935	2.014	0.834	0.924	0.861	0.893
Couples	1.447	1.306	0.575	0.860	0.515	0.676
Couples with relatives	1.176	1.272	0.541	0.726	0.467	0.577
Couples with children	2.039	1.465	0.648	0.941	0.611	0.806
Couples with relatives & children	1.388	1.360	0.591	0.805	0.531	0.657
<i>Farm typology</i>						
Limited-resource	0.880	0.893	0.442	0.653	0.300	0.434
Retirement	0.999	1.171	0.503	0.634	0.415	0.494
Residential/lifestyle	0.660	0.717	0.355	0.488	0.203	0.298
Farming occupation/lower sales	0.867	1.162	0.460	0.634	0.389	0.428
Farming occupation/higher sales	1.344	1.082	0.439	0.941	0.359	0.644
Large	0.801	1.126	0.406	0.624	0.337	0.390
Very large	1.087	0.843	0.436	0.748	0.294	0.538
<i>Farm type by Common Market Organization</i>						
Cereal	1.445	1.397	0.598	0.838	0.549	0.676
Industrial crops	1.268	1.283	0.531	0.797	0.468	0.611
Vegetable	2.431	1.523	0.700	0.939	0.668	0.854
Fruit	1.332	1.396	0.572	0.854	0.529	0.638
Olives	1.789	1.616	0.647	0.870	0.644	0.759
Grapes	1.000	1.149	0.489	0.690	0.405	0.499
Floriculture	2.576	1.687	0.802	0.921	0.796	0.867
Beef	1.303	1.437	0.577	0.763	0.535	0.627
Dairy	1.590	1.338	0.596	0.895	0.533	0.716
Other livestock	3.522	1.554	0.772	0.958	0.748	0.925

Figure 3 Lorenz Curves by Macro Regions, Per Capita Extended Income – Scenario A

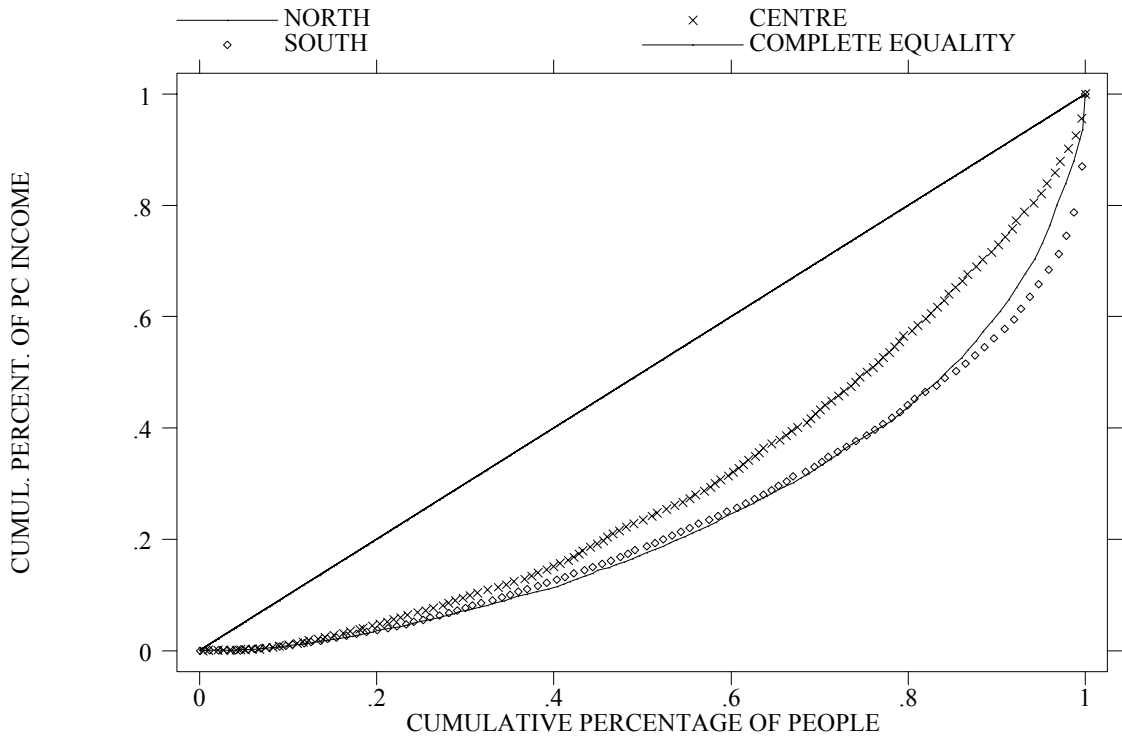


Figure 4 Transformed Lorenz Curves by Macro Regions, Per Capita Extended Income – Scenario A

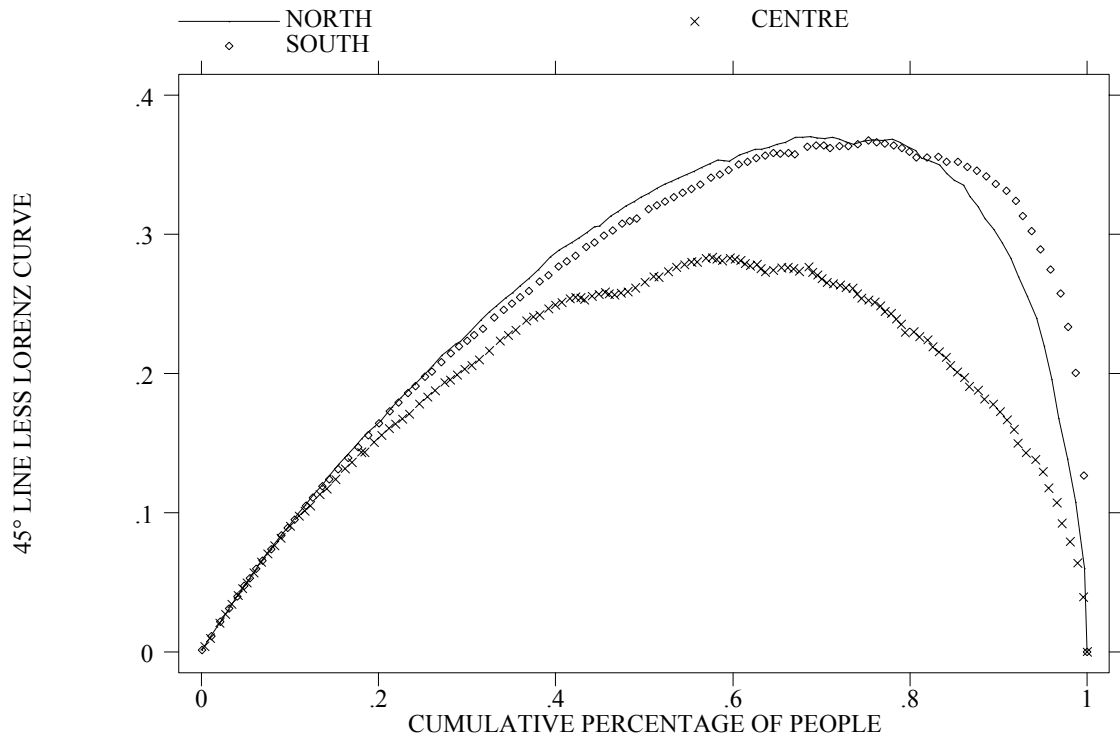


TABLE 6 Poverty Measures for Adjusted Per Capita Net Income – Scenario A. No. of Farms 1,777

	% of farms	of Head Count	Poverty Gap	FGT	Sen	DGL
Total sample		0.515	0.362	0.310	0.451	1.109
		Macro region				
North	0.383	0.426	0.318	0.284	0.381	0.917
Centre	0.221	0.573	0.374	0.305	0.490	1.234
South	0.396	0.569	0.397	0.339	0.498	1.226
		Family typology				
Singles	5.35	0.505	0.438	0.417	0.477	1.089
Singles with relatives	6.87	0.467	0.347	0.304	0.417	1.007
Singles with children	3.49	0.290	0.180	0.160	0.245	0.626
Singles with relatives & children	1.91	0.471	0.376	0.341	0.432	1.014
Couples	17.33	0.597	0.414	0.359	0.521	1.287
Couples with relatives	4.5	0.425	0.302	0.256	0.374	0.916
Couples with children	46.26	0.506	0.357	0.305	0.444	1.090
Couples with relatives & children	14.29	0.559	0.354	0.281	0.474	1.204
		<i>Farm typology</i>				
Limited-resource	7.93	0.993	0.855	0.783	0.936	2.139
Retirement	2.48	0.682	0.510	0.443	0.611	1.469
Residential/lifestyle	2.36	0.857	0.629	0.542	0.762	1.847
Farming occupation/lower sales	12.94	0.948	0.743	0.654	0.863	2.042
Farming occupation/higher sales	45.86	0.523	0.309	0.248	0.434	1.126
Large	24.54	0.144	0.111	0.101	0.131	0.311
Very large	3.88	0.029	0.029	0.029	0.029	0.062
		<i>Farm type by Common Market Organization</i>				
Cereal	30.22	0.536	0.373	0.319	0.469	1.155
Industrial crops	2.48	0.636	0.416	0.341	0.545	1.371
Vegetable	8.78	0.442	0.321	0.277	0.392	0.953
Fruit	9.23	0.628	0.457	0.402	0.557	1.353
Olives	3.71	0.742	0.592	0.526	0.680	1.600
Grapes	9.68	0.657	0.464	0.392	0.577	1.415
Floriculture	2.87	0.608	0.469	0.426	0.550	1.310
Beef	5.63	0.410	0.288	0.248	0.359	0.883
Dairy	17.84	0.297	0.183	0.150	0.249	0.639
Other livestock	9.57	0.582	0.409	0.353	0.510	1.255

Note: DGL is the Dagum-Gambassi-Lemmi's poverty ratio. Poverty line is set at a per capita income of 6,937,000 lire per year computed as 0.5 times the median of the Bank of Italy income distribution.

TABLE 7 Poverty Measures for Adjusted PC Net Income – Scenario B. No. of Farms 1,777

	% of Head farms Count	Poverty Gap	FGT	Sen	DGL
Total sample	0.512	0.359	0.308	0.449	1.098
<i>Macro region</i>					
North	0.383 0.423	0.316	0.282	0.378	0.907
Centre	0.221 0.573	0.372	0.304	0.489	1.228
South	0.396 0.565	0.395	0.336	0.494	1.211
<i>Family typology</i>					
Singles	5.35 0.505	0.437	0.416	0.477	1.083
Singles with relatives	6.87 0.459	0.345	0.303	0.411	0.984
Singles with children	3.49 0.274	0.178	0.159	0.234	0.588
Singles with relatives & children	1.91 0.471	0.376	0.341	0.431	1.009
Couples	17.33 0.588	0.410	0.356	0.514	1.260
Couples with relatives	4.5 0.425	0.301	0.255	0.373	0.911
Couples with children	46.26 0.506	0.355	0.303	0.443	1.085
Couples with relatives & children	14.29 0.559	0.351	0.279	0.473	1.199
<i>Farm typology</i>					
Limited-resource	7.93 0.993	0.854	0.782	0.935	2.129
Retirement	2.48 0.682	0.510	0.442	0.610	1.462
Residential/lifestyle	2.36 0.857	0.628	0.541	0.762	1.838
Farming occupation/lower sales	12.94 0.943	0.742	0.654	0.860	2.023
Farming occupation/higher sales	45.86 0.518	0.306	0.246	0.430	1.110
Large	24.54 0.144	0.108	0.098	0.129	0.310
Very large	3.88 0.029	0.029	0.029	0.029	0.062
<i>Farm type by Common Market Organization</i>					
Cereal	30.22 0.534	0.372	0.318	0.467	1.146
Industrial crops	2.48 0.636	0.414	0.340	0.544	1.365
Vegetable	8.78 0.442	0.317	0.272	0.390	0.948
Fruit	9.23 0.616	0.453	0.399	0.548	1.321
Olives	3.71 0.742	0.590	0.523	0.679	1.592
Grapes	9.68 0.657	0.457	0.385	0.574	1.409
Floriculture	2.87 0.608	0.466	0.424	0.549	1.303
Beef	5.63 0.410	0.286	0.245	0.358	0.879
Dairy	17.84 0.290	0.181	0.149	0.245	0.622
Other livestock	9.57 0.582	0.407	0.352	0.509	1.249

TABLE 8 Poverty Measures for Adjusted PC Global Income – Scenario A. No. of Farms 1,777

	% of Head Count farms	Poverty Gap	FGT	Sen	DGL
Total sample	0.387	0.231	0.172	0.295	0.608
<i>Macro region</i>					
North	0.383 0.316	0.200	0.152	0.248	0.495
Centre	0.221 0.420	0.233	0.171	0.309	0.659
South	0.396 0.438	0.260	0.192	0.333	0.688
<i>Family typology</i>					
Singles	5.35 0.453	0.297	0.213	0.361	0.710
Singles with relatives	6.87 0.328	0.210	0.167	0.258	0.515
Singles with children	3.49 0.194	0.111	0.082	0.145	0.304
Singles with relatives & children	1.91 0.353	0.254	0.197	0.295	0.554
Couples	17.33 0.429	0.262	0.199	0.331	0.673
Couples with relatives	4.5 0.275	0.140	0.096	0.196	0.432
Couples with children	46.26 0.397	0.241	0.181	0.305	0.622
Couples with relatives & children	14.29 0.398	0.200	0.140	0.281	0.624
<i>Farm typology</i>					
Limited-resource	7.93 0.993	0.714	0.564	0.828	1.558
Retirement	2.48 0.364	0.179	0.127	0.255	0.571
Residential/lifestyle	2.36 0.333	0.157	0.088	0.230	0.523
Farming occupation/lower sales	12.94 0.691	0.420	0.311	0.531	1.085
Farming occupation/higher sales	45.86 0.377	0.202	0.146	0.274	0.591
Large	24.54 0.115	0.076	0.059	0.092	0.180
Very large	3.88 0.029	0.020	0.014	0.024	0.045
<i>Farm type by Common Market Organization</i>					
Cereal	30.22 0.389	0.227	0.170	0.294	0.611
Industrial crops	2.48 0.409	0.248	0.184	0.314	0.642
Vegetable	8.78 0.359	0.222	0.166	0.278	0.563
Fruit	9.23 0.482	0.305	0.229	0.378	0.756
Olives	3.71 0.576	0.380	0.304	0.460	0.903
Grapes	9.68 0.512	0.295	0.214	0.384	0.803
Floriculture	2.87 0.529	0.331	0.251	0.413	0.831
Beef	5.63 0.270	0.176	0.135	0.214	0.424
Dairy	17.84 0.211	0.112	0.078	0.153	0.332
Other livestock	9.57 0.465	0.276	0.207	0.354	0.729

TABLE 9 Poverty Measures for Adjusted PC Global Income – Scenario B. No. of Farms 1,777

	% of Head farms Count	Poverty Gap	FGT	Sen	DGL
Total sample	0.383	0.229	0.171	0.292	0.598
<i>Macro region</i>					
North	0.383 0.314	0.199	0.150	0.246	0.491
Centre	0.221 0.415	0.231	0.170	0.306	0.647
South	0.396 0.432	0.258	0.191	0.329	0.675
<i>Family typology</i>					
Singles	5.35 0.442	0.296	0.212	0.356	0.690
Singles with relatives	6.87 0.328	0.209	0.166	0.258	0.512
Singles with children	3.49 0.194	0.111	0.081	0.145	0.302
Singles with relatives & children	1.91 0.353	0.254	0.196	0.294	0.551
Couples	17.33 0.422	0.260	0.197	0.326	0.659
Couples with relatives	4.5 0.275	0.140	0.096	0.195	0.429
Couples with children	46.26 0.393	0.239	0.179	0.302	0.613
Couples with relatives & children	14.29 0.394	0.198	0.138	0.278	0.615
<i>Farm typology</i>					
Limited-resource	7.93 0.993	0.713	0.563	0.827	1.550
Retirement	2.48 0.364	0.179	0.127	0.254	0.568
Residential/lifestyle	2.36 0.333	0.156	0.086	0.228	0.520
Farming occupation/lower sales	12.94 0.691	0.420	0.310	0.531	1.079
Farming occupation/higher sales	45.86 0.369	0.200	0.144	0.269	0.576
Large	24.54 0.112	0.073	0.056	0.089	0.175
Very large	3.88 0.029	0.020	0.014	0.024	0.045
<i>Farm type by Common Market Organization</i>					
Cereal	30.22 0.384	0.227	0.170	0.291	0.599
Industrial crops	2.48 0.409	0.247	0.184	0.313	0.639
Vegetable	8.78 0.353	0.218	0.163	0.273	0.550
Fruit	9.23 0.476	0.302	0.226	0.373	0.742
Olives	3.71 0.576	0.379	0.304	0.460	0.899
Grapes	9.68 0.506	0.290	0.209	0.378	0.790
Floriculture	2.87 0.529	0.329	0.249	0.411	0.826
Beef	5.63 0.270	0.174	0.132	0.213	0.421
Dairy	17.84 0.208	0.112	0.077	0.151	0.325
Other livestock	9.57 0.465	0.275	0.206	0.352	0.725

TABLE 10 Poverty Measures for Adjusted PC Extended Income – Scenario A. No. of Farms 1,777

	% of farms	of Head Count	Poverty Gap	FGT	Sen	DGL
Total sample		0.118	0.071	0.054	0.092	0.186
<i>Macro region</i>						
North	0.383	0.101	0.067	0.052	0.082	0.160
Centre	0.221	0.102	0.066	0.053	0.082	0.161
South	0.396	0.142	0.078	0.056	0.106	0.225
<i>Family typology</i>						
Singles	5.35	0.326	0.194	0.134	0.253	0.516
Singles with relatives	6.87	0.066	0.040	0.028	0.051	0.104
Singles with children	3.49	0.081	0.049	0.040	0.063	0.128
Singles with relatives & children	1.91	0.147	0.080	0.059	0.110	0.233
Couples	17.33	0.130	0.080	0.060	0.102	0.205
Couples with relatives	4.5	0.050	0.043	0.037	0.046	0.079
Couples with children	46.26	0.122	0.076	0.060	0.096	0.192
Couples with relatives & children	14.29	0.063	0.025	0.018	0.042	0.100
<i>Farm typology</i>						
Limited-resource	7.93	0.355	0.185	0.128	0.260	0.561
Retirement	2.48	0.068	0.053	0.041	0.060	0.108
Residential/lifestyle	2.36	0.024	0.015	0.010	0.019	0.038
Farming occupation/lower sales	12.94	0.191	0.103	0.078	0.142	0.303
Farming occupation/higher sales	45.86	0.102	0.068	0.053	0.083	0.161
Large	24.54	0.062	0.041	0.032	0.050	0.098
Very large	3.88	0.014	0.008	0.004	0.011	0.023
<i>Farm type by Common Market Organization</i>						
Cereal	30.22	0.115	0.067	0.050	0.088	0.183
Industrial crops	2.48	0.159	0.102	0.081	0.127	0.252
Vegetable	8.78	0.122	0.082	0.064	0.100	0.193
Fruit	9.23	0.159	0.086	0.065	0.118	0.251
Olives	3.71	0.152	0.097	0.074	0.121	0.240
Grapes	9.68	0.128	0.085	0.067	0.104	0.202
Floriculture	2.87	0.235	0.146	0.109	0.185	0.372
Beef	5.63	0.130	0.080	0.060	0.102	0.206
Dairy	17.84	0.025	0.016	0.012	0.020	0.040
Other livestock	9.57	0.176	0.102	0.076	0.135	0.279

TABLE 11 Poverty Measures for Adjusted PC Extended Income – Scenario B. No. of Farms 1,777

	% of farms	Head Count	Poverty Gap	FGT	Sen	DGL
Total sample	0.116	0.070	0.053	0.090	0.183	
<i>Macro region</i>						
North	0.383	0.100	0.067	0.052	0.081	0.157
Centre	0.221	0.102	0.065	0.051	0.081	0.160
South	0.396	0.139	0.077	0.056	0.104	0.219
<i>Family typology</i>						
Singles	5.35	0.326	0.195	0.134	0.252	0.514
Singles with relatives	6.87	0.066	0.040	0.028	0.051	0.103
Singles with children	3.49	0.081	0.047	0.038	0.062	0.127
Singles with relatives & children	1.91	0.147	0.080	0.057	0.109	0.232
Couples	17.33	0.123	0.077	0.058	0.098	0.194
Couples with relatives	4.5	0.050	0.043	0.037	0.046	0.079
Couples with children	46.26	0.120	0.076	0.059	0.095	0.190
Couples with relatives & children	14.29	0.063	0.025	0.018	0.041	0.099
<i>Farm typology</i>						
Limited-resource	7.93	0.355	0.182	0.123	0.257	0.558
Retirement	2.48	0.068	0.053	0.041	0.059	0.107
Residential/lifestyle	2.36	0.024	0.015	0.010	0.019	0.037
Farming occupation/lower sales	12.94	0.191	0.103	0.078	0.141	0.301
Farming occupation/higher sales	45.86	0.102	0.067	0.053	0.082	0.160
Large	24.54	0.055	0.040	0.032	0.046	0.087
Very large	3.88	0.014	0.008	0.004	0.011	0.023
<i>Farm type by Common Market Organization</i>						
Cereal	30.22	0.115	0.067	0.050	0.088	0.182
Industrial crops	2.48	0.159	0.102	0.081	0.127	0.250
Vegetable	8.78	0.115	0.080	0.063	0.096	0.182
Fruit	9.23	0.152	0.085	0.065	0.114	0.240
Olives	3.71	0.152	0.097	0.074	0.121	0.239
Grapes	9.68	0.128	0.084	0.066	0.103	0.201
Floriculture	2.87	0.235	0.144	0.107	0.184	0.370
Beef	5.63	0.120	0.079	0.060	0.097	0.189
Dairy	17.84	0.025	0.016	0.012	0.020	0.040
Other livestock	9.57	0.176	0.098	0.071	0.132	0.278

TABLE 12: Abbreviated Social Welfare Function, 9th/1st, and 8th/2nd for Adjusted PC Global Income - Scenario A. - No. of Farms 1,777

	ASWF	9 th /1 st	8 th /2 nd
Total sample	11467	51.82	11.56
<i>Macro region</i>			
North	16216	78.17	14.58
Centre	7436	31.17	6.81
South	9700	37.93	10.26
<i>Family typology</i>			
Singles	16083	65.43	23.10
Singles with relatives	17199	109.39	17.20
Singles with children	20471	30.42	6.89
Singles with relatives & children	25119	206.43	15.65
Couples	7362	34.71	11.35
Couples with relatives	11998	20.38	5.60
Couples with children	10892	56.41	12.27
Couples with relatives & children	10121	41.23	7.28
<i>Farm typology</i>			
Limited-resource	1302	8.45	4.99
Retirement	8128	18.12	5.58
Residential/lifestyle	6710	5.06	3.52
Farming occupation/lower sales	3124	16.88	8.65
Farming occupation/higher sales	7340	21.18	4.72
Large	24183	12.64	3.96
Very large	109662	9.63	2.96
<i>Farm type by Common Market Organization</i>			
Cereal	9718	47.54	10.06
Industrial crops	6758	26.66	6.68
Vegetable	14797	76.16	12.86
Fruit	7174	38.36	13.11
Olives	4547	35.00	15.35
Grapes	5392	24.61	8.32
Floriculture	14841	107.78	14.60
Beef	13121	53.77	8.10
Dairy	20428	31.32	7.45
Other livestock	12686	49.72	18.26

Table 13: Ratio between ASWF for Per Capita Global and Net Income. No. of Farms 1,777

	ASWF	
	B/A Global	B/A Net
Total sample	1.011	1.013
<i>Macro region</i>		
North	1.011	1.012
Centre	1.009	1.012
South	1.012	1.014
<i>Family typology</i>		
Singles	1.016	1.018
Singles with relatives	1.012	1.013
Singles with children	1.010	1.012
Singles with relatives & children	1.013	1.014
Couples	1.010	1.012
Couples with relatives	1.008	1.010
Couples with children	1.011	1.013
Couples with relatives & children	1.010	1.011
<i>Farm typology</i>		
Limited-resource	1.001	1.003
Retirement	1.004	1.009
Residential/lifestyle	1.006	1.008
Farming occupation/lower sales	1.002	1.004
Farming occupation/higher sales	1.010	1.012
Large	1.014	1.014
Very large	1.013	1.013
<i>Farm type by Common Market Organization</i>		
Cereal	1.005	1.006
Industrial crops	1.007	1.008
Vegetable	1.021	1.023
Fruit	1.018	1.022
Olives	1.007	1.010
Grapes	1.023	1.032
Floriculture	1.017	1.018
Beef	1.009	1.011
Dairy	1.009	1.010
Other livestock	1.010	1.011

Conclusions

The proposed distributional analysis based both on farm, global and extended incomes can be of great help in improving the efficacy of targeting agricultural and rural policies and in selecting among alternative policy measures. The inequality and poverty measures, for instance, could be used as a basis to identify the correct beneficiaries of decoupled payments, such as those proposed by the Mid-term review of the CAP, ensuring that agricultural households receive a sufficient level of income to meet the basic needs of all the household members. In addition, they could be used to define the eligibility of a farm to the use of structural funds, avoiding the possibility that poor farms located in rich regions were excluded by the use of those funds.

The micro-simulation showed that the global and extended incomes are crucial to mitigate poverty and inequality among Italian agricultural households. Further, the results suggest that the fiscal scenario incorporating the tax exemption is strictly socially preferred to the old fiscal scenario but the difference in terms of level of individual welfares, movements in and out of poverty and changes in income inequality is negligible.

Appendix 1

The methodology used to derive gross from net global incomes.

Farm income Information about the farm income have not been directly collected by the survey. The gross (before tax) farm income is given by the sum of the net income from cash sales, wages paid to the operator, net rental income from renting farmland, government payments and other revenues for non agricultural businesses run by the farm (e.g. agritourism, etc.). This variable allows one to directly simulate the impact of different fiscal regimes: given the gross (before tax) income the different rules are applied in order to obtain the net (of tax) income, this last variable is the one used in the present paper to perform the distributional analysis. The direct and indirect taxes paid by each farm have been simulated taking into account the several provisions in the tax codes that are specifically designed in order to lower the taxes paid by farm operators.

Global household income. The Ismea data set registers off farm incomes from wages, salaries and pensions net of tax and social contributions. In order to evaluate the impact of different fiscal regimes the gross household global income, that is the sum of all the monetary labour and non labour incomes perceived by the farm household, have been rebuilt by making use of the observed information about net non farm incomes. The methodology used is the so called “inversion rule”, that is based on the reversing of each mathematical rule linking gross to net income, at the same time taking into account for deductions, tax and family allowances which depend, in turn, on taxable income. Once the gross non farm incomes have been calculated, the global household income can be obtained by adding the previously calculated gross farm income to the other gross household incomes. Hence, by applying the inversion rule a net global household income can be obtained for each of the fiscal regimes under analysis.

Appendix 2

The Ismea farm typology

Farm typology	Description
Limited-resource	Any small farm with global family income, gross sales and total farm asset less the first quartile of the <i>respective</i> distribution
Retirement	Small farms whose operators report they are retired
Residential	Small farms whose operators are not retired and report a major occupation other than farming
Small family farms	Small farms with gross sales less than the first quartile of the distribution and whose operators report farming as their major occupation.
Medium family farms	Any farm with gross sales less than the third quartile of the distribution and whose operators report farming as their major occupation.
Large family farms	Any farm with gross sales over the third quartile of the distribution

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