Labor Supply, Child Care, and Welfare in Spanish Households

INMACULADA GARCÍA AND JOSÉ ALBERTO MOLINA*

This paper presents a household model in which both spouses work and care for their children, thereby obtaining a measure of household welfare. Applying this model to the Spanish case allows for drawing some basic conclusions. That is, the highest efficiency in caring for children is obtained when time is offered by the mother. Moreover, the time dedicated to child care by the father is considered as leisure time in a higher proportion than time dedicated by the mother. Also, a direct and strong relationship is detected between monetary income and welfare. Household welfare is greater when the children are older, and welfare increases when the father dedicates less time to work outside the home. (JEL J22, J13, I31)

Introduction

Traditionally, literature devoted to analyzing household labor supply is based on maximization utility models which consider that the available time of each spouse in a family is allocated between work time and leisure time. One problem with this type of model is that it does not include other family activities that consume time, for example, the production of goods and services within the household. In this context, Becker [1965] formulated the household production function which considers that the goods and services bought in the market are not directly consumed. Rather, they are productive factors. Together with time, they are used in a productive process carried out in the household, and they generate the goods and services that give utility to the family. Other papers that consider the theoretical and empirical aspects of household production theory are Michael [1972, 1973], Gronau [1977, 1986], Rosenzweig and Schultz [1983], Graham and Green [1984], Al-Ghannam [1993], and Apps and Rees [1996].

In recent decades, the majority of western countries have noted important changes in time allocation among the different activities of each family member. The traditional pattern of behavior is characterized by the husband devoting a great part of his available time to work outside the home and the wife devoting her time to housework. However, this pattern no longer prevails in the majority of families. Now, the wife actively participates in the labor market, whereas the husband devotes a part of his time to housework. Thus, both spouses participate in activities inside and outside the home. This change is caused by social, technological, and economic factors and leads to households

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where each spouse is no longer a specialist in one particular activity. Therefore, there are no *a priori* differences between husbands and wives when they distribute their available time between housework and paid work.

In this context, this paper studies the activity of Spanish husbands and wives in the labor market and in the time they devote to child care. It also analyzes the specialization of each spouse in families where both spouses work outside the home. The influence of these activities on household welfare is also studied. To that end, a family labor supply model is presented in which the household production function allows for obtaining care and education for the children as an output, considering that a particular percentage of the time devoted to this activity can be taken as leisure time. Once the labor supply and the child care functions for both spouses are derived, the equivalent income is obtained as a household welfare indicator. This measure allows for comparing the welfare level of families with different socioeconomic characteristics. Thus, determination can be made of the influence over the household welfare of male and female worked time, leisure time, and child care time, as well as the monetary income and some sociodemographic variables. These include, for example, household size, the education level of the parents, or the existence of other family members who care for the children. The model is estimated using Spain's statistical information from the "Encuesta de Estructura, Conciencia y Biografía de Clase" (ECBC) [1991].

The second section of this paper presents the household theoretical model and welfare analysis, then the data and estimation method are described. The third section includes the empirical results, and the fourth section presents the conclusion.

The Theoretical Model

The theoretical model allows for deriving the work time and child care time functions for each spouse, considering that both individuals devote a part of their available time to each of these two activities and that child care time can be partially considered as leisure time. This formulation is an adaptation of the Graham and Green [1984] model. It incorporates the household productive activity, which is the point of interest, or the care and education of the children.

The household labor supply model considers that the family is formed by two agents who can work, namely the husband and wife. The objective of the family is to maximize one utility function whose endogenous variables are household consumption and the effective leisure time of both spouses, $u = u(C, L_h, L_w)$, where C is the total consumption, $(C = X + Z)$, L_h is the effective leisure time of the husband, and L_w is the effective leisure time of the wife. Total consumption is made up of the monetary income, X, and the monetary valuation of the care that the parents give directly to their children, Z. This value is obtained from a household production function which depends on the time devoted to the children by both spouses, $Z = Z(H_h, H_w)$, where H_h and H_w are the child care time of the husband and wife, respectively. The time worked outside the home is represented by N_h for the husband and N_w for the wife, while the leisure time for husband and wife is l_h and l_w, respectively. Thus, the time restriction is

$T = N_i + l_i + H_i$, $i = h, w$, where T is the total available time allocated between work, leisure, and child care.

The effective leisure time of each spouse is formed by the time that is truly devoted to leisure and that part of child care time that is considered as leisure time by the family. That is, $L_i = l_i + g(H_i)$, $i = h, w$, where:

$$g(H_i) = H_i - \left(\frac{1}{T^{\delta_i}}\right)\frac{H_i^{1+\delta_i}}{1+\delta_i}, \quad \delta_i \geq 0, \quad i = h, w \quad ,$$

is a function which implies that each additional hour devoted to child care is evaluated as leisure time at a lower percentage. The parameter δ_i has a value that indicates the leisure component of each hour devoted to child care. Thus, the spouse with the highest value of this parameter will be considered as the individual with the highest leisure component in the time dedicated to the children. By contrast, if this parameter is 0, then this indicates that the spouse does not consider such child care time as leisure time. The theoretical justification and properties of this functional form appear in Graham and Green [1984]. Moreover, the budget restriction is $X = \omega_h N_h + \omega_w N_w + y$, where ω_h and ω_w are the husband's and wife's wages, respectively, and y is the family nonwage income.

Each household solves the problem of maximizing the utility function subject to the budget restriction. Substituting the variables C, L_h, and L_w by the expressions cited in the above utility function, the Lagrangian auxiliar function corresponding to the resolution of the optimization problem is:

$$\begin{aligned} L = u\left[X + Z(H_h, H_w), T - N_h - H_h + g(H_h), T - N_w - H_w + g(H_w)\right] \\ + \lambda(\omega_h N_h + \omega_w N_w + y - X) \quad , \end{aligned} \tag{1}$$

where λ is the Lagrange multiplier. By deriving the endogenous variables H_h, H_w, N_h, N_w, and X and using the Lagrangian multiplier, the first order conditions are obtained, providing the interior solution:

$$\frac{\partial L}{\partial H_h} = \frac{\partial u}{\partial C}\frac{\partial Z}{\partial H_h} + \frac{\partial u}{\partial L_h}\left(-1 + \frac{dg(H_h)}{dH_h}\right) = 0 \quad , \tag{2A}$$

$$\frac{\partial L}{\partial H_w} = \frac{\partial u}{\partial C}\frac{\partial Z}{\partial H_w} + \frac{\partial u}{\partial L_w}\left(-1 + \frac{dg(H_w)}{dH_w}\right) = 0 \quad , \tag{2B}$$

$$\frac{\partial L}{\partial N_h} = -\frac{\partial u}{\partial L_h} + \lambda \omega_h = 0 \quad , \tag{2C}$$

$$\frac{\partial L}{\partial N_w} = -\frac{\partial u}{\partial L_w} + \lambda \omega_w = 0 \quad , \tag{2D}$$

$$\frac{\partial L}{\partial X} = \frac{\partial u}{\partial C} - \lambda = 0 \quad , \tag{2E}$$

$$\frac{\partial L}{\partial \lambda} = \omega_h N_h + \omega_w N_w + y - X = 0 \quad , \tag{2F}$$

The particular functional forms for the preference function and the production function take a Cobb-Douglas formulation:

$$u = C^{\gamma} L_h^{\mu} L_w^{\pi}, \gamma, \mu, \pi > 0 \quad \text{and} \quad Z = A H_h^{\alpha} H_w^{\beta}, A, \alpha, \beta > 0 \quad ,$$

where γ, μ, π, A, α, and β are parameters. This is an easy formulation which satisfies the desired theoretical properties. Moreover, its parameters can be directly interpreted. The coefficients γ, μ, and π are the elasticities of the utility, u, with respect to each argument of the function, that is, the consumption and effective leisure time of both spouses, $\gamma = (\partial u / \partial C)/(C/u)$, $\mu = (\partial u / \partial L_h)/(L_h/u)$ and $\pi = (\partial u / \partial L_w)/(L_w/u)$. Parameter A measures the efficiency of the productive process with higher values of this parameter indicating higher efficiency, given than the value of A represents the output level when the values of the two inputs are 1. Finally, coefficients α and β are the elasticities of output Z with respect to each input, that is, with respect to the time dedicated by each spouse to the children, $\alpha = (\partial Z/\partial H_h)(H_h/Z)$ and $\beta = (\partial Z/\partial H_w)(H_w/Z)$. Thus, conditions (2A)-(2F) allow for deriving the following functions for child care, labor supply, and monetary income, depending on both male and female wages and on nonwage income, namely:

$$H_h = \left[\frac{A\beta T^{\delta_w}}{\omega_w} \left(\frac{A\alpha T^{\delta_h}}{\omega_h} \right)^{(\delta_w - \beta + 1)/\beta} \right]^{\beta/\left((\delta_h - \alpha + 1)(\delta_w - \beta + 1) - \alpha\beta\right)} \quad , \tag{3A}$$

$$H_w = \left[\frac{A\alpha T^{\delta_h}}{\omega_h} \left(\frac{A\beta T^{\delta_w}}{\omega_w} \right)^{(\delta_h - \alpha + 1)/\alpha} \right]^{\alpha/\left((\delta_h - \alpha + 1)(\delta_w - \beta + 1) - \alpha\beta\right)}, \tag{3B}$$

$$N_h = \frac{\pi + \gamma}{\mu + \pi + \gamma} \left[T - \frac{1}{T^{\delta_h}} \frac{H_h^{1+\delta_h}}{1 + \delta_h} - \frac{\mu}{\omega_h \gamma} \left(y + AH_h^{\alpha} H_w^{\beta} \right) \right]$$
$$- \frac{\mu\omega_w}{(\mu + \pi + \gamma)\omega_h} \left[T - \frac{1}{T^{\delta_w}} \frac{H_w^{1+\delta_w}}{1 + \delta_w} - \frac{\pi}{\omega_w \gamma} \left(y + AH_h^{\alpha} H_w^{\beta} \right) \right], \tag{3C}$$

$$N_w = \frac{\mu + \gamma}{\mu + \pi + \gamma} \left[T - \frac{1}{T^{\delta_w}} \frac{H_w^{1+\delta_w}}{1 + \delta_w} - \frac{\pi}{\omega_w \gamma} \left(y + AH_h^{\alpha} H_w^{\beta} \right) \right]$$
$$- \frac{\pi\omega_h}{(\mu + \pi + \gamma)\omega_w} \left[T - \frac{1}{T^{\delta_h}} \frac{H_h^{1+\delta_h}}{1 + \delta_h} - \frac{\mu}{\omega_h \gamma} \left(y + AH_h^{\alpha} H_w^{\beta} \right) \right], \tag{3D}$$

$$X = \frac{\gamma\omega_w}{\mu + \pi + \gamma} \left[T - \frac{1}{T^{\delta_w}} \frac{H_w^{1+\delta_w}}{1 + \delta_w} - \frac{\pi}{\omega_w \gamma} \left(y + AH_h^{\alpha} H_w^{\beta} \right) \right]$$
$$+ \frac{\gamma\omega_h}{\mu + \pi + \gamma} \left[T - \frac{1}{T^{\delta_h}} \frac{H_h^{1+\delta_h}}{1 + \delta_h} - \frac{\mu}{\omega_h \gamma} \left(y + AH_h^{\alpha} H_w^{\beta} \right) \right] + y, \tag{3E}$$

Equations (3A) and (3B) reveal that the time devoted to child care, H_h and H_w, depends solely on the wages of both spouses and not on nonwage family income, which was first observed by Gronau [1977].

Regarding welfare analysis, equivalent income was used as a household monetary indicator of welfare. This is derived from the estimated parameters of a particular functional form of preferences that take into account the family monetary income, as well as the corresponding labor time, leisure time, child care time, and different sociodemographic characteristics. This measure, initially proposed by King [1983] and used in other applied papers such as Blundell et al. [1986, 1988], Apps and Savage

[1989], Kaiser et al. [1992], Apps [1994], and Apps and Rees [1996], is derived from the indirect utility function of the model, obtained by substituting the three arguments of the utility function $u = u(C, L_h, L_w)$ by its initial expressions as defined above:

$$V(\omega_h, \omega_w, y, z) = \left[\omega_h N_h + \omega_w N_w + y + A(z) H_h^{\alpha} H_w^{\beta}\right]^{\gamma} \left[T - N_h - \frac{1}{T^{\delta_h}} \frac{H_h^{1+\delta_h}}{1+\delta_h}\right]^{\mu} \left[T - N_w - \frac{1}{T^{\delta_w}} \frac{H_w^{1+\delta_w}}{1+\delta_w}\right]^{\pi}, \quad (4)$$

where z is the vector of family sociodemographic characteristics, and H_h, H_w, N_h, and N_w are expressions (3A)-(3D). If the reference values are now assumed for wages and characteristics, which are identical for all the households, and formulating the above indirect utility function (4) in terms of these reference values and the corresponding income (called nonwage equivalent income, y^E), then the analogous expression $V(\omega_h^r, \omega_w^r, y^E, z^r)$ is derived. Thereafter, according to King [1983], and from the equality $V(\omega_h, \omega_w, y, z) = V(\omega_h^r, \omega_w^r, y^E, z^r)$, the equivalent nonwage income for each household can be obtained. This welfare indicator is defined as the income and allows for obtaining the utility level of each household if its own sociodemographic characteristics are exactly the same as those considered as the reference characteristics. Equivalent income constitutes a monetary indicator of household welfare because, as it takes the same reference characteristics for every family, it allows for perfectly comparing different households independent of their particular family composition.[1]

The Data and Estimation Method

This paper employs one Spanish cross-section corresponding to 1991 to estimate the model. The statistical information is obtained from the ECBC [1991] survey which includes 598 feasible observations for this analysis. Weights are used to solve the equiprobability problem of the ECBC which results from two overrepresentations, namely the agents with secondary and college education levels and the agents from the Madrid housing area.

Table 1 shows the name, mean, and standard deviation of all the variables. First, the wages per hour of the husband (ω_h) and the wife (ω_w) are measured in pesetas. Second, the annual nonwage income of the family (y) is presented. The variables H_h and H_w are the child care hours per week of both spouses, and the hours worked per week are N_h and N_w. Three dummy variables indicate the existence of children age 0 to 4 ($N1$), 5 to 14 ($N2$), and 15 to 23 ($N3$). Next, a dummy variable indicates the simultaneous existence of children age 0 to 14 and 15 to 23 (N). This last regressor is important because it includes the situation where older children can care for their younger siblings and, thus, substitute for their parents in this activity. Household size (*HSIZE*) is considered along with another dummy variable with the value 1 if there is domestic help

or other family members who can care for the children (*OTHER*). Finally, three new variables are considered which indicate the education level of the spouse with the highest education level: the primary (*EDU*1), secondary (*EDU*2), and college (*EDU*3) education levels. In this sense, the education level of both spouses is not introduced to avoid possible multicollinearity problems.

Before carrying out the econometric analysis, some brief descriptive comments on the mean values of the variables should be provided. First, the male wage per hour, 824.94 pesetas, is higher than the female wage per hour, 739.48 pesetas, as expected. Second, the child care time per week of the mother, 25.44 hours, is higher than that of the father, 16.6, whereas the husband dedicates more time to work outside the home, 40.38 hours per week, than does the wife, 36.35 hours. Regarding the dummy variables, 41 percent, 70 percent, and 20 percent of the sample families have children in the three age categories of 0-4, 5-14, and 15-23, respectively. Only 14 percent of families simultaneously have children in the age categories of 0-14 and 15-23. In 21 percent of the households, other family members care for the children, and the percentage of families where the highest education level is the primary, secondary, or college level is 49 percent, 25 percent, and 26 percent, respectively.

TABLE 1
Variables

Variable	Mean	Standard Deviation	Variable	Mean	Standard Deviation
ω_h	824.94	353.75	*N*2	0.70	0.46
ω_w	739.48	335.74	*N*3	0.20	0.40
y	46034.48	224207.30	*N*	0.14	0.35
H_h	16.60	11.70	*HSIZE*	4.02	1.87
H_w	25.44	16.58	*OTHER*	0.21	0.40
N_h	40.38	07.65	*EDU*1	0.49	0.50
N_w	36.35	08.27	*EDU*2	0.25	0.43
*N*1	00.41	00.49	*EDU*3	0.26	0.44

The stochastic model is obtained by adding an error term in each of the five initial equations, (3A)-(3E). However, these functions constitute a complete system of behavior equations, therefore, only four of these five are independent, with one of them being redundant. This means that due to the theoretical adding-up restriction of every complete system of functions, the covariance matrix is singular and the likelihood function is

undefined. In this case, the usual procedure is to omit one of the equations, for example, that corresponds to monetary income, and to estimate the remaining system jointly.

Moreover, the four-equation system is estimated in terms of budget shares, α's, obtained by multiplying each expression by its corresponding wage, the male wage for (3A) and (3C) and the female wage for (3B) and (3D), and by dividing by the implicit income, defined as the full income that could be obtained by the family if all of its members devoted all of their available time to work, that is, $Y = \omega_h T + \omega_w T + y$. Therefore, the different budget shares are:

$$\alpha_{H_h} = \frac{\omega_h H_h}{Y}, \quad \alpha_{H_w} = \frac{\omega_w H_w}{Y}, \quad \alpha_{N_h} = \frac{\omega_h N_h}{Y}, \quad \text{and} \quad \alpha_{N_w} = \frac{\omega_w N_w}{Y}.$$

As is usual in this kind of model, the remaining system of these four equations is estimated by the maximum likelihood method assuming (in order to facilitate the estimation) the two transformations where $a = \pi/\gamma$ and $b = \mu/\gamma$:

$$\alpha_{H_h} = \left[\frac{A\beta T^{\delta_w}}{\omega_w} \left(\frac{A\beta T^{\delta_h}}{\omega_h} \right)^{(\delta_w - \beta + 1)/\beta} \right]^{\beta/\left((\delta_h - \alpha + 1)(\delta_w - \beta + 1) - \alpha\beta\right)} \cdot \frac{\omega_h}{Y} + \varepsilon_{H_h}, \tag{5A}$$

$$\alpha_{H_w} = \left[\frac{A\alpha T^{\delta_h}}{\omega_h} \left(\frac{A\beta T^{\delta_w}}{\omega_w} \right)^{(\delta_h - \alpha + 1)/\alpha} \right]^{\alpha/\left((\delta_h - \alpha + 1)(\delta_w - \beta + 1) - \alpha\beta\right)} \cdot \frac{\omega_w}{Y} + \varepsilon_{H_w}, \tag{5B}$$

$$\alpha_{N_h} = \left\{ \frac{a+1}{b+a+1} \left[T - \frac{1}{T^{\delta_h}} \frac{H_w^{1+\delta_h}}{1+\delta_h} - \frac{b\left(y + AH_h^{\alpha} H_w^{\beta}\right)}{\omega_h} \right] \right.$$
$$\left. - \frac{b\omega_w}{(b+a+1)\omega_h} \left[T - \frac{1}{T^{\delta_w}} \frac{H_h^{1+\delta_w}}{1+\delta_w} - \frac{a}{\omega_w} \left(y + AH_h^{\alpha} H_w^{\beta} \right) \right] \right\} \frac{\omega_h}{Y} + \varepsilon_{N_h}, \tag{5C}$$

$$\alpha_{N_w} = \left\{ \frac{b+1}{b+a+1} \left[T - \frac{1}{T^{\delta_w}} \frac{H_w^{1+\delta_w}}{1+\delta_w} - \frac{a\left(y + AH_h^{\alpha} H_w^{\beta}\right)}{\omega_w} \right] \right.$$
$$\left. - \frac{a\omega_h}{(b+a+1)\omega_w} \left[T - \frac{1}{T^{\delta_h}} \frac{H_h^{1+\delta_h}}{1+\delta_h} - \frac{b}{\omega_h} \left(y + AH_h^{\alpha} H_w^{\beta} \right) \right] \right\} \frac{\omega_w}{Y} + \varepsilon_{N_w} \quad , \tag{5D}$$

where the error terms, ε_{H_h}, ε_{H_w}, ε_{N_h}, and ε_{N_w}, follow a multivariant normal distribution. Barten [1968, 1969], Brown and Deaton [1972], Deaton [1978], and Blundell [1988], among others, have offered detailed explanations on the econometric formulation and the maximum likelihood estimation of complete systems of equations.

Empirical Results

To analyze the effects of the different family sociodemographic variables (z) on the parents' decisions regarding the time devoted to child care, in the (5A)-(5D) stochastic system, substitute the parameter, A, of the production function by the linear specification:

$$A(z) = A_0 + A_{N1} N1 + A_{N2} N2 + A_{N3} N3 + A_N N + A_{HSIZE} HSIZE$$
$$+ A_{OTHER} OTHER + A_{EDU1} EDU1 + A_{EDU3} EDU3 \quad . \tag{6}$$

Table 2 includes the estimated parameters and the t-values. First, note that all of the coefficients are individually significant at the 5 percent level. The individual parameters that make up $A(z)$ indicate the effect of family characteristics on the efficiency of the productive process. This, in turn, allows for obtaining the care and education of the children as an output, with higher values of these particular parameters implying higher efficiency. In other words, given the situation in which the parents dedicate some time to child care, a higher efficiency will imply that the output of that child care time will be higher.

Thus, the positive sign and the magnitude of parameters A_{N1}, A_{N2}, and A_{N3} indicate that when there are children in only one age group, the production process is more efficient if they belong to the youngest age group, 0-4, with 5-14 in second place and 15-23 in last place. That is, when the children are young and their parents are more necessary and less susceptible to substitution, then the time that the parents dedicate to child care provides a higher output than when the children are older. Moreover, note that if there are children in more than one age group, then the production of care and education is more efficient than if all the children belong to just one group. For example, if there is one child between 0 and 4 years old and another between 5 and 14 years old, then the effect on the efficiency will be the sum of parameters A_{N1} and A_{N2}. Therefore,

it will be higher than if both children belong to the same age group, in which case, the dummy variable implies that the effect will have the magnitude of only one of these parameters.

TABLE 2
Estimated Parameters

Parameter	Estimation	t-value	Parameter	Estimation	t-value
A_0	13.024*	9.36	A_{EDU3}	-0.032*	-2.18
A_{N1}	3.271*	2.34	α	1.422*	2.37
A_{N2}	2.174*	2.08	β	2.377*	2.71
A_{N3}	0.418*	3.14	δ_w	1.726*	1.99
A_N	-0.124*	-2.32	δ_h	2.819*	2.88
A_{HSIZE}	0.281*	3.12	$b = \mu/\gamma$	1.018*	12.12
A_{OTHER}	-0.326*	-3.36	$a = \pi/\gamma$	1.004*	10.33
A_{EDU1}	-0.018*	-4.21			

Notes: * denotes significance at the 5 percent level. The number of observations were 598. Log likelihood is 2021.62.

Note that when there are older and younger children living together in the family, the efficiency of the parents in child care time is higher. This is obtained as a result of a combination of two effects, one positive and the other negative, with the first being higher than the second. The first and positive effect is due to the parameters A_{N1}, A_{N2}, and A_{N3} and appears because the parents can both care for and educate their children of different ages at the same time. On the other hand, the negative effect is due to the parameter A_N and is derived from the dedication of older children to care for and educate their younger siblings.

Furthermore, the positive sign of A_{HSIZE} indicates that the efficiency increases with household size. The negative sign of A_{OTHER} means that when there are other family members present (different from brothers, sisters, or parents) who care for the children, then the efficiency of the parents will be lower.

It is also interesting to note the result derived with respect to the parents' education. Thus, the negative signs of parameters A_{EDU1} and A_{EDU3} must be interpreted with respect to the chosen reference education level. Therefore, the highest efficiency appears when the education of the spouse with the highest education level corresponds to the secondary

level, followed by the parents with only a primary education, then those who have a college education.

The parameters α and β are the household production elasticities with respect to child care time of the husband and wife, H_h and H_w, respectively. Both coefficients are positive with β being higher than α, indicating that the effect on Z is higher when the variation in child care time is given by the wife than by the husband. This result indicates that husbands can easily modify the time they devote to their children without important changes in the final result of the care and education of their children, which would arise if such modifications were made by the wife.

Moreover, the parameters δ_h and δ_w are significantly different from 0, which means that the child care time of both spouses has an important leisure component for the household. In particular, the parameter δ_h is higher than δ_w, thus, the child care time given by the husband is considered as leisure time in a higher proportion than that given by the wife. This indicates that the activities carried out by wives in the care and education of the children (for example, in food preparation and feeding, dressing, helping in scholastic tasks, and in their personal problems) have a lower leisure component than the activities to which the husbands dedicate more time, such as playing or taking the children for a walk.

Finally, the parameters a and b are the relationship between the elasticities of utility with respect to the leisure time of both spouses and the elasticity of utility with respect to consumption. Therefore, as both parameters are higher than 1, for both spouses, they show that the effect of leisure changes on utility is higher than the effect of consumption variations. Furthermore, b is higher than a. Thus, it can be deduced that a variation in the husband's leisure time implies a higher effect on the utility than in the case of the wife. Thus, if the husband modifies the number of his hours worked, then his leisure time will change in the opposite direction, and the magnitude of the effect on the utility level will be higher than when the wife varies her hours worked.

In summary, analysis of the estimated parameters reveals that the highest efficiency in caring for children is obtained when they are between 0 and 4 years old, as was expected. Furthermore, if the parents devote more time to caring for more than one child of different ages, then the valuation of this care and education time is higher than if all the children belong to the same age group. Moreover, if simultaneously there are older and younger children, then the older children can dedicate a percentage of their time to care for and educate their younger siblings. Furthermore, the time devoted by the wife to the care and education of the children has a lower leisure component than the husband's, with higher effects on the children if there is a change in the wife's care time. This is a logical result considering that, in general, the care time dedicated by the mother is much greater than the father's and is occupied with more necessary activities.

Regarding the welfare analysis, the sample mean variables are considered as reference values. Together with the estimated parameters, the equivalent full income of each family can be calculated. Next, households are ranked according to equivalent income and monetary income, dividing the ranks into five groups, and the average values of the relevant variables are obtained for each category. Table 3 shows the equivalent full

income ranking, and Table 4 presents the ranking according to the monetary income values.

Comparison of both rankings allows for analyzing the differences and similarities between the families who appear in the best and worst positions of both monetary income and welfare rankings. Thus, the differences detected between both rankings lie in the fact that the welfare indicator incorporates the family monetary income as well as the time devoted by both spouses to labor activities, leisure time, time dedicated to the care and education of the children, and several sociodemographic variables. Analysis of both tables allows for detecting a relationship between equivalent income and monetary income, which, if it is positive, will mean that the latter is an important component in household welfare valuation. Moreover, the effect of the other sociodemographic variables on both equivalent and monetary incomes is deduced.

TABLE 3
Equivalent Income Ranking

Variables	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Mean
Equivalent Income	8.25	8.93	9.52	10.48	12.87	10.01
Monetary Income	1.79	2.31	2.88	3.38	3.94	2.86
Percent of $N1$	44.52	37.85	39.52	42.15	40.06	40.82
Percent of $N2$	77.12	69.85	74.22	68.21	62.65	70.41
Percent of $N3$	13.65	18.93	20.15	22.14	24.63	19.90
Percent of N	8.20	13.21	15.98	16.44	17.62	14.29
Percent of *HSIZE*	3.52	3.81	3.99	4.25	4.53	4.02
Percent of *OTHER*	15.63	17.85	17.61	21.56	33.75	21.28
Percent of *EDU*1	50.12	48.53	52.12	46.52	47.81	49.02
Percent of *EDU*2	24.15	27.30	22.15	25.62	26.48	25.14
Percent of *EDU*3	35.73	24.17	25.73	27.86	25.71	25.84
H_h	17.35	15.21	17.86	16.52	16.06	16.60
H_w	26.31	27.45	26.11	25.13	22.20	25.44
N_h	42.36	41.08	40.89	38.98	38.64	40.39
N_w	37.52	35.52	33.12	38.77	36.82	36.35

TABLE 4
Monetary Income Ranking

Variables	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Mean
Monetary Income	1.66	2.25	2.67	3.34	4.42	2.86
Equivalent Income	8.66	8.95	9.05	11.26	12.13	10.01
Percent of $N1$	42.50	43.59	28.21	53.85	35.90	40.82
Percent of $N2$	70.00	64.10	82.50	61.54	74.36	70.41
Percent of $N3$	15.00	17.95	25.64	20.51	20.51	19.90
Percent of N	10.00	10.26	17.90	15.39	18.00	14.29
Percent of *HSIZE*	3.46	4.35	3.98	4.21	4.10	4.02
Percent of *OTHER*	18.52	22.13	19.52	20.98	25.25	21.28
Percent of *EDU*1	56.13	54.33	38.11	46.32	50.21	49.02
Percent of *EDU*2	25.22	25.13	32.33	29.83	13.19	25.14
Percent of *EDU*3	18.65	20.54	29.56	23.85	36.60	25.84
H_h	15.80	17.91	16.98	15.84	16.51	16.60
H_w	27.96	24.80	30.40	22.16	21.80	25.44
N_h	39.81	41.46	40.28	41.18	39.21	40.39
N_w	30.93	37.95	36.90	39.01	37.13	36.35

From Table 3, observe that monetary income increases with equivalent income from each quintile to the next. Furthermore, the variables that indicate the presence of children in the three age categories do not follow a clear trend except for the age group 15-23 where an increasing evolution is noted. This variable indicates the percentage of households with at least one child between 15 and 23 years old and with at least another between 0 and 14 years old. Here, note a clear increase with the quintiles. Next, notice that welfare also increases with household size. Moreover, if there are other family members who collaborate in caring for the children, then welfare also increases. With respect to the education level of the parents, there is no clear conclusion. Finally, hours worked show that a decrease in the husband's hours worked will increase family welfare.

The same variables appear in Table 4 with observations being ranked according to monetary income. Note that this variable increases with equivalent income. With respect to the presence of children, a clear pattern of behavior in any of the three age categories cannot be deduced. The variable that indicates the presence of children 0 to 14 years old

and 15 to 23 years old shows a growing trend, although this increase is not as clear as in the case of equivalent income. Finally, no clear trend is observed in the other variables.

Analysis of Tables 3 and 4 reveals a high correlation between monetary income and equivalent income, indicating that monetary income is a very important component in family welfare. If differences in the rankings are noted, it can be deduced that the help given by other people in caring for and educating the children does not depend on the economic level of the family but does increase the welfare. Therefore, in the majority of cases, such help does not correspond to hired child care givers. Rather, this corresponds to other family members—specifically the grandparents, who dedicate their free time to the care of their grandchildren. Moreover, welfare is higher in families where the husband dedicates fewer hours to work. However, this does not necessarily mean that he devotes more time to the care of his children, given that analysis of the equivalent income ranking does not reveal an increasing trend in the welfare indicator.

Summary and Conclusions

This paper analyzes the distribution of available time of each spouse to leisure time, worked time, and child care time and, subsequently, to study the effects on household welfare of the worked time and the child care time of both spouses. To that end, a household model has been formulated that allows for deriving the labor supply functions and the child care functions. These are then estimated using a Spanish survey [ECBC, 1991] and employing the parameters in order to calculate the equivalent income as an indicator of family welfare.

From the estimated parameters, results were first obtained on the efficiency of the productive process, giving rise to the care and education of the children as an output. Results were then obtained on the elasticities of production and on the spouses' valuation of the leisure component of their child care time. Thus, it is deduced that child care time is more efficient when there are children between 0 and 4 years old, then when there is at least one child between 5 and 14 years old, and, finally, when the children are older than 14 years old. That time is also more efficient if there are children in different age categories, indicating that the older children can devote a part of their time to care for and educate their younger siblings. Moreover, child care is more efficient as family size increases and if the parents' education level is intermediate. By contrast, it is less efficient when there are other people who collaborate in caring for and educating the children. Furthermore, production elasticities indicate that the efficiency of the wife's child care time is higher than the husband's. Lastly, the husband's child care time is considered as leisure time in a higher percentage than the wife's.

Finally, with respect to the welfare analysis, some results were obtained that indicate a relationship between welfare and monetary income. Analysis of the effect on welfare of some other socioeconomic variables detects a direct and strong relationship between monetary income and welfare. Moreover, household welfare is higher when there are older children than when there are younger ones but lower when there are simultaneously older and younger children because the older substitute for their parents in caring for the

younger. Furthermore, family welfare increases with family size, when there are other family members who care for the children (usually the grandparents), and when the husband devotes less hours to work outside the home.

Footnotes

1. Detailed calculations in this section are available from the authors upon request.

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