Extended and Full Incomes at the Household and Individual Level: An Application to Farm Households

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This study illustrates the methodology used in computing total farm household, extended, and full income both at the household and individual level for a sample of Italian farm households and compares the distribution of these incomes across genders. The notion of extended and full incomes is important both to understand differences in family organization and to describe how households respond to policy changes by reallocating labor among the farm, the home, and the off-farm opportunities.

Information about off-farm paid employment permits the derivation of total and disposable farm household income (Hill, Eurostat, Organization for Economic Cooperation and Development (OECD), Smeeding, Smeeding and Weinberg). The family portfolio of labor choices also includes employment in domestic activities. This form of self-employment is valued at the *unpaid* equilibrium shadow wage and, if a competitive environment is assumed, corresponds to the opportunity cost of time. The incorporation of this implicit source of income in the computation of household incomes gives the *extended* income (Lazear and Michael, Jenkins and O'Leary, International Research and Training Institute for the Advancement of Women (INSTRAW). The sum of extended income and the value of leisure time form the Beckerian notion of *full* income (Becker).

Under both a behavioral and a policy point of view, it is relevant to take into formal consideration that decisions made by the household unit are conditional on the information sets related to both the production and consumption side of the household economy. What is often neglected is that the production side of the household economy consists of both farming and domestic activities. Considering both extended and full incomes explicitly recognizes the contribution of home activities to the formation of household resources. Farm and "home-produced" incomes are traditionally pooled within the family. In order to derive individual incomes, we assign these sources of income to each worker in proportion to the amount of contributed labor. We can then estimate the relative contribution of the husband and wife to the paid and unpaid sources of household income and to undertake a gender-specific analysis of the income distributions.

The next section provides an overview of the methods adopted for the estimation of total farm household, extended, and full income using a sample of Italian farm households described in the subsequent section. A short illustration of the distributional characteristics of the household and individual income series follows.

The Estimation of Extended and Full Incomes

The implementation of the Beckerian notion of full income requires evaluating the time endowment, which is employed in both paid and unpaid working activities and leisure, and measuring nonlabor incomes derived from returns on nonfarm assets and/or pensions. The accomplishment of this task requires the derivation of total farm household and extended incomes along with the evaluation of leisure time. Both farming and home production are family enterprises, the difference being that farm output is marketable, while domestic output, often

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composed by public components, is sold within the household at an implicit price.

Each member (i) of a farm household of size N can allocate its time endowment among the following activities $T = (f_i + o_i + h_i + l_i) + I_i = d_i + I_i$, where f_i is time in hours devoted to farm labor activities; o_i is time devoted to off-farm labor either in agriculture or in other sectors (paid at the market wage) and commuting time; h_i is time devoted to unpaid home production activities; l_i is time devoted to pure leisure, such as recreational activities; I_i is time devoted to rest and personal care. The amount of disposable time is $d_i = f_i + o_i + h_i + l_i$.

Traditionally, economists define "unpaid work" as the time spent at home doing housework and producing goods and services for the family. Similarly, for farm households, farm labor supplied by household members is not directly paid to farm operators. Farmers remunerate themselves at an implicit wage. The time contributed by farm operators is often referred to as unpaid farm labor (Huffman). Both farm labor (f_i) and domestic work (h_i) are defined as unpaid work. The availability of individual time-use data permits separating the time devoted to domestic work from the time allocated to pure leisure.

As summarized in table 1, total farm household income (y^m) is the sum of farm, off-farm, nonlabor income, and social transfers of the N household members:

$$\begin{aligned} y^m &= \sum_{i=1}^{N} w_i^f f_i + \sum_{i=1}^{N} w_i^o o_i + \sum_{i=1}^{N} y_i^{nl} + y^{tr} \\ &= \sum_{i=1}^{N} y_i^f + \sum_{i=1}^{N} y_i^o + \sum_{i=1}^{N} y_i^{nl} + y^{tr} \\ &= y^f + y^o + y^{nl} + y^{tr} \end{aligned}$$

where w_i^f is the gender-specific implicit farm wage; w_i^o is the exogenous market wage of individual i; y_i^{nl} is individual nonlabor income derived from nonfarm assets and property income; and y^{tr} is social transfers and other money incomes, such as universal benefits and

Table 1. Definition of Total Farm Household Extended and Full Income and Evaluation Methods

	Income	Evaluation Methods
1. Total farm household income ($y^m = y^f + y^o + y^{nl} + y^{tr}$)		
a. Net (pretax) operating income	Farm income (y^f)	• Accounting
i. From farm self-employment		• Market—opportunity cost
ii. From imputed rent for owner-occupied dwellings		• Shadow wage
b. Money wage or salary income as *dependent* employees from off-farm	Off-farm income (y^o)	• Market wage
i. Agricultural and/or		
ii. Nonagricultural activities and/or		• As for 1.a
c. Net income from nonfarm self-employment as *independent* operators		
d. Other cash market income (e.g., interests, dividends, rents, private pensions)	Nonlabor income (y^{nl})	
e. Social transfers or other money income	Social transfers (y^{tr})	
2. In kind earnings (*home own-consumption*)	y^a	• Market price
3. Taxes and contributions (t)	Disposable farm household income (y^n) $= (y^m + y^a) - t$	
a. Property income paid (farm business tax)		
b. Net direct and payroll taxes (off-farm personal tax)		
c. Social contributions		
4. Value of domestic production (y^h) (e.g., food preparation, household chores, child care, etc.)	Extended income (y^e) $= y^n + y^h$	• Market or opportunity-cost approach • Shadow wage
5. Value of leisure (y^l) (e.g., recreational activities, entertainment)	Full income (y^F) $= y^e + y^l$	• Market or shadow wage

social insurance ("non" means tested) transfers (child allowances, social security or retirement, disability insurance, unemployment compensation, and workers' injuries compensation), cash mean-tested welfare payments, interhousehold transfers (e.g., inheritances, alimony and child support paid and received, or other forms of intermittent income in cash or in kind, such as child care by relatives). Disposable farm household income is obtained by deducting from total farm household income, including the value of self-consumption (y^a) "sold" by the farm to the household, the value of farm, personal taxes, and social contributions t, $y^n = (y^m + y^a) - t$. Gross or net extended income (y^e) is derived by adding the valuation of domestic activities (y^h) to either y^m or y^n, respectively. Similarly, for pre- or post-tax full income, $y^F = y^e + y^l$, which requires the valuation of leisure (y^l).

In a farm household context, the income-accounting exercise depicted in table 1 presents at least two major critical tasks: (*a*) nonmarket valuation of unpaid household labor, employed on farm and/or on domestic activities, and leisure and (*b*) assignability of household farm and nonlabor income to each member of the household.

The valuation of farm and domestic household production can be undertaken by following two approaches (Harvey): (*a*) the *opportunity-cost approach* emphasizing the opportunity cost of time devoted to a specific activity that could have been sold on the market, and (*b*) the *market-cost approach* measuring the value of household production (farming or domestic activities) by pricing it at the cost of hiring someone on the market to accomplish the household tasks.

The assignability problem can be treated by attributing to each household member the amount of farm income in proportion to the share of hours worked on farm. Nonlabor income, on the other hand, can be reasonably assumed to be redistributed in proportion to each member's contribution. This information can be deduced from the data or directly asked in a questionnaire. However, the problem should be more properly examined within a collective representation of the household that provides the theoretical basis for estimating the rule governing intrahousehold allocation of resources (see Chiappori and Arias, Menon, and Perali for an application using the data presented here). It is interesting to emphasize that the definition of full income described in table 1 is not specific to farm households but describes all households self-employed in entrepreneurial activities that can be more properly seen as "farm-firm" households. This is the most general model because it embodies the case for urban and rural households when farming or other household entrepreneurial activities are not undertaken. We now proceed by describing the method used for evaluating each income component as outlined in the last column of table 1.

Valuation of "Unpaid" Farm Work

On farm family labor is traditionally derived from the farm accounts as the amount of income that remains after covering variable costs and remunerating fixed factors of production. This is the method used in this study. If markets are competitive and the decisions of the farm are separable from the decisions of the household, then in equilibrium farmers are indifferent between working on or off farm. Agricultural wages can then be estimated using an opportunity-cost approach (Huffman). However, in case of market failures or missing markets, farm households' decisions are no longer separable and prevailing market wages differ from the value of the farming marginal product. In these situations, self-employment in agriculture should be estimated with a shadow value approach (Skoufias; Arias, Menon, and Perali).

Valuation of Off-Farm Wages

The off-farm wage in agriculture is the one observed from workers hired in the farms. Nonagricultural wages are those prevailing in the market when observed. In this study, nonagricultural off-farm wages are not observed. We combine information on off-farm wages present in the Bank of Italy's 1995 income survey using a hedonic method to derive gender-specific wage equations (Huffman). The predicted wage rate measures the highest foregone alternative that is precluded by doing farm work.

Valuation of Household Production and "Unpaid" Domestic Work

This study adopts the market cost approach in valuing unpaid domestic work. 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 (Perali). Our application of the method accounts for activities with different productivity, such as household cleaning and childcare. Therefore, the shadow wage rate of household production (w_i^h) of individual i is given by the weighted sum $w_i^h = \sum_j q_{ij} w_j^*$, where $q_{ij} = h_{ij}/h_i$ is the share of time devoted to activity j by individual i, $j = 1, \ldots, J$ indexes unpaid domestic activities, and w_j^* is the market wage rate of activity j, such as cooking, babysitting, gardening, or other. An interesting element of this approach is the application of different market wage rates for different activities. In other studies the value of household production corresponds to the mean market wage of a housekeeper. Another possibility is to estimate the shadow value of household production assuming a constant returns-to-scale household technology (Apps and Rees).

Valuation of Leisure

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 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 by setting the value of leisure to zero. However, because the members of farm households can allocate their working time with certainty on the farm, it is plausible to assume that there is no involuntary unemployment. Therefore, pure leisure of farm households can be taken as genuine leisure (Wales and Woodland). 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. Jenkins and O'Leary stress that it is implausible to set the value of leisure time equal to the market wage rate.

Data Description

The empirical analysis of this work uses data from the nationwide *Survey on the Socio-Economic Conditions of Italian Agriculture* undertaken in 1996 by ISMEA. The questionnaire was designed on the basis of a collective household model (Caiumi and Perali) with the specific aim of gathering statistical information on the behavior of each family member and the sharing of public and private resources within the household. The survey combines information about household and farm characteristics, time use, farm profits, off-farm income, governmental and inter-household transfers, consumption, technology, nonfarm assets, and information about the degree of autonomy of the household members in both farm and household decision making. Important information to recover individual incomes comes from the answer to the direct question about the contribution of the spouse to total farm household income, which averages 24% in the ISMEA data. The sample was designed on the basis of the 1992 Agricultural Census selecting agricultural farms with an economic size of at least four European size units (about 4,500 euros). This explains the marked agricultural, rather than rural, nature of the sample and the relatively low dependence of the sampled farm households on off-farm labor opportunities. The ISMEA sample counts 1,777 farm households. The design of the ISMEA survey includes a section of time-use data (Juster and Stafford). The specialized section on time use is a stylized time diary that collects, on a daily basis and for each household member, information on the allocation of time between on-farm work, off-farm work, domestic work (household chores, child care, care of the elder, gardening, and maintenance of the orchard) and recreational activities undertaken alone or with others. The holistic design of the ISMEA survey minimizes the need to "crosswalk" surveys to produce estimates of total farm household income, extended, and full incomes and guarantees a high level of quality and data consistency (Smeeding and Weinberg).

An Empirical Illustration

This section describes how total farm household, extended, and full income is composed, showing the relative contribution of the couple's components and compares the levels of income inequality of both husband and wife. The joint investigation of time allocation and income composition illustrates how the Italian farm household applies the strategy of selling available family time to the labor market as a means to complement farm income and a risk-coping strategy from the uncertainty associated with farming and changes in economic policies. The distributional results are presented in table 2 for the entire household

Table 2. Inequality of Farm Incomes by Household Types and Gender—Gini Coefficients

	Between Households			Within Households	
	Farm Income	Total Income		Husband	Wife
Sample	0.652	0.561		0.607	0.685
Northwest	0.621	0.528		0.589	0.671
Northeast	0.612	0.527		0.611	0.660
Center	0.503	0.397		0.434	0.520
South	0.655	0.571		0.599	0.670
Islands	0.702	0.601		0.652	0.801
Crops	0.601	0.503		0.540	0.662
Mixed[a]	0.682	0.581		0.658	0.711
Diary	0.591	0.540		0.553	0.627
Other livestock	0.691	0.600		0.648	0.724
Limited-resource	0.588	0.540		0.609	0.676
Retirement	0.581	0.475		0.500	0.586
Residential/lifestyle	0.448	0.249		0.242	0.522
Farming occupation/lower sales	0.508	0.400		0.488	0.656
Farming occupation/higher sales	0.437	0.379		0.414	0.596
Large family farms	0.388	0.382		0.439	0.554
Very large family farms	0.432	0.421		0.535	0.653
If husband is decision maker	0.644	0.553		0.606	0.656
	Husband			Wife	
	Extended Income	Full Income		Extended Income	Full Income
Sample	0.524	0.483		0.511	0.459
Northwest	0.518	0.496		0.567	0.525
Northeast	0.546	0.513		0.497	0.465
Center	0.350	0.309		0.382	0.328
South	0.498	0.446		0.493	0.430
Islands	0.568	0.526		0.502	0.430

Individual Income

[a] Vegetables, fruits, olive, grape, and floriculture.

and for each spouse. The analytical grid is obtained by sequentially selecting the sample in terms of macroregion, family type, and gender.

In the left columns of table 2, the unit of analysis is the farm household. Farm type and geographic location significantly affect inequality. In the center of Italy, inequality in farm incomes is relatively lower, especially in terms of total farm household incomes. The distribution of both farm and total farm household income is relatively more unequal in the south and in the islands, 0.7 and 0.6, respectively. It is relevant to note that the exclusion of other income sources from the analysis of inequality may critically alter the actual picture of inequality and welfare of the farm households. The Gini coefficient reduces from 0.65 to 0.56 for an average Italian farm when total farm household income is compared. As it is reasonable to expect, the Gini coefficient reduces less when computed in terms of total farm household income for dairy farms considering that milk production is highly labor intensive and off-farm sources of income are relatively less important. The distribution is more equitable among crop farmers.

Table 2 also extends the analysis to intrahousehold inequality (columns on the right). In general, the distribution of incomes of husbands is more equal than the wives' distribution. The Gini coefficient for husbands and wives is 0.61 and 0.69, respectively. Interestingly, the distributional gap between husbands and wives is not significantly different when the husband is the sole decision maker about farm matters in the household. Geographic location, on the other hand, has a significant impact on individual inequality. The center of Italy shows the lowest level of individual inequality, but the gender gap is much higher than, for example, in the Italian northeast. In Sicily and Sardinia, the distribution of total farm household incomes is the most unequal. The gender gap is smaller in the farming industries that can more easily employ female workers, such as the dairy, other livestock, and the mixed sector.

Table 3. Composition of Full Income by Farm Household Typology—Euros

	Limited Resources		Retirement		Residential/ Lifestyle		Lower Sales		Higher Sales		Large Farm		Very Large Farm	
	Mean	Share	Mean	Share	Mean	Share	Mean	Share	Mean	Share	Mean	Share	Mean	Share
Farm	2,988	0.123	11,593	0.234	9,043	0.135	6,227	0.146	21,214	0.363	79,555	0.602	368,579	0.828
Off-farm	1,032	0.023	0	0	30,322	0.432	8,422	0.130	4,682	0.057	4,343	0.030	3,796	0.007
Nonlabor	5,594	0.138	19,879	0.325	4,256	0.056	6,402	0.130	6,708	0.103	14,404	0.094	15,713	0.054
Total	*9,614*		*31,472*		*43,621*		*21,051*		*32,604*		*98,302*		*388,088*	
Domestic	11,626	0.438	10,610	0.263	17,384	0.256	16,292	0.358	17,006	0.306	19,084	0.178	21,190	0.074
Extended	*21,240*		*42,082*		*61,005*		*37,343*		*49,610*		*117,386*		*409,278*	
Leisure	7,017	0.278	6,917	0.178	8,462	0.122	9,814	0.237	9,047	0.172	9,743	0.096	10,037	0.037
Full	*28,257*		*48,999*		*69,467*		*47,157*		*58,657*		*127,129*		*419,315*	

The level of the Gini coefficient by farm type shows that total farm household income is more equally distributed in all farm types. For the household types where agricultural income is more important, inequality is lower. Inequality in total incomes is very low for the residential households that rely heavily on off-farm income sources. Access to off-farm sources is limited to husbands' judging by the large size of the gap between husbands and wives. The gender gap remains large in the family type that is more dependent on farming.

The bottom panel of table 2 presents the inequality indices related to the distribution of extended and full incomes. Inspection of the indices reveals how large the equalizing impact of broadening the income definition is. Inequality declines both for husbands and wives with the broadening. Gender disparities almost vanish in terms of extended incomes. The most egalitarian economic indicator is the one associated with full income. Interestingly, the gender gap is reversed when inequality is measured in terms of full incomes. The central region is the most equal. The south is less unequal than the north due to a different family organization that, in the south, is more oriented toward domestic activities.

Table 3 reports the composition of full income by farm household type both in levels and shares. The relative importance of off-farm income sources is particularly important for residential households. Nonfarm assets, on the other hand, are important for the retirement type and the household with limited resources. Household production is relatively more important for households with limited farming resources. Households with a high level of employment on farm devote little time to leisure.

Conclusions

This study shows that shedding light on the household shadow economy is both interesting under a behavioral point of view and policy relevant. For example, compared to the north, households in the center and south of Italy are relatively poorer in terms of farm and total income levels but are comparably well-off in terms of extended and full incomes. The gender gap between husbands and wives engaged in agriculture is negligible when extended and full incomes are considered. The presentation also reveals many of the methodological limitations still existing about evaluating unpaid work and leisure and the derivation

of individual incomes and welfare levels using household-level information.

In general, the results suggest that: (*a*) the economic situation and standard of living of farm households cannot be adequately described by on-farm income alone and (*b*) the estimation of extended and full incomes is crucial to better understand the adjustment to changes in economic policies and the impact on household welfare.

References

Apps, P.F., and R. Rees. "Labor Supply, Household Production and Intra-family Welfare Distribution." *Journal of Public Economics* 60(1996):199–219.

Arias, C., M. Menon, and F. Perali. *Econometric Estimation of the Farm-Household Model Applied to Italian Data*. Mimeo, Department of Economics, University of Verona, 2003.

Becker, G.S. "A Theory of Allocation of Time." *Economic Journal* 75(1965):493–517.

Chiappori, P.A. "Collective Labor Supply and Welfare." *Journal of Political Economy* 100(1992):437–67.

Caiumi, A., and F. Perali. "Female Labor Force Participation: A Comparison between Urban and Rural Families." *American Journal of Agricultural Economics* 79(1997):595–601.

Eurostat. Agricultural Income 1995, Agriculture, Forestry and Fisheries. Theme 5, Yearbooks and Yearly Statistic. Series A, Brussels, 1996.

Harvey, S.J. *The Valuation of Household Production: How Different Are the Opportunity Cost and Market Price Valuation Methods?* Mimeo, Department of Economics, University of Hartford, 1996.

Hill, B. *Farm Incomes, Wealth, and Agricultural Policy*. Avebury England: Ashgate Publishing Limited, 1996.

Huffman, W.E. "Farm Labor: Key Conceptual and Measurement Issues on the Route to Better Farm Cost and Return Estimates." Working paper 280, Dept. Econ., Iowa State University, 1996.

INSTRAW. *Valuation of Household Production and Satellite Accounts*. United Nations, Geneva, 1996.

Jenkins, S.P., and N.C. O'Leary. "Household Income Plus Household Production: The Distribution of Extended Income in the U.K." *Review of Income and Wealth* 42(1996):401–19.

Juster, F., and F. Stafford. "The Allocation of Time: Empirical Findings, Behavioral Models, and Problems of Measurement." *Journal of Economic Literature* 29(1991):471–522.

Lazear, E.P., and R.T. Michael. *Allocation of Income Within the Household*. Chicago: Chicago University Press, 1988.

OECD. *Farm Household Income: Issues and Policy Responses*. Paris, France: OECD, 2003.

Perali, F. "Stima, Distribuzione e Decomposizione per Genere del Reddito Esteso: Metodologia ed Applicazione ad un Campione di Individui." *Economia e Lavoro* 3-4(1999):37–56.

Skoufias, E. "Using Shadow Wages to Estimate Labor Supply of Agricultural Households." *American Journal of Agricultural Economics* 76(1994):215–77.

Smeeding, T.M. "Time and Public Policy: Why Do We Care and What Instruments Are Needed?" Paper presented at Conference on Time Use, Non-Market Work, and Family Well-Being, Washington DC, 1997.

Smeeding, T.M., and D. Weinberg. "Toward a Uniform Household Income Definition." Paper presented at Canberra Group on Household Income Measurement Meeting in The Hague, The Netherlands, 1998.

Wales, T.J., and A.D. Woodland. "Estimation of the Allocation of Time for Work, Leisure, and Housework." *Econometrica* 45(1977):116–32.