Intra-Household Allocation of Time and Resources: Empirical Evidence on a Sample of Italian Households with Young Children

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Abstract

This paper examines the labour supply decision of the household when the presence of pre-school children, creating non-separabilities in the use of time, is explicitly taken into account. A set of nested tests is obtained from the standard household utility model and from the collective one, both including a household production function measuring the quality of time provided to the children. The application of the tests to a sample of Italian households shows that the collective model cannot be rejected. We also find evidence against the income pooling hypothesis and against the Slutsky inter-person symmetry condition. However, the identification of the income parameters shows that the distribution of the household non-labour income does not affect the household's labour supply system. We also provide a measure of the bias implicit in the standard household utility approach, by comparing the labour supply elasticiticies obtained from the two models.

Keywords: household labour supply, children
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1. *Introduction*

In the traditional literature on household labour supply there is an open debate on whether a joint utility model or a "male chauvinist" model better represent the real decision- making process. The necessary and sufficient conditions of the two models differ greatly. The unitary model implies equal cross-substitution effects on husband's and wife's labour supply with the spouse's wage entering into individual leisure only as an adjustment to income. The “male chauvinist” model considers independent utilities, but the wife treats the husband's earnings only as property income. A more recent approach, the "collective" model, has been tried, and some empirical evidence using it is available[1]. This model allows for different preference structures to affect the simultaneous decision of husband and wife's labour supply, and constrains individual labour supply and consumption to be Pareto efficient given an arbitrary income- sharing rule in any household budgetary situation.

A common empirical result of the literature, including unitary and collective models is that:

> “the standard joint utility model seems inadequate when confronted with sharp differences in the behaviour of families with and without children. An augmented version which includes children as a joint consumption good and the care of children as an alternative use of time seems a more promising approach” (Lundberg, 1988, p. 231).

However, the empirical evidence by Fortin and Lacroix (1997) suggests that even the collective model is inadequate in the case of young couples with pre-school children.

In this paper we present a model that extends both the traditional household utility framework (also called unitary framework) and the collective one, to include pre-school children and then, following Fortin and Lacroix (FL henceforth), we derive necessary and sufficient conditions to test between the two models. The approach of the present paper is more general than in FL, in that it deals with the presence of children in a

[1] See Chiappori (1988) and Fortin and Lacroix (1997).

household creating non-separabilities similar to those examined by the literature on public goods and externalities.

Much of the recent literature on child care provides evidence of the impact of changes in child care costs on women's participation decisions. Few papers estimate a structural model of the two simultaneous decisions, childbearing and labour market participation[2]. They focus only on the mother, and they consider the other family members' earnings as exogenous. Our aim is a joint model of the labour supply decisions of both spouses and of the demand for child care to examine the impact of the child care problem on the decision to work.

In each model discussed below, the presence of pre-school children is assumed to affect the preference structure of the family in a paternalistic way, that is both parents care about the quality of the care that their children receive. The quality of time is the result of the maximisation of a production function, in which the inputs are the time that parents spend with the child, the time occupied by informal child care, such as that provided by relatives and the time of formal child care (nurseries and crèches). These are assumed to be perfect substitutes for one another; this assumption constrains decisions on the wife's participation and use of child care to be efficiently driven by the hourly cost of each input only. Extending this approach to consider more flexible degrees of substitution would provide additional information on the role played by preferences in this simultaneous decision.

The empirical application uses the 1993 Italian Survey of Household Income and Wealth (SHIW) conducted by the Bank of Italy. From a sample of 8,089 households interviewed in 1993, we select a sub-sample of married couples with pre-school children. The empirical model is an application of the generalised Heckman two-step procedure to the estimation of two labour supply functions, correcting the wife's hours of work equation for the selection bias created by the joint decision on the labour market participation and use of child care.

The econometric specification is in line with the main literature; however, we also extend the labour supply estimation to the sub-sample of households that work but do not buy any formal child care, by considering an

[2] See in particular Michalopoulos et al. (1992) and Ribar (1995).

endogenous switching selection model. We then test the restrictions derived from both the unitary and the collective model.

The paper is organised in four substantive sections. In Section 2 the unitary and the collective models with a household production function are analysed, and an unrestricted labour supply system is introduced to derive a series of nested tests for each case. Section 3 discusses the stochastic specification and Section 4 the sample selection and its main characteristics. Section 5 presents the empirical results. The concluding remarks are given in Section 6.

2. A Theoretical Framework for Household Labour Supply with Child Care

What does the problem of time allocation for a young couple with children aged 0-5 look like? A well- known result in the econometric literature is that the labour supply of this particular demographic group differs remarkably from the rest of the population. The presence of very young children engenders strong non-separabilities in the couple's work decisions.

This section introduces an interpretation of the decision- making process of this group, both in the context of a standard household utility function and in the collective framework, and derives a set of testable restrictions for each case.

In trying to model the simultaneous decisions on labour supply, consumption, and quality of time, the literature has relied on one important simplifying assumption. Because existing data-sets give child- care costs only for working women, papers on child care assume that there is no distinction between pure leisure and time spent caring for children. This does indeed reduce the number of variables considered; but it does not explain why a non-working mother would prefer to buy child care, even during the child's early years.

Since in our sample we actually observe all four possible combinations derived from the participation and formal child care decisions (i.e. working wives both buying and not buying child care; and housewives buying and not buying child care), we keep the two variables, leisure and the mother’s time spent with the children, separate. Hence, we consider preferences as defined over consumption, pure leisure and the children’s quality of life. That is: we

make the standard assumption of disutility from work plus the assumption that both parents care about the quality of time their children receive.

The value for the quality of time is obtained by maximising a production function whose inputs are the time that parents spend with the child, the time provided by other relatives (not necessarily living in the house) and the time of child care that is purchased. We call the first two inputs "*informal*", and the third "*formal" child care*, the latter consists mainly in nursery schools and crèches, and nannies. All types of child care are assumed to be perfect substitutes.

In order to derive a series of nested tests, both the unitary and the collective approach are compared with an unrestricted system of household labour supplies.

The functional form chosen in both approaches is the linear expenditure system (LES); the choice is driven by the search for a more flexible functional form than the quadratic indirect utility, strongly limited by the implied linear marginal utility, used in FL. The LES[3] keeps the algebra relatively simple and its degree of flexibility depends on the number of goods considered (i.e., the number of coefficients to estimate in the labour supply equations).

2.1. *The Unitary Case*

Assuming a household utility having Stone Geary form, defined over individual consumption C^m, C^f (the superscript *m* designates the husband, *f* the wife), leisure l^m, l^f and the quality of child care Q^c, we consider a utility maximisation problem as follows:

[3] The LES form is monotonic in the wage rate: an LES is always either forward-sloping or backward- sloping, depending on whether the level of income is higher or lower than the subsistence level. See Michalopoulos et al. (1992) for empirical evidence of a structural model with the same functional form.

$$\max d_1 \log\left(C^m - \gamma^m(\mathbf{z})\right) + d_2 \log\left(C^f - \gamma^f(\mathbf{z})\right) + d_3 \log\left(l^m\right) + d_4 \log\left(l^f\right) + d_5 \log Q^c$$

$$s.t. C^m + C^f + p^{cc} t^{cc} + p^o t^o = y + w^m h^m + w^f h^f$$
$$T^m = l^m + h^m + t^m \qquad (1)$$
$$T^f = l^f + h^f + t^f$$
$$T^c = t^m + t^f + t^o + t^{cc}$$

where $d_i \geq 0$ ($i=1,...,5$); $\gamma^j = \gamma^j(\mathbf{z})$ ($j=m,f$), the function of demographics, defines the minimum committed level of consumption, the other three goods having a subsistence level fixed at zero. The price of consumption has been normalised to 1, and w^m, w^f, p^{cc}, p^o are respectively the individual wage rates and the hourly prices for formal child care (the time measured by t^{cc}) and for that provided by relatives (t^o). The constraints are the household budget, and the time endowments for each parent and each child; all constraints have to hold.

$Q^c = \left(t^m + t^f + \delta^o t^o + t^{cc}\right)$ is a production function whose inputs are the time each parent spends with the children (t^f and t^m), the care provided by other adults in the family if available (δ^o is a dummy for availability taking either 1 or 0), and the time of formal child care purchased. All these inputs are perfect substitutes for one another[4].

It is assumed that $w^m \neq \min\{w^m, w^f, p^{cc}, p^o\}$; together with the perfect substitution assumption, this precludes considering the father's care as an efficient form of child care. Given the budget constraint, therefore, the decision on the form of child care is driven by the other three prices: w^f, p^{cc}, p^o. The time the mother spends with the child has an opportunity cost equal to her expected wage. Moreover, since relatives providing child care are usually retired, we can fix $p^o = 0$.[5]

[4] Because of the assumption of perfect substitutability, Q^c can only take a constant value, i.e. the child's total time endowment.

[5] The drawback of this assumption is that whenever informal care is available, it is always preferred to the other child care types, it is unrationed and there is no shadow cost. However, since the data set used here does not include such a variable, we only consider it as a potential

To exclude the case of $l^f = 0$, which would give an infinite disutility, we impose $T^f > T^c$, so that the mother can always enjoy a bit of leisure.

The final choice of formal, informal or maternal child care is determined by the availability of other adults, individual preferences on leisure and consumption, and the structure of the labour market and the child care market (we do not specify this decision-making process in great detail). The same variables influence the mother's decision to participate in the labour market, and whenever they are favourable, the labour supply system of a household with two working parents that solves the maximisation problem (1) is the following:

$$\begin{aligned} h^m &= (d_1 + d_2 + d_4)T^m - \frac{d_3}{w^m}\left[y + w^f T^f - (1-\delta^o)p^{cc}T^c - \gamma(\mathbf{z})\right] \\ h^f &= (d_1 + d_2 + d_3)T^f - \frac{d_4}{w^f}\left[y + w^m T^m - (1-\delta^o)p^{cc}T^c - \gamma(\mathbf{z})\right] \end{aligned} \tag{2}$$

where $\gamma = \gamma^f(\mathbf{z}) + \gamma^m(\mathbf{z})$ and since the coefficient d_5 in the household utility function in (1) is always multiplied by a constant, we have used the normalisation $\sum_{i=1}^{4} d_i = 1$. In (2), the lack of informal child care imposes an extra cost when both parents work.

Moreover, changes in non- labour income and in the spouse's potential earnings are constrained to have the same effect on individual labour supplies.

2.2. *The Collective Model*

Underlying the collective model is the idea that each person with power to decide in a family has a well-defined preference set and individual choices are Pareto-efficient. Following Chiappori (1988), the literature distinguishes between models envisaging only the consumption of private goods, i.e.

option, and do not develop its analysis too far.

goods consumed individually by each family member, and those allowing for both private and public goods (those consumed in common). An example of the general case with both private and public goods is:

$$\max_{C^m, C^f, l^m, l^f, Q^C} W\left(U^m\left(C^m, l^m, Q^C\right) + \Psi(\mathbf{w}, \mathbf{y}) U^f\left(C^f, l^f, Q^C\right)\right)$$

subject to the household budget constraint. Here Q^C is a public good, whereas consumption and individual leisure are private goods; $\Psi(\cdot)$ is an exogenous function, homogeneous of degree zero in wage rates and individual non-labour incomes, which means that the second fundamental welfare theorem holds[6].

The problem under investigation here involves both public and private goods (private consumption and leisure, but also the shared concern of both parents caring for the children's quality of life). This term creates non-separabilities in the individual utilities. However, because it is assumed that individual preferences are of the Stone-Geary type and that the times the parents spend with the child are perfect substitutes and $w^m \neq \min\{w^m, w^f, p^{cc}, p^o\}$, $t^m > 0$ is never a Pareto-optimal solution. Thus the aggregate problem can be decentralised into the following two problems, one for the husband and one the wife:

[6] With this general approach one must choose either to test for it since the derived aggregate demand for consumption satisfies a Slutsky symmetry plus a rank one factor (see Browning and Chiappori, 1994) or, if one's prefer to decentralise the problem to an individual level, to impose some assumptions on the decentralisation process, as in Chiuri and Simmons (1997), and derive extra restrictions for them.

As Chiappori (1988) shows, the simpler case of only private goods and egoistic agents has an extra property: the aggregate collective problem is separable in consumption and leisure and equivalent to two distinct individual utility maximisation problems, each subject to a budget constraint defined by an exogenous function of wages and non-labour incomes, homogeneous of degree one, called the income sharing rule, which meets the total household budget constraint.

$$\max_{C^m, l^m} f_1 \log\left(C^m - \gamma(\mathbf{z})\right) + f_2 \log\left(l^m\right) + f_3 \log T^C$$
$$s.t. C^m = \phi^m + w^m h^m$$
$$T^1 = l^1 + h^1$$
$$f_j \geq 0; \sum_{i=1}^{3} f_i = 1$$

where the quality of child care has become a constant externality, and

$$\max_{C^f, l^f, t^f, t^o, t^{cc}} g_1 \log\left(C^f - \gamma(\mathbf{z})\right) + g_2 \log\left(l^f\right) + g_3 \log\left(t^f + \delta^o t^o + t^{cc}\right)$$
$$s.t. C^f = y - \phi^m + w^f h^f - p^{cc} t^{cc} - p^o t^o$$
$$T^f = l^f + h^f + t^f$$
$$T^c = t^f + t^o + t^{cc}$$
$$g_j \geq 0; \sum_{i=1}^{3} g_i = 1$$

In both problems, we take:

$$\phi^m(\mathbf{w}, \mathbf{y}, p_{cc}) = k_0 + k_1 w^m T^m + k_2 w^f T^f + k_3 y + k_4 y^m + k_5 p^{cc} T^C \qquad (3)$$

The income sharing rule (3) is assumed linear in the variables determining household full income (in the equation $y = y^f + y^m$ is family non-labour income) and in the total exogenous cost of child care. This is the same form used by FL, but with an extra term $p^{cc} T^c$ [7]. The main properties of the

[7] The case we are dealing with is an example of a collective model extended to a household production function for a "marketable domestic good", which has, according to the distinction made in Chiappori (1997), no problem of identification of the income sharing rule, since the price for the domestic good is exogenous to the household. In our specific case, if leisure or time spent looking after children or individual consumption were observable, then we could

income sharing rule are that:

> "The distribution function ... must be allowed to depend on prices and total expenditures, since these influence the distribution of 'power' within the household" Browning and Chiappori (1994, p. 6).

In this collective model, given decentralisation, cross-equation restrictions in the two labour supplies can be derived only because of the requirement that the income sharing rule has must satisfy the household budget constraint. The labour supply system is thus a solution of the two simultaneous problems:

$$h^m = \frac{f_1}{(f_1+f_2)}T^m - \frac{f_2\left[\phi^m(\cdot)-\gamma(\mathbf{z})\right]}{w^m(f_1+f_2)}$$
$$h^f = \frac{g_1}{(g_1+g_2)}T^f - \frac{g_2\left[y-\phi^f(\cdot)-\gamma(\mathbf{z})\right]}{w^f(g_1+g_2)}$$

Substituting the income sharing rule specification, this system can be rewritten as:

$$\begin{aligned} h^m &= (f_1 - f_2k_1)T^m - \frac{f_2}{w^m}\left[k_0 + k_2w^fT^f + k_3y + k_4y^m - k_5p^{cc}T^C - \gamma^m(\mathbf{z})\right] \\ h^f &= (g_1+g_2k_2)T^f - \frac{g_2}{w^f}\left[(1-k_3)y - k_0 - k_1w^mT^m - k_4y^m - (k_5+1-\delta^o)p^{cc}T^C - \gamma^f(\mathbf{z})\right] \end{aligned} \tag{4}$$

Note that in all cases the hours offered by the husband are unaffected by the wife's optimal choice; and only when $\delta^0 = 1$ do the two coefficients of the cost of child care in the labour supply functions become 'symmetric', as in (2). In either case, each income source is allowed to affect individual

avoid imposing an *a priori* functional form and instead identify the income sharing rule (and preferences) up to an additive constant (see also Bourguignon *et al.* 1995 and Bourguignon 1999 for the specific case of caring preferences for children's consumption).

labour supply independently of the others, but according to the weight attributed by the income sharing rule.

2.3. *The Unrestricted Model and the Testable Restrictions*

Consider the following household labour supply system:

$$\begin{aligned} h^m &= a_1 T^m + a_2 \frac{w^f T^f}{w^m} + a_3 \frac{y}{w^m} + a_4 \frac{y^m}{w^m} + a_5 \frac{p^{cc} T^c}{w^m} + a_6 \frac{\mathbf{z}}{w^m} \\ h^f &= b_1 T^f + b_2 \frac{w^m T^m}{w^f} + b_3 \frac{y}{w^f} + b_4 \frac{y^m}{w^f} + b_5 \frac{p^{cc} T^c}{w^f} + b_6 \frac{\mathbf{z}}{w^f} \end{aligned} \tag{5}$$

The system is derived from the assumptions that the leisure of both husband and wife is linear in the budget share and homogeneous of degree zero in all prices and incomes (p^{cc}, w^m, w^f, y, y^m) and that each person, the child included, has a defined time endowment, i.e. T^m, T^f, T^c. All prices and incomes are in real terms; **z** is a vector of demographic variables and a constant.

We call the system in (5) *unrestricted* because no cross-equation restrictions are imposed. However it provides the nesting framework to test for a unitary and for a collective model.

Three sets of restrictions characterise the unitary system (2); they are the necessary and sufficient conditions for a household utility function to be maximised, subject to a budget constraint:

a) the income pooling hypothesis, i.e. all the household's full income sources have the same coefficient in the labour supplies;

b) the Slutsky matrix must be symmetric;

c) and it has to be negative semi-definite.

By comparing the system (2) with (5) we derive the necessary and sufficient conditions to impose on the unrestricted model with 12 coefficients to satisfy a unitary framework, with 4 coefficients.

TABLE 1
THE THREE MODELS COMPARED

Unrestricted	Unitary	Collective
a_1	$d_1 + d_3 + d_4$	$f_1 - f_2 k_1$
a_2	$-d_2$	$-f_2 k_2$
a_3	$-d_2$	$-f_2 k_3$
a_4	0	$-f_2 k_4$
a_5	$d_2(1-\delta^o)$	$-f_2 k_5$
a_6	$d_2(\gamma^m + \gamma^f)$	$f_2 \gamma^m$
b_1	$d_1 + d_2 + d_4$	$g_1 + g_2 k_2$
b_2	$-d_3$	$g_2 k_1$
b_3	$-d_3$	$-g_2(1-k_3)$
b_4	0	$g_2 k_4$
b_5	$d_3(1-\delta^o)$	$g_2(k_5 + 1 - \delta^o)$
b_6	$d_3(\gamma^m + \gamma^f)$	$g_2 \gamma^f$

Note: The first column lists the parameters of the unrestricted system (5); the second, those of the unitary model (2); the third, those in the collective system (4).

These conditions translate into the following testable sets:

a) income pooling hypothesis:

$a_2 = a_3$ $\qquad$ $b_2 = b_3$

$a_4 = 0$ $\qquad$ $b_4 = 0$

b) Slutsky symmetry:

$$a_2 = a_1 - 1 \qquad\qquad b_5 = \frac{(b_1 - 1)a_5(1-\delta^o)}{(a_1 - 1)}$$

$$b_2 = b_1 - 1 \qquad\qquad b_6 = \frac{(b_1 - 1)a_6}{(a_1 - 1)}$$

c) negative semi-definiteness of the Slutsky matrix:

$0 \le a_i < 1 \qquad 0 \le b_i < 1 \qquad$ with $i=1,...,5$.

To test whether the restrictions implied by the collective model are valid, we first test some cross-equation restrictions that allow us to identify all the coefficients of the income sharing rule appearing in system (4), except the constant term. We thus derive the coefficients of each individual utility function and test for the integrability condition:

$$\frac{\partial h^i}{\partial w^i} - \frac{\partial h^i}{\partial \phi^i} h^i \ge 0 \qquad \text{with } i=m,f \text{ and } \phi^f = y - \phi^m.$$

Comparing (4) with the unrestricted system, we obtain three restrictions to impose on (5) in order to identify the 9 coefficients of the collective model:

d)

$$b_1 = \frac{b_3(a_1 - a_2 - 1)}{(a_1 - a_3 - 1)} - \frac{b_2(a_3 - a_2)}{(a_1 - a_3 - 1)} + 1$$

$$b_4 = -\frac{a_4(b_2 - b_3)}{(a_1 - a_3 - 1)}$$

$$b_5 = -\frac{a_5(b_2 - b_3)}{(a_1 - a_3 - 1)} + \frac{b_3(a_1 - 1) + b_2 a_3}{(a_1 - a_3 - 1)}(1 - \delta^o)$$

We also test whether the weight of each individual income included in the income sharing rule could be the same ($k_1 = k_2 = k_3$ and $k_4 = 0$):

e)
$$a_2 = a_3 \qquad b_4 = 0$$
$$a_4 = 0 \qquad b_2 = \frac{a_2 b_3}{\left(a_1 - 2a_2 - 1\right)}.$$

In other words, we test whether the income sharing rule, identifiable with conditions d) satisfies the pooling hypothesis.

3. The Stochastic Specification

The sample of working couples using the market child care service has two variables, female labour supply and demand for formal child care, both truncated at zero level. Therefore, after considering an additive error term in each labour supply equation, capturing both measurement error and unobservable variations in preferences, we must deal with the selection bias caused by this truncation level.

Heckman's two-step procedure provides consistent estimates of a truncated regression, by conditioning them on a previous estimation of the reduced form of the decision-making process that generates the same variable. However, in selectivity problems it is important to determine whether inclusion in the sample is the result of a single binary decision, or if it is the result of a single binary variable arising from more than one binary decision. If the decision-making process is incorrectly taken as a univariate probit model, then one would estimate incorrect sample selectivity regressors for the labour supply equation. The difficulties of providing satisfactory empirical evidence supporting a structural model of labour supply for households with young children might be related to this deficiency.

From the analysis in section 1, it follows that the simultaneous household decisions on wife's participation status and formal child care are determined by: individual or household preferences, price and wage values, which implicitly involve such variables as local labour and the child care market conditions, and the availability of informal child care. We thus assume two latent variables (I_w^*, I_{cc}^*) in reduced form, capturing the participation decision and the decision to buy formal child care in each family; and we define two

distinct female labour supplies expressed in a generic form[8]:

$$I_w^* = \mathbf{Z}'\alpha_w - \varepsilon_w$$

$$I_{cc}^* = \mathbf{Z}'\alpha_{cc} - \varepsilon_{cc}$$

$$h^{f*} = \mathbf{X}'\beta + u^f$$

where the vector of random errors $\varepsilon \equiv \left[\varepsilon_w, \varepsilon_{cc}, u^f\right]$ is distributed as a multivariate normal $N_3\left(0, \Sigma^f\right)$ and

$$\Sigma^f = \begin{bmatrix} 1 & \rho & \sigma^f_{wh} \\ \rho & 1 & \sigma^f_{cch} \\ \sigma^f_{wh} & \sigma^f_{cch} & \sigma^{f\,2}_h \end{bmatrix} = \begin{bmatrix} \Sigma_{wcc} & \Sigma_{wcch} \\ \Sigma_{hwcc} & \Sigma_h \end{bmatrix}$$

is the variance-covariance matrix (in the last expression Σ_{wcc} is *2x2* and Σ_h is a scalar). The vector $\mathbf{Z}$ includes household demographic characteristics and characteristics of the labour and child care markets. We also construct a dichotomous variable I_j, with *j=w,cc* such that $I_j = 1 \Leftrightarrow I_j^* \geq 0$ and $I_j = 0 \Leftrightarrow I_j^* < 0$; this indicates which alternative is chosen in each equation. $\mathbf{X}' \equiv \left[y, y^m, \mathbf{w}, p_{cc}, \mathbf{T}, \mathbf{z}\right]'$ are the regressors in the wife's labour supply derived in section 1.

Then, we can observe the wife's labour supply as the following:

$$h^f = h^{f*} \quad \text{if} \quad I_w^* > 0 \text{ and } I_{cc}^* > 0 \text{ or if } I_w^* > 0 \text{ and } I_{cc}^* \leq 0 \quad (6)$$

[8] FL use Heckman (1979)'s two-step procedure to estimate the two labour supplies, thus correcting the wife's hours-of-work equation for selection bias, after which they test the restrictions derived from both the unitary and the collective model. To test the three models in the case of a pre-school child, we generalise the FL approach to the case of two joint decisions both related to the wife's time endowment, i.e., those on participation and on child care.

$= 0$ otherwise

The log-likelihood function[9], describing the joint probability of the events in (6), can be decomposed into a "the selection model", where only the parameters (α_j, ρ) have to be estimated, and a "conditional outcome model", which estimates the parameters vectors β and the covariances Σ_{wcch}, holding (α_j, ρ) fixed at the estimated values $(\hat{\alpha}_j, \hat{\rho})$. In the labour supply equation h^{f*}, the conditional mean of the disturbance term will be given by the following expressions[10]:

$$E\left[u^f \middle| I_w^* > 0, I_{cc}^* > 0\right] = E\left[u^f \middle| \varepsilon_w < Z'\alpha_w, \varepsilon_{cc} < Z'\alpha_{cc}\right] =$$

$$= \sigma_{wh}^f \left[\frac{\phi\left(Z'\alpha_w\right)\Phi\left(\left(\alpha_{cc} - \rho\alpha_w\right)Z'/(1-\rho^2)^{1/2}\right)}{\Phi_2\left(Z'\alpha_w, Z'\alpha_{cc}; \rho\right)} \right] +$$
$$+ \sigma_{cch}^f \left[\frac{\phi\left(Z'\alpha_{cc}\right)\Phi\left(\left(\alpha_w - \rho\alpha_{cc}\right)Z'/(1-\rho^2)^{1/2}\right)}{\Phi_2\left(Z'\alpha_w, Z'\alpha_{cc}; \rho\right)} \right] \tag{7}$$

$$E\left[u^f \middle| I_w^* > 0, I_{cc}^* \le 0\right] = E\left[u^f \middle| \varepsilon_w < Z'\alpha_w, \varepsilon_{cc} \ge Z'\alpha_{cc}\right] =$$

$$= \sigma_{wh}^f \left[\frac{\phi\left(Z'\alpha_w\right)\Phi\left(-\left(\alpha_{cc} + \rho\alpha_w\right)Z'/(1+\rho^2)^{1/2}\right)}{\Phi_2\left(Z'\alpha_w, -Z'\alpha_{cc}; -\rho\right)} \right] +$$
$$+ \sigma_{cch}^f \left[\frac{-\phi\left(Z'\alpha_{cc}\right)\Phi\left(\left(\alpha_w + \rho\alpha_{cc}\right)Z'/(1+\rho^2)^{1/2}\right)}{\Phi_2\left(Z'\alpha_w, -Z'\alpha_{cc}; -\rho\right)} \right] \tag{8}$$

[9] See Appendix 1.

[10] The subscript 2 denotes bivariate and f(.) the density function. $\Phi(\cdot), \phi(\cdot)$ are respectively the normal c.d.f. and p.d.f.

Given consistent estimators of the reduced-form parameters, one can obtain consistent estimators of the expressions in brackets in (7) and (8). These can be added to the labour supply equations, as "sample selectivity regressors": they asymptotically purge the equations of selectivity bias[11].

We have not yet considered the husband's labour supply. This variable is not truncated, but its disturbances are assumed to be correlated with the wife's error term. A strong correlation would make it worth investigating the effects of the sample selection regressors on the husband equation as well. We do this, by testing for the null hypothesis that $\sigma_{cch}^{m} = 0, \sigma_{wh}^{m} = 0$ and for misspecification.

Another relevant consideration is that wage rates, non-labour incomes, and child care expenditures are not exogenous to hours of work. FL list various reasons for considering the first two sets of variables as endogenous; for the wage rate, division bias, since this is a derived variable (yearly after-tax labour earnings divided by the product of working weeks per year and working hours per week), and unobservable components (e.g., preferences for work) that might influence both wage and hours. Individual non-labour income could include endogenous components (e.g., it could come from labour income savings). Finally, as the next section will describe, the market for child care in Italy is extremely heterogeneous, so the hourly cost of child care can be interpreted as a random variable depending on socio-economic and political variables that affect the consumer's choice bundle. Moreover, since in the collective model the total cost of formal child care is an explanatory variable for the income sharing rule, regardless of whether the family actually uses the service, one must have a measure of the predicted cost for households with zero demand. All these variables are accordingly instrumented with exogenous socio-demographic and regional variables.

In short, the three labour supply systems are estimated each one with a three-step procedure: first, the bivariate probit in reduced form and the bivariate inverse of Mill's ratio in brackets in (7)-(8) are computed; second,

[11] Connelly (1992) and Jenkins and Symons (1995) estimate the female participation decision conditioned on a previous joint estimation of that equation and the cost of child care assumed bivariate normally distributed. Their analysis differs from ours in that they assume child care cost to be conditional on the woman participating in the labour market, because of the type of data they use. This is not the case of our data set, and we take it into account.

all the instrumental variables are used to estimate the household's total and the husband's non-labour income, the husband's and wife's wage rates, and the hourly price of child care. For each of the last two variables we use as regressors, the univariate inverse of the Mill's ratio derived from the marginal distributions of the multivariate normal $N_3(0, \Sigma^f)$, to correct for selection bias. Third, using their estimates to provide fitted values to replace the endogenous variables, the two labour supply equations are estimated by maximum likelihood.

4. *Data Description*

The data set used in this study is the Bank of Italy's biannual Survey of Household Income and Wealth (SHIW). This is the most comprehensive survey of micro data on income and wealth in Italy, covering the socio-economic status, labour and non-labour income and wealth of more than 8,000 Italian households (24,000 individuals). Moreover, the survey for 1993 has two special sections on public and private services, giving data on the quality of services used and actual costs. Since our focus is on the household's simultaneous decision process on labour supply and child care, we restrict the analysis to 1993 data (for 8,089 households).

Italian family structures have been affected by significant demographic changes since the eighties (a dramatic fall in the birth rate, a pronounced decline in the share of households with 5 or more members, and a simultaneous rise of single-person households)[12]. Even so 72.76 percent of households in the Bank of Italy sample were married couples, a relatively high percentage compared with other western countries.

The households with at least one pre-school child numbered 1,114, but, to ensure the reliability of data on income and hours of work we have restricted the sample to 705, excluding the self-employed and households with an unemployed head or wife who is looking for work. The final sample thus represents only 8.71 percent of the total data set and 11.98 percent of married couples, percentages that reflect the very low fertility rate in Italy

[12] See L. Cannari (1994).

during the nineties.

TABLE 2

SAMPLE STATISTICS

Variable		
Husband's Age	36.940	(5.935)
Wife's Age	32.76	(5.444)
Children	1.905	
0-2 years	0.655	
3 –5 years	0.584	
6 –19 years	0.583	
Other Adults	0.064	
Household Non- Labour Income (NLI)	3,747.600	(4,732.45)
NLI Attributed to the Husband	2,993.100	(4,078.56)
Husband's Hourly Wage	6.852	(2.65) *
Wife's Hourly Wage	6.652	(3.99) *
Husb.'s Weekly Hours of Work	39.71	(7.95) *
Wife's Weekly Hours of Work	33.111	(8.73) *

Note: The table reports the main household characteristics. In the table mean (standard deviation); nominal variables in euro.

* Sub-sample of households with working wife.

Mean and standard deviation of the main demographic variables are summarised in Table 2. The mean household in our restricted sample has 3.96 members; 77.44 percent have only one pre-school aged child, but more than half have children of other age groups. Only 6.38 percent of the families live with other adults (e.g., grandparents or relatives). Non-labour income is the sum of the income from both financial and real assets, pensions and allowances. They are all individual variables, but, in the survey a large share of household income is often attributed to the household head. Testing, among other hypotheses, for the relevance of non-labour income distribution within a household might then be conditioned by the type of data on

individual non-labour income. In any event Del Boca (1997) finds that the non-labour income distribution does affect the labour supply of all demographic groups in the Bank of Italy survey, except households with young children.

The sub-sample of families with both spouses working amounts to nearly 44 per cent of the total (Table 3). For this group the husband's wage rate and working hours are on average slightly higher, and with a much lower variance than the wife's wage.

TABLE 2.A

SAMPLE STATISTICS

Child Care Costs**	max.	4 hours/ day	max.	8 hours/ day
Crèche (0-2)				
Private	228.88	(370.05)	682.24	(758.52)
Public	98.86	(372.84)	592.27	(784.76)
Nursery School (3-5)				
Private	210.71	(362.11)	474.13	(472.12)
Public	44.90	(126.06)	250.22	(299.87)

Note: Mean annual per-child costs in euros (standard deviation in parentheses).

** Sub- sample of households using formal child care

As regards formal child care, the two special survey sections on private and public services give data on the number of children using crèches and nursery schools and the total annual cost, distinguishing between those who do not use the canteen (maximum of 4 hours a day) and those who do (up to 8 hours). Data on hiring and cost of nannies are not collected, nor is there data on the possibility of relatives looking after children. However, the lack of observability on nannies would not appear to affect the validity of the tests greatly, since in 1993 a very low percentage of households reported some expenditure on domestic services (a broader category than nannies alone), in budget survey of the National statistics office, ISTAT. Only 67 out of 2,650 households with more than two members and at least one pre-school child; this group had a very high total expenditure level.

TABLE 3
SAMPLE COMPOSITION BY USE OF FORMAL CHILD CARE AND WIFE'S PARTICIPATION DECISION

	Working	*Not Working*	Total
Child Care	26.81 %	27.38 %	382
No Child Care	17.16 %	28.65 %	323
Total	310	395	705

54 percent of our sample use formal child care (see Table 3). The age of the child seems to influence the choice of using or not using formal child care (34 percent for crèches, 66 percent for nursery schools). The wife's participation decision does not make the difference; the most plausible explanation appears to be the local availability of formal child care: on average formal facilities can meet 50 percent of the potential demand adding up both age groups, but crèches can only cover 5.5 percent, with sharp geographical disparities (capacity ranging from 1-2 per cent in some regions in the South, to 20 percent in Emilia Romagna)[13]. The composition of child care use and participation decision (only 22.2 percent of housewives use the crèche service, but 64.8 percent enrol their children in nursery school) makes clear the predominance of the work-related component in the decision at crèche age.

Table 2.A presents mean and standard deviation of the costs per child, distinguishing between the type of service: public or private, nursery school or crèche. The sample is representative of the Italian child care market, which is heavily local. The public service is usually subsidised by the city government, and the lack of national regulations causes great variability in tariff system adopted[14]. The private sector is not affected by price competition with the public service, since its niche market usually consists of high income families. Moreover the cost of child care, which is low on

[13] ISTAT (1995 b, c, d).

[14] See CER-CNEL Survey Report (1997), chapter 6.

average, also depends on age: crèches generally cost more nursery schools.

All these factors explain the high variance in the observed costs for each type of school; and it is useful to note them for the empirical estimation of expenditure on child care before testing the different structures of household labour supply.

5. *Empirical Results*

The unrestricted system of household labour supply that we estimate is the following:

$$\begin{cases} \dfrac{h^m}{T^m} = a_1 + a_2 \dfrac{w^f T^f}{w^m T^m} + a_3 \dfrac{y}{w^m T^m} + a_4 \dfrac{y^m}{w^m T^m} + a_5 \dfrac{p^{cc} T^c}{w^m T^m} + a_6 \left(\dfrac{\gamma_0^m + \sum_i \gamma_i^m z_i}{w^m T^m} \right) + u^m \\ \dfrac{h^f}{T^f} = b_1 + b_2 \dfrac{w^m T^m}{w^f T^f} + b_3 \dfrac{y}{w^f T^f} + b_4 \dfrac{y^m}{w^f T^f} + b_5 \dfrac{p^{cc} T^c}{w^f T^f} + b_6 \left(\dfrac{\gamma_0^f + \sum_i \gamma_i^f z_i}{w^f T^f} \right) + \\ \qquad + \sigma_{wh}^f \lambda_w^f + \sigma_{cch}^f \lambda_{cc}^f + u^f \end{cases} \tag{9}$$

λ_l^f (with l=w, cc) are the inverse of the Mill ratio in equations (7) and (8), in squared brackets, and individual hours of work are assumed linear in labour income[15].

The procedure is in three steps:

1) a bivariate probit estimate for the two decision choices, expressed in reduced form;

2) determination of the predicted values of some of the regressors on labour supply that could cause problems of endogeneity;

3) estimation of a system of labour supplies, for the husband and the wife. The inverse of the Mill ratio derived from the first step is used to correct

[15] In Figures A.1 in Appendix 2, we plot hours of work against individual wage rates: in both cases there is a clear monotonic and negative relation, precluding misspecification.

for the selection bias in the wife's labour supply due to truncated work hours and demand for child care at zero.

We then investigate the validity of the unitary and of the collective model, testing for the coefficient restrictions derived in section 2.

5.1. *Bivariate Probit Estimation*

Table 4 displays parameter values and standard errors for the joint estimation of the two decisions (wife's participation and use of formal child care), both in reduced form[16].

The wife's participation decision seems determined above all by education, age and husband's occupation; the higher the wife's educational attainment the more likely that she will decide to work; the positive sign of the age coefficient may also be implicitly related to education, since investment in human capital usually delays marriage and childbirth. Moreover, since people tend to choose spouses with similar levels of education, the husband's being a white-collar worker determines a higher probability of the wife's participating.

Whether the youngest child is of the crèche age (0-2) or of the nursery school age does not seem to be relevant; but, this is not true of the number of children, disaggregated into pre-school and school -age. The higher the number of children, the more unlikely the wife's working.

Even though the presence of another adult (either working or retired) in the household does not to appear to be important, the negative sign and the high significance of the migration dummy, which takes the value 1 when either spouse lives in a different province from their home town, suggests

[16] Each probit equation has been tested for heteroskedasticity (Lagrange Multiplier test statistic $\chi^2_{(5)}$=8.5487, $\chi^2_{(5)}$=4.4965, respectively for the participation and for the child care equation), misspecification (Reset test, t-ratio of the predicted squared -0.381 and -0.858 respectively) and normality (Orme (1988) Information Matrix test: respectively, $IM_1 \ \chi^2_{(2)} = 2.788$; $IM_2 \ \chi^2_{(2)} = 2.887$ for the participation equation; $IM_1 \ \chi^2_{(2)} = 1.037$; $IM_2 \ \chi^2_{(2)} = 1.033$, for the child care equation).

that unavailability of help from relatives reduces the probability of the woman working.

Finally, among the variables that denote labour market characteristics, the pattern of the geographical dummies is interesting: they are all negative except for the Northwest, where there are more employment opportunities and a more expensive life-style.

The decision to buy formal child care seems to be affected by the age and number of children. The probability of using a market service increases when the child is aged 3-5 and when the family has more than one pre-school child. It decreases if there are older children, especially more than one, since they can be of help to the mother. This is a result also found in Ribar (1992).

Economic variables relating to income (husband's occupation and wife's potential, i.e. her education) are not significant, even though they have the expected sign. This weakens the assumption of perfect substitutability made in section 2, which implies that the decision on the form of child care is driven by a comparison between the price of the service and the woman's wage rate. The actual evidence would suggest imperfect substitutability, bringing other factors into the decision-making process.

The migration dummy and the presence of other adults, considered as indirect measures of the availability of informal child care have the right sign, but one might have expected a higher level of significance. On the other hand we should be careful in drawing conclusions, since the sample of those not using nurseries or crèches, includes households that are potential users of nannies, another unobserved variable.

Examining the market characteristics, the probability of using the market service increases with its availability, an index of the local level of competition and efficiency; the positive sign of the coefficient for the unemployment rate may reflect public policy variables: the areas with higher unemployment might be those with greater public intervention, hence stronger subsidies for public services. Finally, the common negative sign on all geographical variables is explained by the relation with the reference category: the sub-sample of households in the Northeast shows a higher probability of using the market service.

TABLE 4

BIVARIATE PROBIT ESTIMATES FOR THE PROBABILITY OF WIFE'S BEING EMPLOYED AND OF HOUSEHOLD'S PURCHASING CHILD CARE, IN REDUCED FORM.

Variable	*Participation* Param. (std. err.)		*Child Care* Param. (std. err.)	
Constant	-2.474 (1.058)	***	-2.798 (1.025)	***
Age	0.024 (0.013)	**	0.015 (0.012)	
Education: Junior High School Or High School	0.771 (0.237)	***	0.183 (0.182)	
Degree Or Higher	1.987 (0.320)	***	0.176 (0.245)	
Husband's Occupation: Skilled Blue Col.	0.137 (0.210)		-0.167 (0.198)	
White Col.	0.617 (0.213)	***	-0.055 (0.203)	
Youngest Child Aged: 0-2 Years (Not Only Child)	0.055 (0.233)		0.149 (0.222)	
3-5 Years	0.223 (0.447)		0.211 (0.465)	
Number Of Pre-School Children: 2	-0.387 (0.224)	**	1.321 (0.212)	***
3 Or More	-0.286 (0.522)		1.000 (0.484)	**
1 Aged 3-5	-0.157 (0.413)		0.863 (0.427)	**
Number Of School-age Children: 1	-0.287 (0.166)	**	-0.201 (0.148)	*
2 Or More	-0.169 (0.213)		-0.335 (0.213)	*
Other Adults In The Household: Working	-0.460 (0.773)		-0.070 (0.487)	
Retired	-0.251 (0.268)		0.050 (0.190)	
Geographical Area: Northwest	0.313 (0.193)	*	-0.285 (0.187)	*
Centre	-0.410 (0.220)	**	-0.363 (0.231)	*
South	-0.559 (0.278)	**	-0.398 (0.283)	*
Sicily and Sardinia	-0.644 (0.329)	**	-0.844 (0.327)	***
Type of area[1] : Town	-0.040 (0.170)		0.155 (0.173)	
City	-0.125 (0.137)		0.058 (0.144)	
Migration Dummy[2]	-0.446 (0.182)	***	0.080 (0.160)	
Unemployment Rate by Province[3]	-0.031 (0.052)		0.102 (0.051)	**
No. Of Private Nursery and Crèche Places Per 10 Children Aged Under 6, by Province	0.208 (0.181)		0.268 (0.174)	*
No. Of Public Nursery and Crèche Places[4] Per 10 Children Aged Under 6, by Province	0.207 (0.156)		0.319 (0.149)	***
Correlation Coefficient (ρ)	0.288 (0.071) ***			

log L = -772.520; n = 705 (***: $p \leq 0.01$; **: $0.01 < p \leq 0.05$; *: $0.05 < p \leq 0.10$).

Note: Reference categories for categorical variables: household living in Northeast, in a rural area, with a wife with at most primary school education, not working, one child aged 0-2, and unskilled blue-collar husband.

(1) Classes of inhabitants per type of area: 20,000-500,000 (*town*); >50,0000 (*city*).

(2) It takes the value 1 if the province of the couple's birth place differs from the province where the family was living at the time of the interview; 0 otherwise.

(3) Source ISTAT (1995a) .

(4) Source ISTAT (1995b, c, d).

Finally, there is a positive correlation in the error distribution which supports the assumption of substitutability for the formal child care for a working mother's care[17]. The values and significance of the parameters can give more information on each decision-making process.

To summarise, the bivariate probit estimation has outlined the simultaneous nature of the two choices and shown that demographics count, especially in the participation decision, and that child care purchase is influenced by the quality of the local service, measured as potential access, more than by any financial consideration.

To address the endogeneity problem caused by some variables in the two supply equations, we regress these on other exogenous variables, before saving predicted values that will replace the observed ones. We instrument the endogenous variables with indicators of economic environment and social status (occupation, education, and household composition), chosen by balancing the statistical properties of the model with the information content of the variables [18]. Compared with the bivariate probit regressors, the final set of instruments excludes the unemployment rate, the area variables and the availability of formal child care, but includes the wife's occupation as a variable not influencing the simultaneous decision process on participation and child care, but prices, wages and non-labour incomes. There are a number of economic reasons for these identifying restrictions. Several should be mentioned, as Italian peculiarities: namely, that wage rate is almost entirely nationally bargained, a very marginal share varying by firm; the price of child care is heterogeneous, as noted, but depends significantly on the local government (captured by the geographical dummies and family characteristics). We correct for the selection bias when estimating both the wife's wage and the price of child care[19]. For a presentation of the results of

[17] The significant positive ρ estimate contrasts with what Connelly (1992) and Symons and Jenkins (1995) find with US and UK data, respectively; however, this result with Italian data can be explained by noticing that those mothers unexpectedly working are more likely to use the formal structure because it is subsidised.

[18] We test for heteroskedasticity and misspecification.

[19] We estimate the husband's wage rate in logarithmic form, by standard OLS (results in Table A.1); the wife's wage equation (in logs) is corrected for selection bias, but only the participation decision is taken into account: first we estimate the reduced form by selectivity corrected OLS and, since this method gives consistent but inefficient estimators (see

the second step in the estimation procedure, see Appendix 2.

5.2. *The System of Household Labour Supply*

In order to estimate the system of labour supplies starting from the unrestricted model in (9) we fix an exogenous value for the total individual time endowments. In the literature this variable is either estimated jointly with the parameters or fixed exogenously[20]. We choose the latter strategy because we have problems of identification once the derived restrictions are imposed. We assume $T^f = T^m = 72$ as the weekly time endowment for wife and husband and $T^c = 48$ as the maximum number of parental working hours per week during which children need to be looked after[21]. We also check whether the parameter values and their significance are affected by the two scaling values chosen[22].

In the functional form used for the utility in both the unitary and the collective model, the household consumption, separable into the two individuals consumption and leisure, has a subsistence level function of demographic variables, γ^f, γ^m. We use the instrumental variables; we must exclude the geographical dummies and two of the couple occupation dummies because of problems of multicollinearity, but we also check whether these restrictions might cause misspecification. They all enter γ^f, γ^m, in linear form together with a constant term.

Heckman,1979 and Greene, 1981), we use them as starting values in the iterating procedure for a FIML estimation of the log-wage equation and of the participation probit (results in Table A.2). In estimating the hourly price of child care, the presence of cases with zero observed cost when the (public) service is actually used prevents us from applying the same technique of the last regression. Instead we estimate a tobit corrected for selection: we assume that the price for child care is observed only when the dichotomous variable I_{cc} takes the value 1; moreover, the price is censored at the zero level, since $p_{cc} = 0$ if the latent variable $p^*_{cc} \leq 0$ (see Table A.3 for the empirical results). We estimate household non-labour income and the non-labour income attributed to the husband by OLS (see Tables A.4 and A.5).

[20] See Kooreman and Kapteyn (1986).

[21] A condition imposed in section 1 for the solution of each theoretical model was that $T^f > T^c$.

[22] Table A.6 in the Appendix shows that the unrestricted model, re-estimated with $T^f = T^m = 80$ and $T^c = 56$, is substantially robust to the choice of scaling values.

From the total sample of households with pre-school children, we extract those with both parents working: 189 cases with $I_{cc}=1$ and 121 with $I_{cc}=0$. The lack of data on informal child care, on the time the mother spends with the child, and on the demand for nannies has relevant implications for the power of the tests derived for the two models. Defining the dichotomous variable I_{cc} as a proxy for the availability of informal child care creates a form of misspecification in the sub-sample of households not using nursery schools and crèches, and so not declaring any cost for this service, but not necessarily using the informal structure. A deeper analysis of this group of families did not reveal any peculiarity from which one can infer their behaviour. The wife's occupation is similar to that found in the sample of all households with working wives. The distribution of the hours of work offered follows the pattern of the total sample very closely. As to residence, 85.95 percent of this group also lives in the place of birth of one spouse (86.24 percent is the percentage of the total sample), but only 3.3 percent of them live with other adults in the family. Given the great difficulty of evaluating the bias introduced by including the potentially heterogeneous households that do not use nursery school or crèches, we follow the *endogenous switching*[23] technique. We estimate the household labour supply by jointly using both sub-samples, but we also check whether the conclusions depend on the composition of the sample.

Table 5 lists the coefficients and the asymptotic standard errors[24] of the labour supply system (5)[25]. Different sources of income have distinct effects on the two labour supplies: the husband's is affected negatively by his own wage rate (the intercept in the subsistence level, i.e. the inverse of the wage rate, is positive and highly significant), but positively by the wife's wage and

[23] See Maddala (1983) sections 9.6 and 9.7 for a discussion of this method.

[24] While instrumenting the endogenous variables we should correct the standard errors. Arellano and Meghir (1992) in Table 4.4 make a comparison of corrected and uncorrected standard errors and show that on average the latter are about 40 percent greater. Nevertheless in our case the correction would be exceedingly complicated, owing to the high non-linearity in some endogenous variable estimations and to the correction terms included in various levels.

[25] The Reset test statistic for misspecification allows us to reject the hypothesis that relevant regressors have been omitted (including the selection terms $\sigma^m_{cch}, \sigma^m_{wh}$ in the men's equation whose coefficients were not significant, and thus were neglected). We also accept the hypothesis of a homoskedastic distribution of the error vector.

by total non-labour income. Conversely, the woman's working hours are influenced negatively by her own wage and also by unearned income. The different dimension of the estimated parameters could cause the rejection of the income pooling hypothesis.

The lack of significance of husband's non-labour income for both equations is consistent with the empirical evidence in Del Boca, which finds a similar results only among households with young children.

The labour supply system is not affected by formal child care costs; this is due, as noted, to the low average cost but also to lack of access.

Among the demographics entering in the subsistence level, the dummy for another adult in the household (with a negative effect on the husband's labour supply and positive on the wife's) and that for migration (a positive coefficient in both equations) are both strongly significant.

Concerning the two estimated covariances of the woman's labour supply error term with the disturbances of the bivariate probit, the significance of σ_{wh}^{f} confirms that the two sub-samples selected, with working wife, are not random.

Table 6 gives all the log-likelihood values obtained from the estimation of system (5), first unrestricted and then with all the restrictions derived in section 1. We thus obtain, for each model, the likelihood ratio. The income pooling hypothesis, which imposes the equality of the coefficients of total non-labour income and the spouse's potential earned income in each equation, must be rejected (LR $\chi^2_{(4)}$=10.85). The two labour supplies also contradict the Slutsky symmetry condition. That is to say, all necessary conditions for a unitary model are rejected by the data.

Conversely, the three restrictions imposed by the collective model cannot be statistically rejected (LR test $\chi^2_{(3)}$=5.384). This holds also when we test an extra condition, i.e. the income sharing rule being independent of the husband's non-labour income ($k_4 = 0$).

A test application of both theoretical models to the sub-sample of formal child care users, proves that the LR test results are not influenced by the non-observability of baby-sitting costs.

TABLE 5
LABOUR SUPPLY SYSTEM ESTIMATES

Parameter	Unrestricted	Model
Husband		
a_1	0.012	(0.065)
a_2	0.128	(0.052) ***
a_3	0.014	(0.010) *
a_4	0.003	(0.009)
a_5	0.221	(0.675)
a_6: *Intercept*	233.518	(55.954) ***
Husband's Age	-1.633	(1.421)
Husband's Educ.: Junior High / High School	-13.259	(15.663)
Degree / Higher Education	78.289	(37.527) **
Wife's Educ.: Junior High / High School	31.531	(14.753) **
Degree / Higher Education	-66.402	(28.355) ***
Husband's Occupation: Clerk	94.435	(13.749) ***
Manager	175.689	(26.582) ***
Wife's Occupation: Skilled Blue Col.	36.158	(16.880) **
Other Adults In Household	-276.194	(128.345) **
Youngest Child Age: 0-2 Years	-6.357	(31.219)
3-5 Years	-15.919	(28.799)
Migration Dummy	44.191	(19.506) **
No. Household Components: 5	46.807	(18.530) ***
>5	-3.031	(43.149)
Wife		
b_1	0.048	(0.053)
b_2	-0.045	(0.058)
b_3	-0.022	(0.008) ***
b_4	0.014	(0.009) *
b_5	0.277	(0.311)
b_6: *Intercept*	242.838	(54.652) ***
Husband's Age	3.499	(1.288) ***
Husband's Educ.:Junior High / High School	29.850	(13.653) **
Degree / Higher Education	124.564	(33.243) ***
Wife's Educ.: Junior High / High School	66.944	(15.040) ***
Degree / Higher Education	70.690	(30.535) ***
Husband's Occupation: Clerk	26.687	(12.070) **
Manager	22.225	(25.359)
Wife's Occupation: Skilled Blue Col.	-36.302	(15.801) **
Other Adults In Household	290.462	(95.190) ***
Youngest Child Age: 0-2 Years	9.760	(13.652)
3-5 Years	15.957	(14.317)
Migration Dummy	33.869	(19.859) **
No. Household Components: 5	24.397	(19.218)
>5	39.272	(37.532)
σ^f_{wh}	-0.051	(0.020) ***
σ^f_{cch}	-0.012	(0.008) *

TABLE 6

TESTING FOR THE UNITARY AND THE COLLECTIVE MODELS

	Without pooling		Collective	With income pooling	
	Unrestricted	Collective	with $k_4 = 0$	Unrestricted	Unitary
	Total sample of households with working wife (n=310)				
logL	571.311	568.614	568.586	565.886	521.199
LR (dof)		5.384 (3)	5.45 (4)	10.850 (4)	100.224 (22)
	Sample of households with working wife and using child care (n=189)				
logL	344.755	342.979	342.330	339.171	323.667
LR (dof)		3.552 (3)	4.851 (4)	11.168 (4)	42.176 (22)

Note: The table includes values of selected log-likelihood functions and likelihood ratio statistics (degrees of freedom in parentheses) for the total sample with both spouses working and for the sub-sample of households using child care.

Table 7 gives the parameter estimates of the collective model, including its special case, i.e. with the income sharing rule unaffected by the husband's non-labour income.

The interdependence of the labour supplies is captured in part by the income sharing rule, defining both individual budgets, and partly also by all household members' decisions on the use of time, an element that is easily neglected by a collective model with only private goods.

A deeper analysis of the empirical results highlights the lack of symmetry in the partners' interdependence. The presence of another adult within the household stimulates an increase in the wife's labour supply, by raising her subsistence consumption level. The same variable has the opposite effect on the husband's work hours. The migration dummy raises the husband's subsistence level, but in the wife's equation is less significant than in the unrestricted model. The application of the collective restrictions may have improved the quality of the estimation, since we found in the probit that the migration condition would discourage the woman from participating in the labour market, most likely because of the lack of help from the rest of the family and given insufficient formal child care services.

TABLE 7
LABOUR SUPPLY ESTIMATES: THE COLLECTIVE MODEL

Parameters	Collective Model		Collective Model with $k_4 = 0$	
Husband				
a_1	0.024	(0.064)	0.017	(0.057)
a_2	0.143	(0.051) ***	0.140	(0.050) ***
a_3	0.021	(0.010) **	0.019	(0.005) ***
a_4	-0.002	(0.009)	0	
a_5	-0.493	(0.672)	-0.412	(0.564)
a_6: *Intercept*	257.636	(56.467) ***	257.390	(56.439) ***
Husband's Age	-2.280	(1.414) *	-2.187	(1.350) *
Husb.'s Educ.:Junior High / High School	-19.902	(15.591)	-18.878	(14.861)
Degree / Higher Educ.	58.981	(37.353) *	63.083	(32.561) **
Wife's Educ.: Junior High/ High School	27.475	(14.685) **	28.433	(14.080) **
Degree / Higher Educ.	-68.367	(28.224) ***	-67.430	(27.938) **
Husban d's Occupation: Clerk	100.449	(13.685) ***	99.909	(13.455) ***
Manager	176.368	(26.459) ***	174.263	(24.946) ***
Wife's Occupation: Skilled Blue Col.	42.907	(16.801) ***	41.556	(15.680) ***
Other Adults In Household	-372.434	(127.749) ***	-349.590	(79.711) ***
Youngest Child Age: 0-2 Years	-28.096	(31.074)	-25.702	(28.995)
3-5 Years	-35.206	(28.665)	-32.810	(26.438)
Migration Dummy	46.755	(19.415) ***	48.815	(17.474) ***
No. Household Components: 5	42.604	(18.444) ***	44.322	(16.991) ***
>5	-32.337	(42.948)	-24.061	(23.671)
Wife				
b_1	0.982		0.982	
b_2	0.024	(0.045)	0.024	(0.045)
b_3	-0.013	(0.003) ***	-0.013	(0.003) ***
b_4	0.0001		0	
b_5	0.031	[0.018 *if* $I_{cc} = 0$]	0.028	[0.015 *if* $I_{cc} = 0$]
b_6: *Intercept*	240.011	(47.683) ***	239.781	(47.690) ***
Husband's Age	3.941	(1.146) ***	3.939	(1.146) ***
Husb.'s Educ.:Junior High / High School	29.147	(13.670) ***	29.029	(13.671) ***
Degree / Higher Educ.	112.113	(30.595) ***	111.767	(30.600) ***
Wife's Educ.: Junior High/ High School	70.521	(12.629) ***	70.502	(12.631) ***
Degree / Higher Educ.	95.870	(22.429) ***	95.973	(22.433) ***
Husband's Occupation: Clerk	29.754	(12.017) ***	29.740	(12.0191)***
Manager	46.774	(22.126) **	46.529	(22.129) **
Wife's Occupation: Skilled Blue Col.	-40.689	(13.912) ***	-40.610	(13.916) ***
Other Adults In Household	211.615	(54.112) ***	212.246	(54.120) ***
Youngest Child Age: 0-2 Years	19.384	(12.830) *	19.161	(12.831) *
3-5 Years	23.265	(13.772) **	23.083	(13.774) **
Migration Dummy	14.245	(14.707)	14.357	(14.709)
No. Household Components: 5	6.420	(16.683)	6.456	(16.685)
>5	-11.803	(23.809)	-11.509	(23.813)
σ^f_{wh}	-0.051	(0.018) ***	-0.051	(0.018) ***
σ^f_{cch}	-0.007	(0.006)	-0.007	(0.006)

Note: In the table parameter values without standard error in brackets are those restricted.

TABLE 8

INCOME SHARING RULE AND UTILITY PARAMETER ESTIMATES

Parameter	Collective Model	Collective Model with $k_4 = 0$
Income sharing rule		
k_1	1.890 (0.304) ***	1.923 (0.300) ***
k_2	-0.423 (0.049) ***	-0.417 (0.047) ***
k_3	-0.063 (0.007) ***	-0.057 (0.006) ***
k_4	0.006 (0.002) ***	0
k_5	1.459 (11.572)	1.224 (9.740)
Husband's utility		
f_1	0.662	0.664
f_2	0.338 (0.040) ***	0.336 (0.039) ***
Wife's utility		
g_1	0.986	0.987
g_2	0.013 (0.003) ***	0.012 (0.011) ***

Note: In the table asymptotic standard errors in brackets.

The results for the collective model are strengthened by the derivation of the parameters and the asymptotic standard errors (obtained by the 'delta method') of the income sharing rule (see Table 8). Those of the collective model without income pooling are very similar to those of the collective model with the added assumption of $k_4 = 0$. Moreover, the parameter estimates of each individual utility[26] satisfy the negative semi-definetness of the Slutsky matrices. Hence all the necessary and sufficient conditions imposed by the collective model as specified in this study are accepted by the empirical evidence. The sign of the coefficients of the income sharing rule implies that an increase in the husband's wage rate tends to reduce his

[26] A weakness of the assumption of perfect substitutabilty of all the forms of child care is the lack of identification of the individual utility parameter linked with the household production function; a more general case would give a better idea of the trade-off among consumption, leisure, and the quality of the child's time.

transfer to the wife. An opposite, if smaller effect is found for changes in the wife's wage rate and total non-labour income. The signs of the income sharing rule parameters are consistent with those found by FL for the sub-sample of young couples without pre-school children, but our results have a higher significance level.

TABLE 9

THE HOUSEHOLD LABOUR SUPPLY ELASTICITIES

	Unrestricted Model		Unitary Model		Collective Model	
Husband						
$\eta_{w^m}^{h^m}$	-0.979		11.556		-0.956	
	(0.117)	***	(6.019)	**	(0.117)	***
$\eta_{w^f}^{h^m}$	0.215		-1.228		0.241	
	(0.087)	***			(0.086)	***
$\eta_{y}^{h^m}$	0.216		-11.289		0.335	
	(0.159)	*			(0.158)	**
Wife						
$\eta_{w^f}^{h^f}$	-0.982		19.579		-1.122	
	(1.208)				(0.333)	***
$\eta_{w^m}^{h^f}$	-0.111		-2.226		0.058	
	(1.341)				(0.109)	
$\eta_{y}^{h^f}$	-0.468		-19.171		-0.283	
	(1.563)				(0.069)	***

Note: In the table the spouses' elasticities ($\eta_{w^j}^{h^j}$, with $j=m,f$) to the individual wage rates and to the household non-labour income evaluated at the mean (asymptotic standard errors), for each of the three models. Elasticities without standard error are those with restricted parameters.

What are the implications of adopting the collective perspective instead of the traditional unitary one? The answer is provided by comparing the uncompensated labour supply elasticities to changes in individual wage rates and non-labour income in the two models (see Table 9). The unitary approach, rejected by our data, would impose cross-elasticities, on average negative (i.e. labour supplies are strongly substitutes for one another) and positively-sloped labour supplies (w^j as a function of h^j, $j=m,f$ given y). Conversely, the collective specification and the unrestricted model estimation we obtain two quite negative uncompensated wage elastisticities for both

husband and wife, show a dominant income effect. If the value for the husband is consistent with international evidence (see Pencavel, 1986), although higher than the average, this is not true of the wife's elasticity, which is conventionally expected to be positive and quite sensitive to wage changes. This result might be interpreted as reflecting a high value of time spent in home production, which could weigh more heavily in Italy than in other countries because of rationing of child care services. Moreover we find that the household labour supplies are weakly complementary. Finally the collective framework detects opposite elasticities to non-labour income: positive for the husband and negative for the wife.

To sum up the main empirical results: the implementation of the likelihood ratio test, the derivation of the parameters involved in the model, and the estimation of the labour supply elasticities are all consistent in highlighting the need for more sophisticated intra-household decision models, that take account of the children's effect on the decision-making process.

6. *Conclusion*

The previous literature has not succeeded in explaining the labour supply behaviour of households with pre-school children. This paper presents a nested test of both the unitary and the collective approach when the decision on the form of child care is explicitly factored in. We find that a collective model with partial income and time sharing cannot be rejected, whereas the assumption of household income pooling and also of the Slutsky symmetry condition, both required by the unitary model, are rejected by the data for Italy. A further proxy of the misspecification created by imposing a utility maximising framework is provided by the labour supply elasticity estimates for both models.

Because of the simple functional form used we are not able to quantify the importance of the quality of the time dedicated t children in household decision-making. This is a piece of information that could be obtained by assuming formal child care to be an imperfect substitute; and it could be of help, for instance, in evaluating alternative policy instruments that might influence a broad range of household decisions. Moreover, the future availability of the time use survey will allow us to test for collective rationality without assuming a specific functional form for preferences and income sharing.

Appendix 1

- **The Log-likelihood function**

The framework in (6) can be translated into the following set of probabilities:

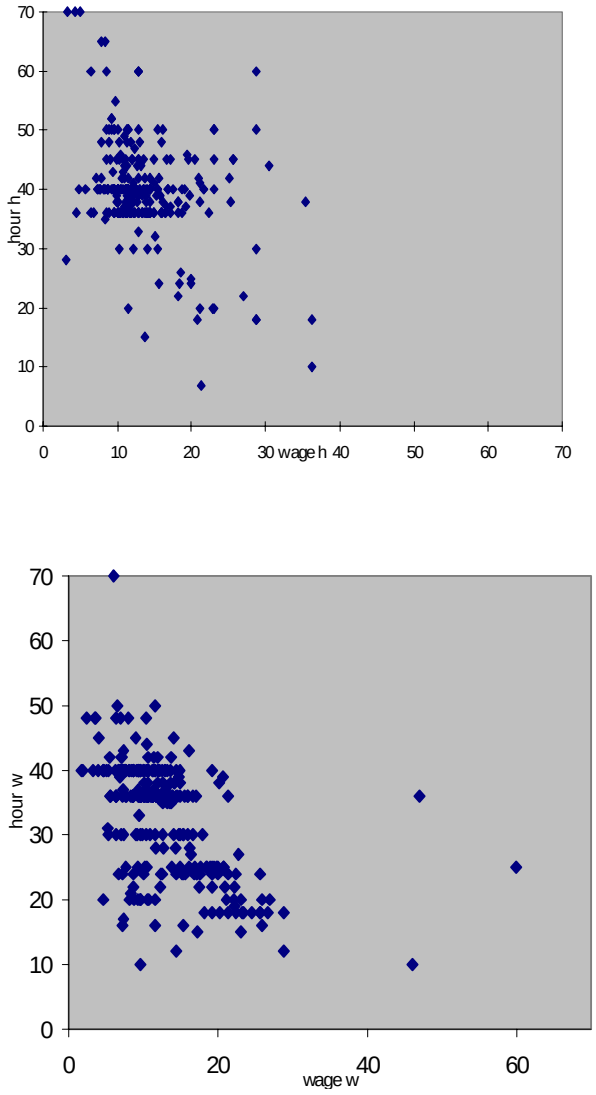
$$\Pr\left(h^f = 0\right) = 1 - \left(\Phi_2\left(\alpha_w' \mathbf{Z}, \alpha_{cc}' \mathbf{Z}; \rho\right) + \Phi_2\left(\alpha_w' \mathbf{Z}, -\alpha_{cc}' \mathbf{Z}; -\rho\right)\right) \tag{A.1}$$

$$\begin{aligned}
&\Pr\left(h^f = h^{f*}\right) = \Pr\left(I_w = 1, I_{cc} = 1 \middle| h^{f*}\right) f\left(h^{f*}\right) + \Pr\left(I_w = 1, I_{cc} = 0 \middle| h^{f*}\right) f\left(h^{f*}\right) = \\
&= \left\{ \Phi_2\left[\mathbf{Z}' \alpha_w + \frac{\sigma_{wh}^f}{\sigma_h^{f\,2}}\left(h^f - \mathbf{x}' \beta\right); \mathbf{Z}' \alpha_{cc} + \frac{\sigma_{cch}^f}{\sigma_h^{f\,2}}\left(h^f - \mathbf{x}' \beta\right); \Sigma_{wcc} - \Sigma_{wcch} \Sigma_h^{-1} \Sigma_{hwcc} \right] + \right. \\
&\left. + \Phi_2\left[\mathbf{Z}' \alpha_w + \frac{\sigma_{wh}^f}{\sigma_h^{f\,2}}\left(h^f - \mathbf{x}' \beta\right); -\mathbf{Z}' \alpha_{cc} - \frac{\sigma_{cch}^f}{\sigma_h^{f\,2}}\left(h^f - \mathbf{x}' \beta\right); -\Sigma_{wcc} - \Sigma_{wcch} \Sigma_h^{-1} \Sigma_{hwcc} \right] \right\} \cdot \\
&\cdot \frac{1}{\sigma_h^f} \phi\left(\frac{h^f - \mathbf{x}' \beta}{\sigma_h^f} \right)
\end{aligned} \tag{A.2}$$

Appendix 2

FIGURE A.1

HUSBAND'S AND WIFE'S HOURS OF WORK BY INDIVIDUAL HOURLY WAGE RATE



Note: The two figures show a monotonic and negative relation in the wage rate for both sample distributions of hours of work (wages in thousands of Italian lire).

- **The endogenous variable estimation**

TABLE A.1

ESTIMATES OF THE HUSBAND'S LOG WAGE RATE

Variable	Parameter (standard error)	
Constant	2.1964 (0.0845)	***
Husband's Age	0.0020 (0.0023)	
Husb.'s Education : Junior Hgh/High School	0.0378 (0.0326)	
Degree/ Higher Educ.	0.2382 (0.0568)	***
Wife's Education: Junior High/ High School	0.0615 (0.0308)	**
Degree / Higher Educ.	0.0037 (0.0577)	
Husband's Occupation: Teacher	0.5356 (0.0702)	***
Clerk	0.2251 (0.0315)	***
Manager	0.3567 (0.0548)	***
Wife's Occupation: Skilled Blue Collar	-0.0973 (0.0413)	***
Teacher	0.0322 (0.0460)	
Youngest Child Age: (Not only child)0-2 Years	0.0393 (0.0342)	
3-5 Years	0.0487 (0.0339)	*
Other Adults In The Household	-0.1552 (0.0609)	***
No. Household Components: 5	0.0624 (0.0373)	**
>5	-0.0075 (0.0499)	
Migration Dummy	0.0687 (0.0363)	**
Geographical Area: Northwest	-0.0606 (0.0396)	*
Centre	-0.0121 (0.0392)	
South	-0.1427 (0.0371)	***
Sicily, Sardinia	-0.0453 (0.0467)	

$R^2 = 0.3811$ *n=702*

Note: The table gives the estimates of the husband's log wage rate, regressed by OLS on a selected set of instrumental variables.

TABLE A.2

ESTIMATES OF THE WIFE'S LOG WAGE RATE

Variable	Parameter (standard error)	
Constant	2.1404 (0.3164)	***
Husband's Age	0.0057 (0.0069)	
Husb.'s Education : Junior Hgh/High School	-0.0294 (0.0776)	
Degree/ Higher Educ.	0.0256 (0.1357)	
Wife's Education: Junior High/ High School	0.1464 (0.0849)	**
Degree / Higher Educ.	0.2166 (0.1601)	*
Husband's Occupation: Teacher	0.1083 (0.1985)	
Clerk	0.0526 (0.0819)	
Manager	0.0550 (0.1374)	
Wife's Occupation: Skilled Blue Collar	-0.1244 (0.0774)	**
Teacher	0.3389 (0.0796)	***
Youngest Child Age: (Not only child)0-2 Years	0.0594 (0.0739)	
3-5 Years	0.0089 (0.0795)	
Other Adults In The Household	0.0552 (0.1772)	
No. Household Components: 5	-0.0046 (0.1344)	
>5	-0.0865 (0.1396)	
Migration Dummy	0.0589 (0.1133)	
Geographical Area: Northwest	-0.0555 (0.0829)	
Centre	-0.1278 (0.0887)	*
South	0.0076 (0.1241)	
Sicily, Sardinia	-0.0003 (0.1498)	
σ_{wf}	0.3983 (0.0338)	***
ρ_{wwf}	-0.3930 (0.3267)	

$\log L = -509.237 \quad n=307$

Note: In the table the estimates of the wife's log wage rate, regressed by ML on a selected set of instrumental variables, and corrected for selectivity in the participation decision.

TABLE A.3

ESTIMATES OF THE HOURLY PRICE OF CHILD CARE

Variable	Parameter (standard error)	
Constant	1.2051 (0.4782)	***
Husband's Age	-0.0011 (0.0133)	
Husb.'s Education : Junior Hgh/High School	-0.0910 (0.1540)	
Degree/ Higher Educ.	0.1228 (0.2801)	
Wife's Education: Junior High/ High School	0.0574 (0.1385)	
Degree / Higher Educ.	0.2856 (0.2328)	
Husband's Occupation: Teacher	0.0926 (0.3787)	
Clerk	0.2709 (0.1389)	**
Manager	0.1067 (0.2764)	
Wife's Occupation: Skilled Blue Collar	0.0492 (0.1948)	
Teacher	-0.0381 (0.1673)	
Youngest Child Age: (Not only child)0-2 Years	-0.6989 (0.1986)	***
3-5 Years	-0.7647 (0.2187)	***
Other Adults In The Household	-0.1614 (0.2883)	
No. Household Components: 5	0.1580 (0.1633)	
>5	-0.0688 (0.2955)	
Migration Dummy	-0.0509 (0.1517)	
Geographical Area: Northwest	0.1909 (0.1712)	
Centre	-0.0287 (0.1663)	
South	-0.5137 (0.1908)	***
Sicily, Sardinia	-0.5083 (0.2649)	**
$\sigma_{p_{cc}}$	0.7913 (0.0307)	***
$\rho_{ccp_{cc}}$	0.0812 (0.2844)	

$\log L = -745.395 \quad n=329$

Note: The table shows the estimates by ML of the hourly price of formal child care. We use a tobit model, since $p_{cc} = 0$ if the latent variable $p_{cc}^{*} \leq 0$, and we correct for selection bias in the decision to buy formal child care.

TABLE A.4

ESTIMATES OF THE HOUSEHOLD'S NON-LABOUR INCOME

Variable	Parameter (standard error)	
Constant	0.0940 (2.2170)	
Husband's Age	0.1549 (0.0609)	***
Husb.'s Education : Junior Hgh/High School	1.6577 (0.8549)	**
Degree/ Higher Educ.	5.4142 (1.4920)	***
Wife's Education: Junior High/ High School	0.6211 (0.8082)	
Degree / Higher Educ.	1.1213 (1.5150)	
Husband's Occupation: Teacher	-0.1708 (1.8410)	
Clerk	0.1206 (0.8236)	
Manager	2.2018 (1.4360)	*
Wife's Occupation: Skilled Blue Collar	-1.6396 (1.0850)	*
Teacher	-2.0385 (1.2070)	**
Youngest Child Age: (Not only child)0-2 Years	1.0771 (0.8972)	
3-5 Years	1.4884 (0.8888)	**
Other Adults In The Household	13.9470 (1.5980)	***
No. Household Components: 5	0.3787 (0.9789)	
>5	2.6096 (1.3030)	***
Migration Dummy	-1.8861 (0.9533)	**
Geographical Area: Northwest	-0.2164 (1.0400)	
Centre	1.0605 (1.0280)	
South	-3.6091 (0.9704)	***
Sicily, Sardinia	-3.4851 (1.2250)	**

$R^2 = 0.2299 \quad n=705$

Nota: The table shows the estimates of the household non-labour income (y/1000), regressed by OLS on the selected set of instrumental variables.

TABLE A.5

ESTIMATES OF THE HUSBAND'S NON-LABOUR INCOME

Variable	Parameter (standard error)	
Constant	1.4572 (2.0220)	
Husband's Age	0.1107 (0.0555)	**
Husb.'s Education : Junior Hgh/High School	1.2620 (0.7798)	*
Degree/ Higher Educ.	3.8309 (1.3610)	***
Wife's Education: Junior High/ High School	0.3802 (0.7373)	
Degree / Higher Educ.	0.7306 (1.3820)	
Husband's Occupation: Teacher	1.4950 (1.6790)	
Clerk	0.6374 (0.7514)	
Manager	3.8881 (1.3100)	***
Wife's Occupation: Skilled Blue Collar	-1.1491 (0.9898)	
Teacher	-1.4452 (1.1010)	*
Youngest Child Age: (Not only child)0-2 Years	1.2586 (0.8185)	*
3-5 Years	1.7277 (0.8108)	**
Other Adults In The Household	2.3810 (1.4580)	*
No. Household Components: 5	-0.5087 (0.8930)	
>5	-1.5964 (1.1880)	*
Migration Dummy	-2.2726 (0.8697)	***
Geographical Area: Northwest	-1.8094 (0.9491)	**
Centre	-0.0295 (0.9375)	
South	-3.3398 (0.8852)	***
Sicily, Sardinia	-3.7596 (1.1170)	***

$R^2 = 0.1371$ $n=705$

Nota: The table shows the estimates of the husband's non-labour income ($y^h / 1000$) regressed by OLS on the selected set of instrumental variables.

- **The labour supply estimation**

TABLE A.6
LABOUR SUPPLY SYSTEM ESTIMATES WITH $T^f = T^m = 80$ AND $T^c = 56$

Parameters	Unrestricted Model	
Husband		
a_1	0.013	(0.059)
a_2	0.136	(0.047) ***
a_3	0.020	(0.010) **
a_4	-0.0002	(0.009)
a_5	-0.362	(0.582)
a_6: *Intercept*	251.410	(56.260) ***
Husband's Age	-2.292	(1.428) *
Husb.'s Educ.:Junior High/ High School	-19.054	(15.750)
Degree / Higher Educ.	62.142	(37.730) **
Wife's Educ.: Junior High/ High School	26.892	(14.840) **
Degree / Higher Educ.	-72.274	(28.510) ***
Husband's Occupation: Clerk	99.699	(13.820) ***
Manager	173.570	(26.730) ***
Wife's Occupation: Skilled Blue Col.	42.800	(16.970)
Other Adults In Household	-357.180	(129.000) ***
Youngest Child Age: 0-2 Years	-33.674	(28.960)
3-5 Years	-26.436	(31.390)
Migration Dummy	48.835	(19.610)
No. Household Components: 5	44.927	(18.630) ***
>5	-24.498	(43.390)
Wife		
b_1	0.026	(0.053)
b_2	-0.051	(0.053)
b_3	-0.028	(0.011) ***
b_4	0.018	(0.010) **
b_5	0.589	(0.615)
b_6: *Intercept*	221.190	(62.180) ***
Husband's Age	4.082	(1.503) ***
Husb.'s Educ.:Junior High/ High School	37.442	(16.130) ***
Degree / Higher Educ.	143.470	(39.340) ***
Wife's Educ.: Junior High/ High School	69.703	(15.600) ***
Degree / Higher Educ.	73.393	(31.090) ***
Husband's Occupation: Clerk	22.978	(13.280) ***
Manager	22.403	(25.590)
Wife's Occupation: Skilled Blue Col.	-45.423	(18.250) ***
Other Adults In Household	369.680	(134.400) ***
Youngest Child Age: 0-2 Years	39.742	(29.710)
3-5 Years	36.703	(32.460)
Migration Dummy	32.994	(20.140) *
No. Household Components: 5	25.031	(19.340)
>5	60.432	(45.840)
σ^f_{wh}	-0.045	(0.018) ***
σ^f_{cch}	-0.007	(0.005)

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