Pan A. Yotopoulos and George J. Mergos*

FAMILY LABOR ALLOCATION IN THE AGRICULTURAL HOUSEHOLD†

The analysis of intrahousehold relations has attracted considerable interest since the work of Becker (1965, 1981). More specifically, the decision on the labor time allocation of household members has been studied by development economists for two reasons. First, it sheds further light on how the development process affects the organization of production and how this, in turn, is related to the reproductive behavior of the population.[1] Second, it provides a vehicle for policy analysis by determining why certain demographic groups (women, children) are bypassed in the course of development and by devising appropriate policies for increasing the participation of such groups.[2]

Research on intrahousehold labor time allocation has been hindered by lack of data on nonmarket activities of the household. The purpose of this paper is to study the utilization of family labor in the agricultural household with sample data on market and nonmarket activities from rural Philippines. The analysis distinguishes three categories of family labor—men, women, and children—and a broad range of eight activities which include both market and nonmarket

* Professor of Economics, Food Research Institute, and Consultant/Economist, the World Bank, respectively.

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[1] Such questions of the age/sex pattern of labor force participation in development are examined, for example, by Boserup (1970).

[2] The policy issues in this field of research that relate to women are nicely summarized in World Bank (1980). Research that refers to both women and children is reported in Buvinić, Lycette, and McGreevey (1983).

(home) production. The emphasis is on the distribution of household labor, by member and by activity, both among the sample of farm households and within the household. The objective is to identify and explain the patterns prevalent in household labor allocation, based on evidence on the unequal distribution of work among household members and the specialization of demographic groups in certain activities.

Besides the new data used, certain important methodological considerations distinguish this research from previous work in the literature:

(1) It has been reported in the literature that women as a group work longer hours than men.[3] Such group-mean based comparisons completely ignore labor-time differences within demographic groups which could turn out to be quite large.

(2) The time allocated by women and children to market-related activities is reported to be substantial. The present methodology by including only households with all three groups of members (men, women, and children) controls for special situations such as women-headed households. In this way it is possible to determine not only the average contribution of each demographic group, but also the variation of this contribution across households.

(3) Finally, the association between fertility and female labor force participation is approached from a different angle. While the literature has mainly concentrated on the compatibility of childcare with women's work in market and household activities,[4] this paper focuses on the substitutability between work time of different demographic groups, especially of women and children. If it turns out that children's labor complements and substitutes for women's work, the greater the work load women carry, relative to other household members, the stronger their pronatalist incentive would be, if only to lighten the burden of their chores.

INEQUALITY IN FAMILY LABOR ALLOCATION

The crux of our analysis is the "equality" of household labor allocation. The question we address is whether the labor shares of the different demographic groups are equal to the respective population shares. If not, what are the activities that contribute most to such inequality? Is there any clear pattern emerging from the examination of such inequalities and specialization that is consistent with the demand theory of labor time allocation?[5] This question

[3] The longer workday of women is labeled the "double-day phenomenon" (World Bank, 1980, p. 3).

[4] The evidence from industrialized countries shows a trade-off between women's market work and childcare, yet the evidence from developing countries indicates no such trade-off for poor women, which implies that the residual which is reduced is leisure, and not home-production activities.

[5] The literature of the new economics of the household (Becker, 1965; Lancaster, 1966) incorporates a labor supply function, which rests on production theory. Both

is addressed at the interhousehold and the intrahousehold level. Differences in labor allocation among households emanate from differences in participation rates, in quantity of labor supplied, or in quantity of labor demanded. It is asumed that children (aged 6 to 15) and adults (over 15 years' of age) are able to participate in labor activities, whether for market or for z-good production.[6] Beyond that, differences in labor supply among households relate to differences in household size. One controls for the correlation between household size and total labor time by expressing labor per working member.

The quantity of labor supplied by households is a function of exogenous characteristics, such as the wage rate, and factors endogenous with the household, like household income, tastes, and so forth. The wage rate (and the demand for labor) varies greatly by season for different farm activities and by type of work for outside employment. By defining labor very broadly (to include household activities, separate for the peak and the slack agricultural season, farming, gardening, livestock raising, fishing, self-employment in business or trade, and wage employment), the interhousehold variance in the demand for labor decreases considerably. Most household members who wish to keep busy will be so. The remaining factors that can explain the observed inequality in labor allocation among the households are income differences and tastes. The former are captured to a certain extent by standardizing the households roughly according to initial endowments—such as land-owning households and land-tenanting households. How unequal is the resulting labor distribution across households and to what extent would it be related to patterns of labor substitution and specialization? This brings us to the second allocational question that is intrahousehold. The household allocates to members leisure and its complement, labor. Since this is not an equilibrium "full income" approach to the household, leisure allocation is not treated explicitly.[7] For the sake of

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demand and supply functions become operational when markets exist and assign actual (or imputed) values to the time contributed to production by the members of the household and to the output produced in that process. For empirical work on such an approach to the equilibrium of the household see Lau, Lin, and Yotopoulos (1978), Barnum and Squire (1979), Ahn, Singh, and Squire (1981), and Rosenweig (1980).

[6] The characteristic of the z-good is that it is both produced and consumed, but it is not traded (Hymer and Resnick, 1969). As a result of being deprived of the objective valuation of a market price, the z-good analysis has not been empirically implemented (Barnum and Squire, 1980). In the context of this paper z-good activities include *home production* defined to include activities such as cooking, fetching water, cleaning house, gardening, and so forth.

[7] The basic model of the equilibrium of the household (Becker, 1969; Lancaster, 1966) has been extended by considering the time allocation of family members in what is usually referred to as z-good production activities (Hymer and Resnick, 1969). Gronau (1973) elaborates the basic Becker-Lancaster model of the household and derives a model almost identical with Hymer and Resnick as a special case. The empirical implementation, however, of the equilibrium of the household with z-goods is

anchoring our results with comparable situations, however, we may assume that there exists a minimum amount of leisure per working family member which is institutionally determined at 365 days minus 280 working days and for each working day at 24 hours minus 10 working hours. The benchmark maximum level of labor defined thus is 2,800 hours per working member per year.

Once leisure has been subtracted, the household allocates member-labor time between market activities and z-good production.[8] Intrahousehold inequalities in the time allocated to market activities reflect differences in the opportunity cost of labor as expressed by the underlying wage-rate differentials by age and sex. For total labor allocation (in market and z-good activities) such an objective market criterion does not exist. It must be assumed that the subjective considerations alone of equating the marginal utility of leisure of household members determine labor allocation. If there is prima facie evidence that such equalization does not take place, such as when the amounts of labor contributed by household members are vastly different, the conventional explanation is that there exists specialization, or imperfect substitutability, between labor categories and labor activities. Another way to explain the same phenomenon is that there exists intrahousehold exploitation in the partial calculus of labor allocation.

DATA

Data on the allocation of labor time in households are rarely available, and when they are, they do not usually include z-good production activities. The data for this study were collected within the broader context of a survey of 590 agricultural households in Northern Mindanao, the Philippines, organized in 1978/79 by the senior author and funded by the FAO and UNFPA.[9]

The sample of households in this study is stratified according to two overlapping criteria. First, all households operate as farm-firms in the sense that they cultivate land they own or rent. This criterion allows for a discretionary factor in relation to agricultural production activities, and captures therefore certain variance both in the type of work and the amount of work which the study of landless laborers would preclude. Second, all households have three types of working members: adult males, adult females, and children aged 6 to 15 years. This criterion allows for specialization of a type of labor in certain

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not possible, because of the nonexistence of markets for z-goods, nor could we assume separability since the data indicate a substantial overlap of different categories of labor in the production of the same commodity. The household production approach as a result could not be used either (Rosenweig, 1981).

[8] The study focuses on the family labor use as an intermediate input in the production of output in the current period. Labor which will produce future outputs, such as investment in the human agent through time spent at school, is excluded from the study.

[9] For further information, see Yotopoulos (1982b).

activities and also for substitution of one type of labor for another—features that would not have been fully captured if one studied, for example, woman-headed households or childless households. After eliminating households that do not meet the above criteria, 298 observations remained in the sample.

The quality of time-use data depends upon the method of collection and the appropriateness of specific methods is much debated by surveyors and analysts (Cain, 1979). The ideal method of a participant observation is obviously not feasible in large-scale surveys. The data of the Mindanao survey were collected by asking all members of the household a series of questions on market activities and z-good production activities.[10] The fact that the data are recall rather than contemporaneous may lead to considerable reporting error such as underreporting or double counting when the respondent is engaged in more than one activity at the same time. The error that intervenes may be treated as random since there is no reason to expect its systematic association with a particular set of households.

SEX-AGE DISTRIBUTION OF LABOR TIME AMONG HOUSEHOLDS

The sample households are analyzed with reference to labor contributed by each member category—adult males, adult females, and children aged 6 to 15. The analysis is based on mean labor contribution and on the equality of labor allocation among households. The latter is based on the concentration index and its decomposition (see Appendix), derived after ranking the households by total labor allocation. The distinction between tenant and landholding households is made both to control for differences in initial endowments (since landholding households are richer) and also to reflect the difference in sources of income (since the tenant households rely more heavily on labor income).

Table 1 reveals that women's labor constitutes the most important component of household time representing roughly 40 percent of the total while men's and children's follows with about 30 percent of the total each. The per member results standardize for the size of each labor category within the household. Since the average number of children per household is the largest and that of women the smallest, the discrepancy in labor allocation by women increases (to

[10] Market activities are defined as farming, animal raising, fishing, self-employment in business and trade, and wage employment. Z-good production activities are defined as home production activities in peak season, home (nonmarket) production activities in slack season, and gardening. In certain cases data on an activity are aggregated from more detailed information collected. Farming activities are aggregated from time spent in farm preparation, plowing, seed preparation, farrowing, planting, fertilizing, weeding, spraying chemicals, harvesting, transporting, overseeing workers, irrigation, shelling corn and coconuts, and copra making. Home production activities include time spent marketing, fetching water, cooking, cleaning house, washing clothes, ironing clothes, caring for young children, running errands.

between 44 and 48 percent of the total) while the total contribution of children decreases.[11]

The total labor allocation changes noticeably between tenant and landholder households and consistently with the fact that the latter have higher initial endowments. Mean labor time in tenant households is higher than in landholding and the same stands true for the labor time of each member category. But within that total, while men's labor time remains almost the same proportion for the two types of households, the time contributed by women decreases substantially in landholding households. It appears as a result that the component of women's time is fairly elastic to income as the latter presumably increases between tenant and landholder households.

The distribution of members' time across households provides some important insights into labor allocation. Total household time is fairly equally distributed across the sample with the overall Gini coefficient in the neighborhood of 0.25. The decomposition of concentration indexes, however, markedly differentiates the three labor categories. The concentration index for women's time is 0.21 and 0.22 for tenant and landholding households, respectively. This is lower than the overall inequality index of 0.28 and 0.24, respectively. Women's labor is more evently distributed across households because there is probably a "fixed cost" component to their contribution with resulting economies of scale. Certain tasks must be performed no matter how much the total household time is. The opposite is the case with men's and children's labor time. Their concentration indexes being higher than the overall, indicates that such labor appears more heavily in households with higher levels of total labor.

Examination of the per member results provides evidence that there exists considerable division of labor within the household between men's on the one hand and women's and children's time on the other. Had there been perfect substitutability of members' time the contribution of each component to total inequality would have been roughly the same. This is not the case in Table 1. As the percent of child time to total time decreases in the three-member household, to allow for the fact that the number of children per household is the largest in comparison to the number of men and women, the contribution of children's labor becomes more equal across households and their contribution to total inequality decreases. The slack is taken up by an increase in the contribution of women and by their greater share in total inequality (52 percent for tenant households). This is the result of substitution which occurs between women's and children's jobs. Households who have relatively fewer children have more work contributed by women, thus increasing inequality relative to the per household case.

[11] The finding that women contribute substantially greater amounts of time of work than either men or children do is consistent with the evidence Elise Boulding (1976) reports from Africa. However, Cain (1979) has reported the contrary for Bangladesh.

Table 1.—Inequality in Time Allocation Among Households by Category of Member
(Percentages appear in parentheses)

	Tenant households (n =145)				Landholder households (n =153)			
	Mean labor (hours)	Labor force (persons)	Concentration index	Contribution to total inequality	Mean labor (hours)	Labor force (persons)	Concentration index	Contribution to total inequality
Per household								
Adult male	2,744	1.70	0.32	0.10	2,320	2.05	0.23	0.07
	(31)			(35)	(30)			(29)
Adult female	3,684	1.57	0.21	0.09	2,916	1.87	0.22	0.08
	(41)			(31)	(38)			(35)
Child	2,509	2.81	0.33	0.09	2,426	2.76	0.28	0.09
	(28)			(34)	(32)			(36)
Total household	8,939	6.08	0.28	0.28	7,662	6.68	0.24	0.24
	(100)			(100)	(100)			(100)
Per member								
Adult male	1,617		0.27	0.09	1,131		0.30	0.10
	(33)			(40)	(32)			(40)
Adult female	2,353		0.24	0.12	1,560		0.31	0.13
	(48)			(52)	(44)			(52)
Child	891		0.10	0.02	878		0.06	0.02
	(18)			(9)	(25)			(8)
Total household	4,862		0.23	0.23	3,569		0.25	0.25
	(100)			(100)	(100)			(100)

DISTRIBUTION OF LABOR TIME WITHIN HOUSEHOLDS BY ACTIVITY

The analysis of total household time produced evidence of specialization and inequality in labor contributions by different member categories. Next, each labor category is examined separately with reference to the eight activities that absorb the total market and z-good production time. The mean labor contribution for each activity and the equality of labor allocation among activities is examined in order to identify the areas where specialization and inequality arise.

The households are ranked on the basis of total labor allocated by each category of members—males, females, and children—and the total index of inequality so derived is decomposed to concentration indexes for the eight production activities distinguished. The results appear in Table 2, 3, and 4 for male, female, and child labor time, respectively. The overall concentration index for each category indicates that child labor is distributed relatively equally. This is of course consistent with the finding from Table 1 about total labor time allocation among households.

Some interesting observations emanate from examination of the mean labor time allocated to each activity by household member category. Home production activities, total for peak and slack agricultural seasons, account for the largest part of both female and child labor use, from 65 to 80 percent of the total for each category. While women and children specialize in home production, men specialize mainly in farming activities and in wage employment, with just over 20 percent of their total time in each. Of course, at the margins of such specialization between men's activities and women's and children's activities there is a certain amount of substitution and complementarity between different categories of labor. Substitution of men's labor for women's and children's labor is at its weakest in home production activities. The 20 male labor going into home production is substantial from the point of view of total time, but is certainly small in relation to women's and children's labor going into that activity. Women and children, on the other hand, make a most substantial contribution into the male specialization of farming, and to a lesser extent to wage employment. Compared with the 581 hours that males spend on the average (tenant households) in farming, women spend 419 hours and children 322 hours. One surmises that a good part of this labor is employed during peak-season agricultural activities, as evidenced from the fact that labor for home production is reduced by two-thirds over that of peak season for all three categories.

Comparing tenant and landholding households one observes that for almost all activities and for each category of labor the tenant households put in more time than the landholders. This is true even after one normalizes for the differing household sizes by category of labor and expresses labor allocation on a per member basis. The greater family-labor intensity of the activities of tenant households can be better appreciated if examined in conjunction with

the distribution results of Tables 2 to 4.

Farming is the main occupation of the households studied. Farming is also the activity that allows less discretionary choice as to its timing or the amount of labor per job. Despite the fact that households differ as to farm size and type of cultivation, farming labor for all three member categories is quite equally distributed throughout the landholding households and very unequally distributed in the tenant households. As an example, the concentration index of child labor in the former households is 0.24 while the total inequality index is 0.48. The same pattern appears for male and female labor also. This pattern is evidence of the ability of the better-endowed households, the landholders, to supplement family labor by hired labor in meeting the peak labor demands of the agricultural cycle or the additional labor requirements of a relatively large farm size. The tenant households, on the other hand, in similar circumstances would have to rely mostly on family labor, thus creating an unequal distribution of labor across activities. The same story of supplementing family labor by hired labor can be said also for other activities of landholding households. Thus the less intense application of family labor arises, which is probably a correlate of the superior initial endowments and wealth position of the landholding households.

CONCLUSION

The distribution of labor across households and across activities was found to be systematically related to sex and to the household status (tenant versus landholders), both in terms of absolute labor contribution (hours) and of relative distribution (concentration indices). Women and children appear to be the most important labor contributors in the household. Moreover, their contribution becomes even more critical in the less well-endowed households, which are the tenant households in our sample.

Although all categories of household members participate to a certain degree in all production activities enumerated, there is noticeable specialization of men into farming and wage employment and of women and children into home production. This is not surprising. The surprise comes when observing that there is substantial substitution and complementarity of women's and children's labor into the "men's activities" as compared to the relatively small contribution by men to home production—despite the fact that the latter has been defined rather broadly. Moreover, there exists great substitutability between women's and children's time, especially in home production, but also in other market and z-good production activities. This substitutability is more pronounced in the less privileged households, the tenant households. If this finding is corroborated by other studies, it implies an important policy conclusion. The women in the agricultural household must have a pronatalist incentive—and the poorer the household the stronger the incentive. Children may be the most effective way available to rural women for reducing the back-breaking arduousness (and soul-searing boredom) of agricultural work. This tenative observation reminds one of Elisa Boulding's aphorism that in rural households "the wheelbarrow is the best contraceptive"!

Table 2.—Inequality in Time Allocation Within Household by Activity: Male Labor Time
(Percentages appear in parentheses)

	Tenant households (n =145)			Landholder households (n =153)		
	Mean labor (hours)	Concentration index	Contribution to total inequality	Mean labor (hours)	Concentration index	Contribution to total inequality
Per household						
Market activities						
Farming	581	0.52	0.11	453	0.28	0.06
	(21)		(28)	(20)		(14)
Animal raising	368	0.07	0.01	507	0.24	0.05
	(13)		(3)	(22)		(14)
Fishing	479	0.30	0.05	108	0.62	0.03
	(18)		(13)	(5)		(8)
Self-employment	22	0.57	0.01	81	0.75	0.03
	(1)		(1)	(4)		(7)
Wage employment	606	0.58	0.13	535	0.56	0.13
	(22)		(32)	(23)		(33)
Z-good activities						
Home production, peak	120	0.35	0.02	116	0.30	0.01
	(4)		(4)	(5)		(4)
Home production, slack	431	0.35	0.06	366	0.32	0.05
	(16)		(14)	(16)		(13)
Gardening	133	0.42	0.02	154	0.48	0.03
	(5)		(5)	(7)		(7)
Total	2,470	0.40	0.40	2,320	0.39	0.40
	(100)		(100)	(100)		(100)

Per member						
Market activities						
Farming	342	0.35	0.08	221	0.35	0.07
	(21)		(21)	(20)		(17)
Animal raising	217	0.05	0.01	247	0.25	0.06
	(13)		(2)	(22)		(14)
Fishing	282	0.46	0.08	53	0.30	0.01
	(18)		(22)	(5)		(4)
Self-employment	13	0.86	0.01	39	0.86	0.03
	(1)		(2)	(4)		(8)
Wage-employment	357	0.50	0.11	261	0.55	0.13
	(22)		(30)	(23)		(32)
Z-good activities						
Home production, peak	71	0.28	0.01	56	0.41	0.02
	(4)		(3)	(5)		(5)
Home production, slack	254	0.33	0.05	518	0.41	0.06
	(16)		(14)	(16)		(16)
Gardening	78	0.40	0.02	75	0.32	0.02
	(5)		(5)	(7)		(5)
Total	1,614	0.36	0.36	1,135	0.40	0.40
	(100)		(100)	(100)		(100)

Table 3.—Inequality in Time Allocation Within Household by Activity: Female Labor Time
(Percentages appear in parentheses)

	Tenant households (n =145)			Landholder households (n =153)		
	Mean labor (hours)	Concentration index	Contribution to total inequality	Mean labor (hours)	Concentration index	Contribution to total inequality
Per household						
Market activities						
Farming	419	0.55	0.06	256	0.31	0.03
	(11)		(21)	(9)		(9)
Animal raising	307	0.26	0.02	313	0.24	0.03
	(8)		(7)	(11)		(8)
Fishing	24	0.16	0	0	0	0
	(1)		(0)	(0)		(0)
Self-employment	113	0.65	0.02	279	0.67	0.06
	(3)		(7)	(10)		(20)
Wage employment	238	0.82	0.05	146	0.45	0.02
	(6)		(18)	(5)		(7)
Z-good activities						
Home production, peak	609	0.19	0.03	473	0.27	0.04
	(17)		(10)	(16)		(13)
Home production, slack	1,974	0.21	0.11	1,449	0.28	0.14
	(54)		(37)	(43)		(43)
Gardening	0	0	0	0	0	0
	(0)		(0)	(0)		(0)
Total	3,684	0.30	0.30	2,916	0.32	0.32
	(100)		(100)	(100)		(100)

Per member						
Market activities						
Farming	268	0.25	0.03	137	0.42	0.04
	(11)		(9)	(9)		(10)
Animal raising	196	0.23	0.02	168	0.24	0.03
	(8)		(6)	(11)		(7)
Fishing	15	0.64	0	0	0	0
	(1)		(0)	(0)		(0)
Self-employment	72	0.50	0.02	149	0.55	0.05
	(3)		(5)	(10)		(15)
Wage-employment	152	0.21	0.01	78	0.12	0.01
	(6)		(4)	(5)		(2)
Z-good activities						
Home production, peak	389	30	0.05	253	0.34	0.06
	(17)		(16)	(16)		(16)
Home production, slack	1,261	0.32	0.17	775	0.36	0.18
	(54)		(58)	(50)		(50)
Gardening	0	0	0	0	0	0
	(0)		(0)	(0)		(0)
Total	2,353	0.30	0.30	1,560	0.36	0.36
	(100)		(100)	(100)		(100)

Table 4.—Inequality in Time Allocation Within Household by Activity: Child Labor Time
(Percentages appear in parentheses)

	Tenant households (n =145)			Landholder households (n =153)		
	Mean labor (hours)	Concentration index	Contribution to total inequality	Mean labor (hours)	Concentration index	Contribution to total inequality
Per household						
Market activities						
Farming	322	0.55	0.07	228	0.24	0.02
	(13)		(15)	(9)		(5)
Animal raising	89	0.51	0.02	95	0.44	0.02
	(7)		(4)	(4)		(5)
Fishing	17	0.66	0	2	0.52	0
	(1)		(0)	(0)		(0)
Self-employment	0	0	0	8	0.95	0
	(0)		(0)	(0)		(0)
Wage employment	20	0.51	0	14	0.88	0.01
	(1)		(0)	(1)		(2)
Z-good activities						
Home production, peak	439	0.44	0.08	481	0.42	0.08
	(18)		(16)	(20)		(20)
Home production, slack	1,539	0.45	0.28	1,584	0.41	0.27
	(61)		(58)	(65)		(68)
Gardening	83	0.90	0.03	14	0.40	0
	(3)		(6)	(1)		(0)
Total	2,509	0.48	0.48	2,425	0.41	0.40
	(100)		(100)	(100)		(100)

Per member						
Market activities						
Farming	114	0.61	0.08	83	0.28	0.03
	(13)		(18)	(9)		(7)
Animal raising	32	0.42	0.02	34	0.21	0.01
	(4)		(3)	(4)		(2)
Fishing	6	0.34	0	1	0.79	0
	(1)		(0)	(0)		(0)
Self-employment	0	0	0	2	0.59	0
	(0)		(0)	(0)		(0)
Wage-employment	7	0.39	0	5	0.40	0
	(1)		(0)	(1)		(0)
Z-good activities						
Home production, peak	156	0.39	0.07	174	0.40	0.08
	(18)		(15)	(20)		(21)
Home production, slack	547	0.40	0.25	574	0.40	0.26
	(61)		(56)	(65)		(68)
Gardening	29	0.86	0.03	5	0.11	0.01
	(3)		(6)	(1)		(2)
Total	891	0.44	0.44	878	0.38	0.38
	(100)		(100)	(100)		(100)

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APPENDIX

METHODOLOGY OF LABOR TIME INEQUALITY DECOMPOSITION

The Gini coefficient is used to measure inequality in household labor allocation. As is well known the Gini coefficient is derived from the Lorenz curve and provides a complete ordering of distributions. Assume that labor time x of a household is a random variable with probability density function $f(x)$. Then

$$F(x) = \int_o^x f(x)\, dx, \tag{1}$$

where $F(x)$ can be interpreted as the proportion of household units having labor time less or equal to x. $F(x)$ ranges from 0 to 1. Furthermore, if it is assumed that the mean μ of the distribution exists and assuming that $F(x)$ is continuous so that $F\prime(x)$ exists, then

$$F\prime(x) = \frac{1}{\mu} \int_o^x x\, f(x)\, dx. \tag{2}$$

The Lorenz curve is the relationship between the variables $F(x)$ and $F\prime(x)$. In our case, plotting the cumulative distribution of labor time for households ranked in ascending order of total labor allocation would provide the complete ordering of the Lorenz curve. The Gini coefficient based on that curve gives a measure of the inequality of labor distribution.

The three components of total labor time—adult male, adult female, and child labor time—are additive. Their sum gives total labor time. In decomposing the inequality in distribution of total labor time in its three components, one would have assumed that it sufficed to sum the three component Ginis appropriately weighted by the share of each labor component in total labor time. This, however, is not correct since the overall Gini derives from the household ranking according to total labor time, which may not be monotonically related to the household ranking according to individual labor components. For the Gini of the individual labor components the household ranking according to total labor is obviously the "wrong" ranking. The method of decomposing the

Gini coefficient is based on the relationship between the component Ginis and the overall Gini according to the "right" and "wrong" ranking of households.[1]

A "pseudo-Gini" concentration index has been defined for the components,[2] and it has been shown to be related to the true component Gini (the one derived on the basis of the correct ranking) as

$$Cg = \frac{R[g(x), r(x)]}{R[g(x), r(g(x))]} Gg, \tag{3}$$

where the numerator of the fraction is the correlation coefficient between component labor, $g(x)$, and total labor rank, $r(x)$, and the denominator is the correlation coefficient, again of component labor, and component labor rank, $r(g(x))$. It can next be shown that for i components the overall Gini is the sum of the concentration indices appropriately weighted by the share of each labor component to total labor. In our case, for three labor components, the overall Gini of total family time is equal to

$$G = \frac{1}{\mu} \sum_{i=1}^{3} \mu_i \, Cg_i, \tag{4}$$

where the weights μ_i are proportional to the mean of each component of labor. Equation (4) is used to analyze the relationship between total household labor time and labor time of household members. So for the three categories of household labor total labor time inequality will be related to the "pseudo-Gini's" of the labor time of adult males, adult females, and working children. A straightforward extension of the approach will be used to relate the inequality of each category of labor time to the concentration indices of the time devoted to each of the activities the respective household members perform.

[1] For detailed derivation of the decomposition method see Pyatt (1976), Fei, Ranis, and Kuo (1978), and Kakwani (1980, pp. 173–81).

[2] The name is due to Fei, Ranis, and Kuo (1978). The same construct is called concentration index by Pyatt (1976) and Kakwani (1980).