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**GLOBAL AND EXTENDED INCOME OF ITALIAN RURAL HOUSEHOLDS:
A METHODOLOGICAL EXPOSITION USING ISMEA CROSS-SECTION DATA**

Supporting paper submitted by Italy**

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1. INTRODUCTION

The new Common Agricultural Policy (CAP) promoted within Agenda 2000 represents a further step towards policies that are mainly oriented at income support. As a consequence, the estimation of incomes of rural households, beyond the basic component represented by farm profits, is critical to correctly implement the new CAP (Eurostat). Using the ISMEA 1995 socio-economic survey of Italian agriculture, this study 1) defines a methodology for the estimation of a) disposable total income (DTI) derived as the sum of farm income, off-farm income, non labor income, and both intra-household and governmental transfers, b) extended income (EI) given by the sum of DTI and domestic unpaid work, and c) full income as the sum of EI and the value of leisure time of Italian rural households, and 2) describes how on-farm time of the farm operator, namely the husband, is allocated controlling for heterogeneity stemming from differences across macro-regions, levels of education, intra-household decision making processes and relations between farm and household sizes and types.

The estimates are very sensitive to the methodology used in evaluating both the time invested in household production and the time devoted to leisure activities. The proposed methodology strives to reconcile the more traditional methodology of time-use and extended income studies (Jenkins and O'Leary 1994,1995, 1996, Apps and Rees 1996, 1997) and the methodology for the estimation of the implicit "unpaid" farm wages (Huffman 1996).

The next section develops the methodology for the estimation of farm household full income. The study then describes the evaluation of "unpaid" labor time. Results and conclusions follow.

1 The Estimation of full income of the ISMEA farm-households

The estimation of Becker's (1965) "full income" as $Y = \underline{w}T + y$, where \underline{w} is the hourly wage rate, T is disposable time, and y is non labor income, such as capital or pensions is a critical task especially in the case of "farm/firm households." Such estimation requires information on 1) disposable total money income (DTI), 2) the value of household production, both on farm and in the household, and 3) the valuation of leisure activities.

1.1 *Disposable total money income*

In general, disposable total money income, DTI, is not difficult to determine for non-entrepreneurial households. Traditional surveys, such as the Bank of Italy survey on income and wealth used here to complement information on off-farm wages, collect detailed information on wage earnings, transfer payments, and returns on financial capital. As a consequence, for example, the derivation of average hourly wage rates of market labor is easily determined as the ratio of total wages and salaries divided by total hours worked. On the other hand, the on-farm wage rate w_i^f is determined implicitly.

In this study the definition of DTI follows the general definition provided by Lazear and Michael, Smeeding 1994, and Quinn. In particular, the DTI of a farm-household, Y^m , is the sum of the disposable money income of the N members of the household as follows:

$$\begin{aligned} Y^m &= \sum_{i=1}^N w_i^o o_i + \sum_{i=1}^N w_i^f f_i + \sum_{i=1}^N \mathbf{r}_i \mathbf{p}(p, r) + \sum_{i=1}^N y_i + \sum_{i=1}^N y_a = \\ &= \sum_{i=1}^N Y_i^o + \sum_{i=1}^N Y_i^f + \sum_{i=1}^N y_i + \sum_{i=1}^N y_a = \\ &= Y^o + Y^f + y + y_a \end{aligned}$$

where w_i^o is the exogenous market wage of individual i , w_i^f is the individual gender specific implicit farm wage, $\mathbf{p}(p, r)$ is farm profit obtained at output prices p and input prices r , \mathbf{r}_i is the amount of on-farm labor provided by the member i , y_i is individual non labor income, and y_a is the value of food self-consumption “sold” by the farm to the household. In general, the critical tasks of the derivation of farm-household disposable money income are associated to the determination of farm profits and the estimation of family labor cost.

1.1 *Valuation of household “non farm” production*

Our information on the use of time of each member allows us to separate the time devoted to domestic work, that is in household production activities, from the time allocated to “pure” leisure. Traditionally, two fundamentally different approaches have been used in valuing non-market activities (Harvey). The opportunity-cost approach emphasizes the opportunity cost of time devoted, for example, to domestic activities. This method values such activities as if the

activities were sold in the market. The market cost approach suggests to measure the value of household production pricing such activities as the cost of hiring someone on the market to accomplish the household tasks.

1.1 *Valuation of leisure activities*

According to Becker's definition of full income there is no distinction between an hour spent on pure leisure and an hour spent looking for job opportunities. Jenkins and O'Leary (1996) suggest that this may be a problem if one considers the case of involuntary unemployed people as well. As a consequence, most of the studies on full income restrict the estimation to extended income defined as $Y^e = Y^m + Y^l$, that is, setting the value of leisure to zero. However, since the members of farm households can allocate their working time with certainty on the farm, it is plausible to assume that there are no involuntary unemployed people. Hence, we contend that pure leisure of farm households is genuine leisure.

The definition of leisure in this study is in line with the definition generally adopted in the economic literature (Wales and Woodland, Jenkins and O'Leary 1995 and 1996). Considering the certain prospect of the own farm employment, we set the opportunity cost of time devoted to pure leisure equal to the implicit on-farm wage that the individual could earn working on farm. Therefore, the value of leisure activities of the i -th member is given by the following equation $Y_i^l = w_i^l l_i$, where in this case w_i^l is set equal to the implicit farm wage rate w_i^f .

1 **Valuation of "unpaid" labor time**

In this research, the allocation of time among different activities is subject to the constraint $T=168$ hours per week, $T = f_i + o_i + h_i + l_i + \underline{l}_i = d_i + \underline{l}_i$, where f_i , o_i , h_i , l_i , \underline{l}_i and d_i identify the allocation of time of individual $i=1, \dots, N$ on the following activities:

On-farm labor, f_i : time devoted to farm labor activities and commuting time. *Off-farm labor, o_i* , time devoted to off-farm labor formally paid at the market wage, and commuting time. *Domestic labor, h_i* : time devoted to non paid household production activities, such as food preparation,

housework, child care, care of the elder, gardening, shopping, house maintenance, etc. *Leisure*, l_i : time devoted to pure leisure. *Rest*, l_j : time devoted to rest and personal care. *Disposable time*, $= f_i + o_i + h_i + l_i$: time stock allocated to labor activities ($f_i + o_i$), domestic labor (h_i) and recreational activities (l_i).

Overall measures of inequality in earnings, income and other measures of well-being depend crucially both on the measurement and the valuation of time. For this reason, the ISMEA survey (ISMEA 1995) was designed to collect time use data in a very detailed manner.

Three sections are devoted to time-use. In the first section each member of the household was asked how many hours she/he allocated to farming during the past year differentiating by low and high season. In the second section, she/he was asked to describe how her/his time was allocated across major farm activities. Juster and Stafford and Huffman (1996) deem that, using this procedure, most individuals have a relatively good perception about their time allocation. The third section on time use is a stylized time diary which collects, on a per day basis, information on the allocation of time between on-farm work, off-farm work, domestic work and leisure time. These three sections combined together seem to provide a robust and coherent estimation of time use.

In this study, labor is viewed as encompassing all the productive activities of individuals both in farming, off-farm work, or domestic work. Traditionally, economists define “unpaid work” as the time spent at home doing housework, producing goods and services for the family. Similarly, within farm-households, labor supplied by household members is not directly paid to farm operators. For this reason, agricultural economists are used to define the time contributed by the farm operator, partners and relatives as *unpaid* farm labor (Huffman 1996). Both farm labor, f_i , and domestic work, h_i , are defined as unpaid work. We apply the so-called input oriented evaluation method, looking for appropriate shadow prices valuing the time spent on unpaid labor time.

1.1 *The valuation of “unpaid” farm work*

Farm labor encompasses a wide range of human activities required in farming such as time spent on planning, managing, marketing, supervising, producing, accounting and doing technology assessment. Very different approaches were applied to estimate farm wages. In this study, we adopt a procedure that combines information of off-farm wages with the hedonic method to derive gender specific on-farm wage equations (Huffman 1996).

This microeconomic approach looks for the potential wage rate a non-working person on the off-farm market could achieve. The estimated wage rate measures the highest foregone alternative that is precluded by doing farm work. The estimation takes the selectivity bias, which occurs when the selection rule depends on the variable of interest (Heckman 1979), into account. The Heckman approach consists of two steps:

Step 1: labor force participation probability is estimated by PROBIT

Step 2: the wage rate is estimated including the selectivity bias correction

In the ISMEA sample, about 23 percent of the members of the labor force¹ works off-farm. Regardless, to improve the precision of our predictions, we estimated the gender specific wage equations on the joint sample of dependent workers of ISMEA and the sample of dependent workers living in rural areas using the 1995 Bank of Italy data (BDI). The joint sample ISMEA-BDI consists of 4051 individuals and allows for more variability in the estimated potential wages.² The gender specific wage equations are specified as follows:

$$w^i = \mathbf{a}'x^i + \mathbf{b}l^i + \mathbf{e}$$

where w is the wage rate, x is the set of personal attributes and job/local conditions that are potential sources of wage differentials (Tokle and Huffman, Castagnini and Perali 1999), and λ is the sample selectivity bias correction term (the Mill's ratio). The term \mathbf{e} is the stochastic term supposed spheric. The superscript i takes on the value of 1 or 2 for male and female household's members respectively.

¹ 62 percent of the off-farm workers are not the main farm operator or his wife.

² Castagnini and Perali (1998) show that both ISMEA and BDI household samples are drawn from a similar rural population.

When the wage equations, corrected for selectivity, is fitted to data for workers, it can be used to predict the wage for both workers and non workers. At this step, the attribute of potential workers of the ISMEA sample are inserted into the wage equation containing estimated coefficient, obtained from data for observed ISMEA-BDI off-farm dependent workers, excluding the coefficient of the sample selection variable. The resulting predicted wage can be interpreted as an estimate of the average potential wage rate the workers could face if employed on the market.

1.1 Valuation of “unpaid” domestic work

This study adopts the market cost approach in valuing unpaid domestic work. The estimated shadow wage, w^h , of domestic work is the weighted mean of the implicit wages of each activity. The weights are the shares of time devoted to each activity. The shadow wage of each activity is the market wage of the same activities. This approach presumes that the individual can reallocate her/his time in other domestic activities or in leisure time if she/he hires domestic services on the market.

Our application of the method accounts for activities with different productivity such as cleaning and child care. Hence, the shadow wage rate of household production w_i^h of individual i is given by the following weighted sum: $w_i^h = \sum q_j w_j^*$, where $q_j = c_j/c_i$ is the share of time devoted to the activity j by the individual i ; where $j=1, \dots, J$ indexes non paid domestic activities, and w_j^* is the market wage rate of the activity j (cooking, baby-sitting, gardening, etc.).

The derivation of the domestic wage rate for the ISMEA sample is reported in Castagnini and Perali (1998) and the domestic income of individual i is given by $Y_i^h = w_i^h h_i$.

1 Results and Conclusions

The empirical analysis of this work is based on the sample of the *1995 ISMEA Surveys on Socio-Economic Characteristics of Italian Rural Household*. The survey combines information about household and farm characteristics, time use, farm profits, off-farm money income,

governmental and intra-household transfers, consumption, technology and information about the degree of autonomy in both farm and household decision making of the household members.

The ISMEA 1995 survey is a nationwide farm household survey of 1900 farm-households. The analysis is restricted to those households composed of married couples -- with or without children -- aged 18-70 where at least one of the members is fully employed on farm and all children are dependents. This selection criterion left us with a sample of 695 observations. The sampling has been based on the last Agricultural Census conducted in 1992 by the Italian National Statistical Institute (ISTAT).³

Given space limits this section focuses on the results of on-farm work of the husbands, and income composition and inequality of incomes of both husband and wife.⁴ Table 2 shows the estimated parameters of the husband on-farm hours equation. The reference farm operator is aged 35, lives in the Islands but not in plan, has no children, was not growth on farm. He faces the same level of education of the wife, 8 years of schooling. Both husband and wife have no other income sources. They pool income and take the decision jointly. There are no hired workers on the farm and the farm is not diary oriented, furthermore the farm size is 5 hectares. Hence, he works about 2080 hours per year. As the farm operator becomes older (eta), his hours of on-farm work are reduced, 11 hours per year of age. The education level of both the husband (edu1) and the wife (edu2) have a significant effect on on-farm hours. An additional year of edu1 reduces by 26 hours the on-farm work and an increase of one year of edu2 reduces by 49 hours the on-farm work of the husband. If the farm operator grew up on the farm, her/his supply of on farm hours increase by 112 hours corresponding to a reduction of 5.4% with respect to the reference operator. The presence of a dependent child (nchild) increases the hours on-farm supplied annually by 4.6 % (97 hours). The presence of hired workers (sala) has a negative effect on the annual on-farm work of the farm operators. As expected, the results suggest that, other

³ The sample was drawn selecting only commercial farms In Italy, farms are considered as commercial when they have an economic size of at least 2 European Size Units (ESU). One ESU corresponds to 1200 ECU.

⁴ Gender specific hours and wages equations of on-farm, off-farm and housework are available on request.

things equal, livestock production (lvstck) has a significant positive effect on on-farm work. Annual on-farm work increases by 373 hours about 18% more than the reference operator. The impact of an additional hectare of land (land) is statistically significant though the magnitude is not effective for small increases. The sign of (farmwage) is positive, but it is not significant. The variable associated to other sources of income (otherinc) has a negative effect on farm work, as expected, but it is not statistically significant. In line with this result, the presence of a retired person in the family is associated to a reduction of 130 hours (6.2%) total farm work of the husband. If the farm operator is more than 40 years old and does not have dependent children living on the farm (exc), his on-farm work reduces by 60 hours, though the statistical confidence of this effect is low. Both geographical location and altitude have a large, positive and significant effect on the husband supply of on-farm work. Living in North-East strongly increases the on-farm work, about 813 hours corresponding to 39% more than the reference operator. Living in Northwest, Middle and South increases the on-farm work by 13%, 10.4% and 14.4% respectively. In the Italian Islands, disguised unemployment is relatively more diffused than in other regions.⁵ If the farm is located in the plane (plans), farmer works 7.4% more than in hills or mountains. If husband and wife do not pool their incomes (nopool), the husband supply of on-farm work is lower. This fact can be interpreted as a consequence of stronger linkages of the household working members with the outside labor market and a different household organization. The male farmer, who is the sole decision maker on farm matters, is usually fully employed in farming and, as such, has stronger incentives to work on the farm (5.8% more than the reference operator) and to take responsibility.

Table 1 presents the results of the analysis of inequality in the distribution of income in terms of Gini coefficients. The farm-household is taken as the unit of analysis.⁶ Farm type and geographical location significantly affect inequality. In particular, the dairy sector presents less

⁵ The data suggests that pure leisure time is significantly higher for husbands in the Island than in any other macroregion.

⁶ The estimation of the inequality indexes accounts for zero or negative values that it is admissible to encounter when using net farm income.

inequality since the Gini coefficient for the net farm income reduces from .62 to .48. Inequality in farm incomes in the south of Italy is also lower (.55). It is relevant to note that the exclusion of other income sources from the analysis of inequality may critically alter the real picture of inequality and welfare of the farm households. The Gini coefficient reduces from .62 to .57 for an average Italian farm when disposable total household income (DTHI) is compared. In particular, the coefficient of DTHI decreases for farm specialized in non-dairy livestock from .50 to .30.

Table 2 extends the analysis to intra-household inequality. In general, husbands are better-off than wives regarding the disposable total individual income (DTII). The Gini coefficient for husbands and wives is .20 and .49 respectively. However, if the husband is the unique decision maker about farm matters, the inequality for the wife rises to .59. The analysis of inequality indices of the extended income shows how big the equalising impact of broadening the income definition is. Both for husbands and wives the inequality declines. In particular, the coefficient falls to .27 for wives. Location also has a significant impact on inequality. The within-group inequality in terms of extended income by macroregion, compared with the DTII, reduces the Generalized Entropy index from .33 to .10 for wives. Between-group inequality by macroregion for wives falls from .06 to .01. The most egalitarian economic indicator is the one associated to full income. Comparing the Gini for the distribution of full income with the corresponding indexes for DTII, wives face a substantially lower level of inequality. Gender disparities almost vanish: the index coefficient reduces from .49 to .17, close to the same coefficient of the husband, .14.

These results suggest that:

- 1) The economic situation of farm-households cannot be adequately described by farm income alone. We show that the use of DTHI may be a necessary complement to traditional economic indicators in order to develop appropriate income support policy.
- 2) The economic consequences of encompassing the income definition to extended and full income are substantial. They are crucial to explain exhaustively the intra-household

allocation of resources and the behavior related to the consumption of market goods, the production of household products, or the consumption of leisure.

We deem that our “full” approach to the analysis of household incomes is crucial to properly measure the impact of agricultural and rural policies on both farm efficiency and household welfare and to effectively implement, at the microlevel, the European Common Agricultural policy guidelines of Agenda 2000.

Table 1. Estimated Coefficients for Husband Annual On-Farm Labor Demand Equation

Regressors	Variable definition	Coefficient	Std. Error
Farmwage	Farm wage rate	25.98	27.43
Eta	Age in Years	-10.68	4.21
Nchild	Number of dependent children	96.68	31.78
Frised	1 if operator growth on farm	112.20	62.27
Edu1	Years of schooling completed by farm operator	-25.95	13.41
Edu2	Years of schooling completed by wife of farm	-49.24	23.39
Nopool	1 if no income pooling	-159.78	111.94
Sala	1 if hire workers	-107.86	103.87
Lvstck	1 if diary farm	372.80	61.30
Dechus	1 if husband is the decision making	122.36	57.44
Land	number of hectares of land	3.80	0.73
Otherinc	Other non agricultural income	-0.02	0.07
Plans	1 if farm is located in plan	154.85	70.11
North-East	1 if household is located in North-East Region	813.15	105.04
North-West	1 if household is located in North-West Region	272.09	100.46
Middle	1 if household is located in Middle Region	218.42	92.88
South	1 if household is located in South Region	300.94	83.74
Retired	1 if farm operator is formally retired	-130.35	102.47
Exc	1 if aged >40 and no children live on farm	-59.86	97.98
Intercept	Intercept	2277.58	232.97
R ²			0.279
Sample Size			695

Table 2. Gini Coefficients of Incomes Inequality: Between and Within Household Comparisons

	Between Households		Di	Within Household	
	Net farm Income	Total Income		Husband	Wife
Sample Mean	.62	.57		.20	.49
North-East	.58	.54		.16	.38
North-West	.70	.64		.15	.52
Middle	.62	.59		.17	.38
South	.55	.49		.20	.42
Islands	.58	.53		.17	.78
Crops	.49	.47		.22	.51
Diary	.48	.44		.15	.39
Other Livestock	.50	.30		.21	.40
Husband Decision maker	.63	.59		.18	.59
Extended Income	-	-		.17	.27
Full Income	-	-		.14	.18

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