Single Mothers Have a Leisure Premium

Noël BONNEUIL*

Institut national d'études démographiques,

and École des hautes études en sciences sociales

Olivia EKERT-JAFFɆ

Institut national d'études démographiques, France

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*bonneuil@ined.fr

†ekert@ined.fr

Abstract

The collective representation of household behavior implying a Pareto equilibrium between spouses is used to show that single mothers are likely to have more leisure than women in couple, a result consistent with a French survey on women's time use, and consistent with common sense (although not with clichés). Moreover, the Pareto-optimal leisure of the man is a decreasing function of the Pareto-optimal leisure of the woman, implying that women the most deprived of leisure time are better off when separated (with respect to leisure) and their former partner are worse off. The consequence for children is ambivalent, depending on the position of the equilibrium of separated spouses. The extension of the model to household production shows that the variation of the time devoted to children between mother in couple and single mother is also ambivalent; and the various cases are detailed.

1 Introduction

Do single mothers have less or more leisure time than mothers in couple? The answer is not so straightforward: on the one hand, we all have in mind single mothers swamped with work and child care; on the other hand, loneliness demands less household work and offers more freedom to organize one's work. From theory and from French data, we shall show that mothers are likely to have more leisure as single than in couple.

Single-parenthood in fact corresponds to a diversity of situations: women can be single mothers and live by their own parents (these women represent 10 per cent of single mothers in France) (2010 Census), or live only with their children. They may receive allowances from their ex-spouses (32 % are in this case) and from the State. They can also have a love affair without sharing the same roof (23 %, Chardon et al., 2008). If some are poorer after separation, they also learn how to organize themselves, to have their children nursed, to spare themselves leisure time, to struggle for escaping from seclusion and avoid depression, which is a frequent pathology associated with loneliness. One can know extreme cases of single mothers rushing from nurse to school, but these represent only 1.5 % of single mothers.

These many situations do not help single mothers from economic distress: in 2008 France, over 30 % lived under the poverty threshold, which concerned only 13 % of the national population. In 1968, single mothers represented 7.2 % of families with children under 25; in 2005, they counted up to 1.5 million or 17 %. Single parenthood has traditionally been associated with social disgrace, with unmarried mothers threatened of impoverishment. With the increasing prevalence of these mothers, the familial structure has also changed deeply: single mothers now mainly come from separation or divorce, an event which is more likely to occur when children are older. Most children living with their mothers have a father who can be present in their lives, caring for them, and intervening in their education. Having a father who has lived with one's mother increases welfare, because otherwise mothers receive only income tested allowance, provided they earn very little. Widows and mothers that have never lived with the father of their children have become a minority, 15 and 10 per cent respectively (annual census surveys of 2004 to 2007). These mothers have younger children than average mothers. Single mothers usually are poorer and less educated than mothers living in couples, they are more likely to be unemployed, and they take less qualified occupations (66 % of employed single mothers against 60 % for mothers in couples). So single mothers cumulate low resources, low qualification, difficulties to nurse their children, low quality job proposals, especially when they have never lived with the father of their children (Ekert-Jaffé and Grossbard, 2009). Therefore, when children are still young, women can be led to withdraw from the labor market and benefit from social minima and specific family allowances, managing to earn incomes comparable to what they would earn on the labor market. In France, 150,000 women have children under three, no husband, no employment, and live with the allowance of isolated parent (DRESS, 2005).

However, single-parenthood involves some benefits. If women are poorer, they also receive allowances. First, women out of the labor force are encouraged to remain so in order to keep their allowances; they can have priority to put their children in the kindergarten; they benefit from subsidized child care fees, and have time available to search for a job. As housing is exiguous (one room is missing on average, according to Chardon et al., 2008), they have access to subsidized housing and in large cities they can benefit from community care. Second, single mothers have less household work. A smaller flat is easier to clean, there is no vast room, no gardening. They have one person less at home —the father of their child(ren). There is no shirt to iron, no quality meal to serve at fixed hour. Children are fond of pasta and eggs, and this fits low finances. Meanwhile, an employed mother has a higher life standard, but at the price of less leisure (including less time for sleep) than an unemployed mother. This situation is still more serious when children are young and, if so, when young children have also siblings (Ekert-Jaffé, 2010). All mothers of young children with a full-time occupation live on the verge of exhaustion. Household work for housewives that breed a unique child under three is reduced of one hour and a half when these housewives are single mothers. These single mothers devote more time to their children than mothers in couple. Overall, single mothers have more leisure time with which they can escape from seclusion and socialize (by telephone or conversation) or for leisure. The absence of a spouse decreases economies of scale (public good) and makes a fine meal more expensive, so single mothers replace time for cooking by leisure. Grown children can help their mother, and children with one parent become independent younger and help for household work more than children with both parents do. Besides, the older the children, the more likely they are to be children of divorced parents, and the more likely their mothers are employed, and full-time employed.

Poverty a priori associated with single parenthood is limited by the allowance given by the ex-spouse. This concerns 42 % of divorced and separated mothers. Women can cumulate this allowance with an employment with no fear to lose State allowances. Their children are older and mothers of teen-agers are no less educated than mothers in couple, nor do they earn less (Algava, 2002; Algava et al., 2005; Chardon et Daquet, 2009). They have less household work than women in couple, as we explained, but this is also a selection effect: women who devoted little time to household care are also more likely to separate (Becker, 1991). However, widows have also more leisure time, and economic rationality as well as the high price of single mothers show that they are led to reduce this time. It remains that theoretically, a child bred by a single parent receives a sub-optimal education, because the parent who does not care for the child has less interest in it (Weiss and Willis, 1997).

We then suggest to examine the theoretical foundations of the fact that single mothers have more leisure time. We show that this fact is contained in the Pareto-optimal framework of household decision-making. The satisfaction of spouses and of the household has been shown to depend on the intra-household distribution of income and decision power (Thomas, 1990; Schultz, 1990, Browning et al., 1994; Lundberg, Pollak,and Wales, 1997; Phipps and Burton, 1998; Blundell, Chiappori, and Meghir, 2005; Chiappori and Donni, 2006 for a review). This fact has favored the "collective" approach for studying household behavior, whereby individuals with their own preferences make Pareto-efficient decisions. In this model, the respective powers of each spouse modify behaviors even when resources are kept unchanged.

The situation of single mothers constitutes a noteworthy case and an increasing topical question. The theme of divorce with respect to intra-household distribution was addressed by Chiappori, Iyigun, and Weiss (2007, 2008), but these authors did not specifically explore the leisure of single mothers.

2 The Model

2.1 Without Household Production

2.1.1 Mother in Couple

The model stands in the line of the collective representation of household behavior of Blundell et al. (2005) (see also Chiappori, 1988, 1992, 1997; Chiappori and Donni, 2007). Each household member is characterized by his or her own utility function, and decisions are only assumed to result in Pareto-efficient outcomes.

The household consists of two members, 1 for woman and 2 for man. Respective demands for leisure are denoted by L_i, market labor supplies by ℓ_i, and wages by w_i, $i = 1, 2$, Y_1 and Y_2 are the members' respective non-labor incomes (and there is no non labor common income). There are three consumption goods: a Hicksian composite good C, whose price is set to one, C_i is the non observed market good consumed by spouse i, $i = 1, 2$. The Hicksian good is used also for public consumption, whose level is Q ,which represents the amount spent on children. Prices are assumed constant over the sample (cross-sectional data). We ignore the tax system and budget sets are linear (as in Chiappori, 1997). $L_1(w_1, w_2, Y_1, Y_2)$, $L_2(w_1, w_2, Y_1, Y_2)$, $C_1(w_1, w_2, Y_1, Y_2)$, and $Q(w_1, w_2, Y_1, Y_2)$ are twice continuously differentiable.

Each spouse is characterized by differentiable, strictly increasing, strictly convex preferences on leisure, private consumption, and the level of public expenditures. The bundle (w_1, w_2, Y) varies within a compact set of $\mathbb{R}^3_+$, then the vector (L_1, L_2, Q) varies in a compact set of $K \subset I\!R^3_+$. The preferences are represented by continuously differentiable strictly concave utility functions U^i on K.

At the date of marriage, the spouses agree upon the consumption levels of all goods, public and private. The allocation is assumed Pareto efficient and not contingent on future spousal relationships, because the side payments which can be done to avoid a divorce are ignored. As in Chiappori (1997, 2007), the outcome within marriage is not determined, as in Nash bargaining, but depends on the spouses' incomes and marriage conditions.

The programm of the couple is:

$$\max_{L_1,L_2,C_1,C_2,Q} \lambda U_1(L_1, C_1, Q) + (1 - \lambda)U_2(L_2, C_2, Q) \tag{1}$$

subject to the overall constraint

$$Q + C_1 + C_2 + w_1L_1 + w_2L_2 = w_1 + w_2 + Y_1 + Y_2 \tag{2}$$

where the time endowment is normalized to one. We assume that consumption and leisure are separable from the public good Q, as in Blundell et al. (2005), although it is restrictive. The Pareto weight $\lambda \in [0, 1]$ reflects the relative weight of member 1 in the household (Blundell et al., 2005). We assume that λ is continuously differentiable in w_1, w_2, Y_1, and Y_2.

2.1.2 Single Mother

Assuming that the ex-spouses passing from couple to single parents have not changed their preferences, and that the woman keeps children, the woman receives an exogenous allowance $\beta(w_2(1-L_2)+Y_2)$ from her ex-spouse, through which she is also informed upon

L_2 (she already knows β, Y_2 and w_2). The assumption that the ex-spouse gives a fixed proportion of his income is a maximalist hypothesis in a modern vision of separation. It holds true in the case of shared children's care, but this case is not genuinely covered by our model because only the woman produces the public good thanks to the ex-husband's allowance; in other cases, it is a first approximation of negotiations between spouses: the judge commonly decides for a fixed sum, but a father who loses his income can ask for a reduction. A father who increases his income and remains single can decide to give a fixed proportion in order to keep control over the affection of his child(ren) (Weiss and Willis, 1997).

With L_2 given, she solves:

$$\max_{L_1,Q,C_1} U_1(C_1, L_1, Q) \tag{3}$$

under the budget constraint:

$$Q + C_1 + w_1 L_1 + \beta w_2 L_2 = w_1 + Y_1 + \beta(w_2 + Y_2)\,. \tag{4}$$

where β is the proportion of the man's wages transferred to woman, as post-divorce allowance, assumed constant. The public good (amount spent for children) Q remains public. The solution Q of programm $\{(3), (4)\}$ is the piece of information sent to the man and is a function of L_2. As β is fixed, the man tunes Q through his leisure time L_2, and not through his consumption C_2. The man then solves the programm:

$$\max_{L_2,C_2} U_2(C_2, L_2, Q) \tag{5}$$

under budget constraint:

$$C_2 = (1 - \beta)(w_2(1 - L_2) + Y_2)\,. \tag{6}$$

In couple or separated, parents derive utility from children's well-being.

2.1.3 Comparison

With λ varying, the set of Pareto equilibria to mother in couple is a curve (six unknowns for one budget constraint and four first-order conditions). Moreover, under the following assumptions (Ekeland, 1979):

H1 the utility function U_i of individual i depends only of i's commodity basket C_i, L_i, Q;

H2 total resources are initially distributed among individuals;

H3 For any individual i, the pre-order is continuous, monotonic, and strictly convex;

H4 for each individual i, the pre-order is representable by a function u_i concave and twice continuously differentiable on $\overset{\circ}{I\!R}{}_+^3$ and satisfies $\frac{\partial u_i}{\partial y_k} > 0$, for $y_k = C_i, L_i$, or Q for all $y \in I\!R_+^3$;

H5 for all individual i and all $y \in \overset{\circ}{I\!R}{}_+^3$, the determinant of

$$\begin{pmatrix} & & \frac{\partial U_i}{\partial y_1} \\ & \frac{\partial^2 U_i}{\partial y_j \partial y_k} & \\ \frac{\partial U_i}{\partial y_1} & \cdots \frac{\partial U_i}{\partial y_1} & 0 \end{pmatrix}, \tag{7}$$

is not null,

the set of Pareto equilibria $P(\lambda)$ is continuously differentiable with respect to the y_j (here with respect to L_1, L_2, C_1, C_2, Q). Assumption 5 is "purely technical and deprived of any economic interpretation" (Ekeland, 1979: 169).

By contrast, the set of solutions to the single-mother programm is a finite set of points, because it involves five equations (three first-order conditions and two budget constraints) for five unknowns. There then exists a minimal L_1^D solution of {(3), (5)} in L_1.

Proposition 2.1 *All women who had little leisure at the Pareto equilibrium when they were in couple have more leisure when they are single. Specifically, all women with* $L_1 < L_1^D$ *while in couple are better off when single mother, and they then enjoy* L_1^D*.*

Although mathematically obvious, this proposition clarifies the consequence of Pareto optimality for women's leisure. Women with little power λ have also little leisure, and will be better off after marriage. From the statistical point of view, this depends from the distribution of the women's decision power in couple amid the population. Those women who had leisure time *exceeding* L_1^D when they were in couple are worse off after separation with respect to leisure, but these women with much leisure may be unfrequent.

We denote $L_2^*(L_1^*)$ the implicit relationship between the values L_1^* and L_2^* on the curve $P(\lambda)$ of Pareto equilibria.

Proposition 2.2 *Under the assumptions H1 to H5 of Ekeland (1979), the Pareto-optimal leisure times of spouses vary in opposite directions:*

$$\frac{\partial L_2^*}{\partial L_1^*} < 0 \tag{8}$$

Proof:

The first-order conditions of programm Eq. (1) under constraints Eq. (2) yield:

$$\begin{array}{rcll} \frac{\partial U_1}{\partial C_1} & = & \frac{1}{w_1}\frac{\partial U_1}{\partial L_1} & (i) \\ \frac{\partial U_2}{\partial C_2} & = & \frac{1}{w_2}\frac{\partial U_2}{\partial L_2} & (ii) \\ w_1 \frac{\frac{\partial U_1}{\partial Q}}{\frac{\partial U_1}{\partial L_1}} + w_2 \frac{\frac{\partial U_2}{\partial Q}}{\frac{\partial U_2}{\partial L_2}} & = & 1 & (iii) \\ \lambda & = & \frac{1}{1+\frac{w_2}{w_1}\frac{\frac{\partial U_1}{\partial L_1}}{\frac{\partial U_2}{\partial L_2}}} & (iv)\,. \end{array} \tag{9}$$

We denote $P^* = (C_1^*, C_2^*, L_1^*, L_2^*, , Q^*)$ a Pareto equilibrium. As U_1 is strictly concave in Q, an increase in Q^* decreases $\frac{\partial U_1}{\partial Q}|_{P^*}$ and $\frac{\partial U_2}{\partial Q}|_{P^*}$, then, from Eq. (9)(iii), at least one term among $\frac{\partial U_1}{\partial L_1}$ or $\frac{\partial U_2}{\partial L_2}$ decreases, then the concavity of utilities implies that either L_1^* or L_2^* increases (or both).

In addition, from Eq. (9)(i), C_1^* increases with L_1^*, and from Eq. (9)(ii), C_2^* increases with L_2^*. The Pareto equilibrium P^* being on the budget constraint Eq. (2), if an increase in Q leads to an increase in L_1^*, then it implies a decrease in L_2^*. Conversely, if an increase in Q leads to a decrease in L_1^*, then it implies an increase in L_2^*.

Hence, L_2^* is a decreasing function of L_1^*.

$\square$

Subsequently, women with little leisure when in couple are with men with much leisure. Among these people, women with leisure $L_1 < \min(L_1^D, (L_2^*)^{-1}(L_2^D))$ in couple —their men having leisure $L_2 > \max(L_2^D, L_2^*(L_1^D))$— are better off with respect to leisure when separated and their former spouses are worse off. $(L_2^*)^{-1}(L_2^D)$ is the leisure time available to the woman in a couple where the husband has the same leisure as when he is separated.

If the woman has less leisure time in couple than as a single mother, then $L_1 < L_1^D$ and $L_2^*(L1) > L_2^*(L_1^D)$, that is $L_2 > L_2^*(L_1^D)$: the man in couple has then more leisure time than what he would have if his wife in couple had the leisure time of single mother. If $L_1 < (L_2^*)^{-1}(L_2^D)$ then $L_2^*(L_1) > L_2^*(L_2^*)^{-1}(L_2^D)$, that is $L_2^*(L_1) > L_2^D$: the man in couple with this woman has more leisure time than if he were separated.

For more egalitarian couples with respect to leisure, namely couples for which

$$\min(L_1^D, (L_2^*)^{-1}(L_2^D)) < L_1 < \max(L_1^D, (L_2^*)^{-1}(L_2^D)), \tag{10}$$

either $L_1^D > (L_2^*)^{-1}(L_2^D)$ then both man and woman are better off with respect to leisure when separated, or $L_1^D \leq (L_2^*)^{-1}(L_2^D)$ then both man and woman are worse off with respect to leisure when separated.

With regard to the expenditure on children, on the one hand, from the first conditions of programm (3) for the separated woman,

$$\frac{\partial U_1}{\partial Q} = \frac{1}{w_1}\frac{\partial U_1}{\partial L_1} \tag{11}$$

so that the solution Q^D increases with L_1^D. On the other hand, we saw in the proof of Proposition 2.2 that Q^* is an increasing function of L_1^* or of L_2^*. Subsequently, for a sufficiently low L_1^*, depending on the specification of the U_is and a sufficiently high λ reflecting the love of the man for his children, there may exist a threshold $\bar{L}_1^*$ such that $Q^* < Q^D$. In this case, women with very low leisure when in couple would be better off when separated with respect to leisure and to children. In this case, the man after separation has abandoned much of his leisure so that the financial transfer increases both the woman's leisure and the amount of expenditure on children. Also, from Eq. (9), for the woman in couple, the Pareto-optimal consumption C_1^* increases with L_1^*, so that a woman with little leisure has also little consumption, and, depending on the structure of the utilities, she may also increase her consumption after separation.

2.1.4 Specified Utilities

As an example, we specify the utilities of each spouse, in a still general formulation (Chiappori, 1997):

$$U_i := \alpha_i \ln(C_i) + \eta_i \ln Q + \gamma_i \ln(L_i) \tag{12}$$

with $\alpha_i + \eta_i + \gamma_i = 1$, under budget constraint (2). These coefficients α_i, η_i, and γ_i express the weights each spouse gives to the various components of utility. If $\eta_1 < \eta_2$ for example, the man values children more the woman does: $\frac{\partial U_2}{\partial Q} > \frac{\partial U_1}{\partial Q}$.

From first order conditions in Eq. (1), we deduce the values on Pareto equilibria as functions of L_1^*:

$$\begin{cases} C_1^* &= \frac{\alpha_1 w_1}{\gamma_1} L_1^* \\ Q^* &= w_1 \frac{\eta_1}{\gamma_1} L_1^* + w_2 \frac{\eta_2}{\gamma_2} L_2^* \end{cases} \tag{13}$$

and from the budget constraint Eq. (2), the relationship between L_1^* and L_2^*:

$$\frac{w_1}{\gamma_1} L_1^* + \frac{w_2}{\gamma_2} L_2^* = w_1 + w_2 + Y_1 + Y_2 \tag{14}$$

The decision power of the woman is:

$$\lambda = \frac{1}{1 + \frac{\gamma_1}{\gamma_2} \frac{w_2}{w_1} \frac{L_2^*}{L_1^*}} \tag{15}$$

which then increases with L_1^* and decreases with L_2^*, is equal to 0 for $L_1^* = 0$ and to 1 for $L_2^* = 0$.

For single mothers, the optimal allocations L_1^D, C_1^D, and Q^D ("D" for "separated" or "divorced") depend on L_2 (which is decided by the man):

$$\begin{cases} C_1^D &= w_1 \frac{\alpha_1}{\gamma_1} L_1^D \\ Q^D &= w_1 \frac{\eta_1}{\gamma_1} L_1^D \\ \text{with} & \\ \frac{w_1}{\gamma_1} L_1^D &= -\beta w_2 L_2 + w_1 + Y_1 + \beta(w_2 + Y_2) \end{cases} \tag{16}$$

Putting Q^D as a function of L_2 into program (5) of the man leads to a quadratic equation, with two positive solutions. The highest one exceeds 1, so that only the lower solution, which belongs to $[0, 1]$:

$$L_2^D \;:=\; \frac{\beta(1+\gamma_2)(Y_2+w_2)+(1-\eta_2)(Y_1+w_1)-\sqrt{\Delta}}{2\beta}$$

with

$$\Delta \;:=\; \beta^2(Y_2+w_2)^2(1-\gamma_2)^2 + (1-\eta_2)^2(Y_1+w_1)^2 + 2\beta(\alpha_2 - \gamma_2\eta_2)(Y_1+w_1)(Y_2+w_2) \tag{17}$$

is retained.

Figure 1 situates the equilibrium (L_1^D, L_2^D) of separated spouses with respect to the Pareto line on the (L_1^*, L_2^*) line.

From Eq. (13) and (16),

$$Q^* - Q^D = \frac{w_1\eta_1}{\gamma_1}(L_1^* - L_1^D) + \frac{w_2\eta_2}{\gamma_2} L_2^* \tag{18}$$

which implies that all women having less leisure L_1^* than the solution $\bar{L}_1^*$ of:

$$L_1^* = L_1^D - \frac{w_2\eta_2}{\gamma_2}\frac{\gamma_1}{w_1\eta_1} L_2^*(L_1^*) \tag{19}$$

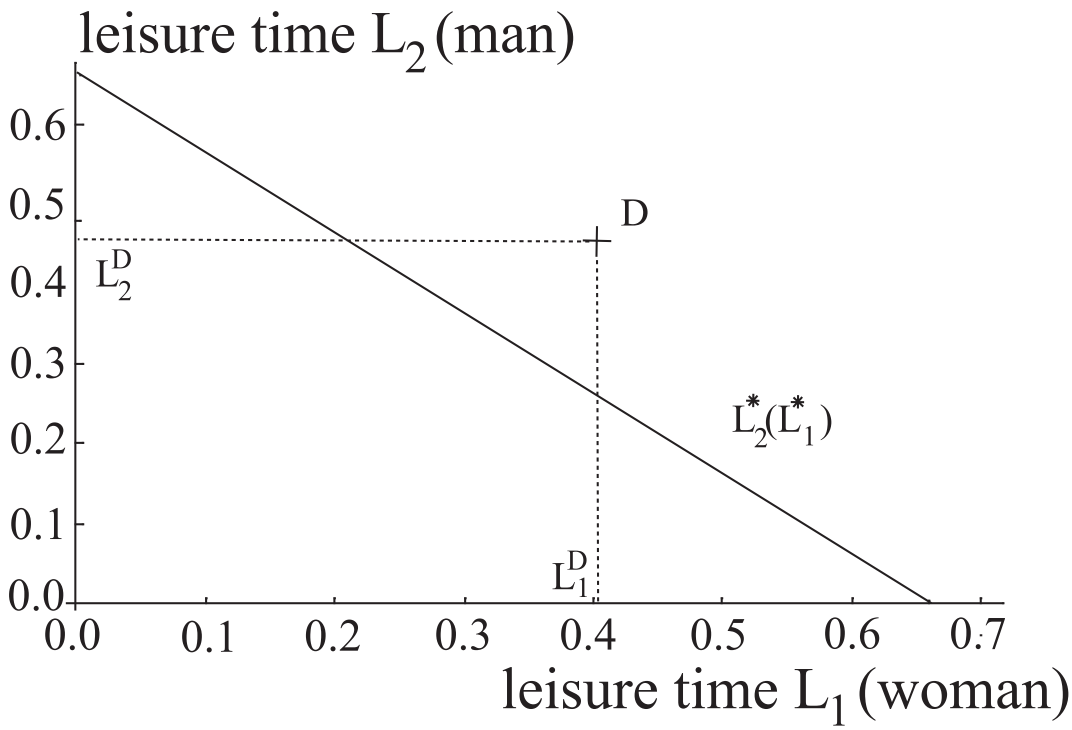

Figure 1: Example of single-parent leisure times at the equilibrium (L_1^D, L_2^D) and the Pareto-optimal line of leisure times in couple $L_2^*(L_1^*)$. Case $\gamma_1 = \gamma_2 = \eta_1 = \eta_2 = 0.33, w_1 = w_2 = 1, \delta = 0.4$.

which after calculation is:

$$\bar{L}_1^* = (L_1^D - \frac{\eta_2}{\eta_1}\frac{\gamma_1}{w_1}(w_1 + w_2 + Y_1 + Y_2))\frac{\eta_1}{\eta_1 - \eta_2} \tag{20}$$

have more leisure and their children receive more after separation. This threshold $\bar{L}_1^*$ can be positive ($\beta = 0.4$, $Y_1 = Y_2 = 0$, $w_1 = 0.5$, $w_2 = 1$, $\eta_1 = 0.2$, $\eta_2 = 0.1$, $\gamma_1 = \gamma_2 = 0.33$), in this case these women can exist, or negative (same parameter values except $\eta_1 = 0.3$, $\eta_2 = 0.2$), in this case these women do not exist.

2.2 With Household Production

2.2.1 Theory

As Blundell et al. (2005) did, we extend the basic model to household production. We assume that the child utility is "produced" using specific expenditure and parental time. Namely, the production function $Q = h(t_1, t_2)$, where t_i is member's i household work (Chiappori, 1997) is assumed positive strictly concave and twice continuously differentiable. In couple or separated, parents derive utility from children's well-being. The programm of the couple is:

$$\max_{L_1, L_2, C_1, C_2, t_1, t_2} \lambda U_1(L_1, C_1, t_1, t_2) + (1 - \lambda) U_2(L_2, C_2, t_1, t_2) \tag{21}$$

subject to the overall constraint

$$h(t_1, t_2) + C_1 + C_2 = w_1 \ell_1 + w_2 \ell_2 + Y_1 + Y_2 \tag{22}$$

and to the time constraints:

$$L_i + t_i + \ell_i = 1 \tag{23}$$

where ℓ_i is member i's time employed in market work.

Eq. (23) into Eq. (22) lead to:

$$C_1 + C_2 + w_1 L_1 + w_2 L_2 + h(t_1, t_2) - w_1 t_1 - w_2 t_2 = w_1 + w_2 + Y_1 + Y_2 \,. \tag{24}$$

The first-order conditions require that the benefit $h(t_1, t_2) - w_1 t_1 - w_2 t_2$ resulting from domestic times be positive or nul, and nul at equilibrium (otherwise the couple's well-being could increase in increasing t_1 or t_2 and in substituting domestic time t_i to market work paid w_i.

Proposition 2.3 *Under the condition*

$$(H6): \qquad \frac{\partial^2 U_i}{\partial t_j^2} < \frac{\partial^2 h}{\partial t_j^2}, \; i, j = 1, 2. \tag{25}$$

and under the assumptions H1 to H5 of Ekeland (1979), the Pareto-optimal leisure times of spouses vary in opposite directions:

$$\frac{\partial L_2^*}{\partial L_1^*} < 0 \tag{26}$$

Hypothesis H6 indicates a certain dis-utility of homework, because of the utility associated with home production: utility accelerates more slowly than the home production. As these functions take negative values, the curvature of the utilities are greater than the curvature of h.

Proof: The first-order conditions of programm Eq. (21) under constraints Eq. (22)

yield:

$$\begin{array}{rcll} \frac{\partial U_1}{\partial C_1} & = & \frac{1}{w_1}\frac{\partial U_1}{\partial L_1} & (i) \\ \frac{\partial U_2}{\partial C_2} & = & \frac{1}{w_2}\frac{\partial U_2}{\partial L_2} & (ii) \\ w_1\frac{\frac{\partial U_1}{\partial t_j}}{\frac{\partial U_1}{\partial L_1}} + w_2\frac{\frac{\partial U_2}{\partial t_j}}{\frac{\partial U_2}{\partial L_2}} & = & \frac{\partial h}{\partial t_j} + w_j \quad j = 1, 2 & (iii). \end{array} \tag{27}$$

When t_1^* increases, the strict concavity of h, U_1, and U_2 with respect to t_1 and t_2 implies that $\frac{\partial U_1}{\partial t_1}$ and $\frac{\partial U_2}{\partial t_1}$ decrease. Assumption H6 implies that these terms decrease faster than $\frac{\partial h}{\partial t_1}$, then at least one denominator among $\frac{\partial U_1}{\partial L_1}$ or $\frac{\partial U_2}{\partial L_2}$ decreases. The concavity of utilities implies that either L_1^* or L_2^* increases (or both).

In addition, from Eq. (27)(i), C_1^* increases with L_1^*, and from Eq. (27)(ii), C_2^* increases with L_2^*. The Pareto equilibrium $(C_1^*, C_2^*, L_1^*, L_2^*, t_1^*, t_2^*)$ being on the budget constraint Eq. (22), an increase in L_1^* implies a decrease in L_2^*.

Hence, L_2^* is a decreasing function of L_1.

□

When separated, the woman solves:

$$\max_{L_1, t_1, C_1} U_1(C_1, L_1, t_1) \tag{28}$$

under the budget constraint:

$$h(t_1, t_2) + C_1 + w_1(L_1 + t_1) + \beta w_2(L_2 + t_2) = w_1 + Y_1 + \beta(w_2 + Y_2)\,. \tag{29}$$

The result is t_1, which is the piece of information sent to the man. It is a function of L_2 and t_2. The man then solves the programm:

$$\max_{L_2, C_2} U_2(C_2, L_2, Q) \tag{30}$$

under the budget constraint:

$$C_2 = (1-\beta)(w_2(1-L_2-t_2)+Y_2)\,. \tag{31}$$

The solution is a finite set of points, and as in the case without household production, there exists a minimal $L1 := L_1^D$ solution of $\{(28), (29), (30), (31)\}$. Then the same conclusions as in the case without household production apply.

2.2.2 Specified Utilities

We add the specification (Chiappori, 1997):

$$h(t_1,t_2) = t_1^{\delta} t_2^{1-\delta} \tag{32}$$

to those of the case without household consumption.

The two equations (27)(iii) become:

$$\begin{cases} \frac{w_1\eta_1}{\gamma_1}L_1 + \frac{w_2\eta_2}{\gamma_2}L_2 & = & t_1^{\delta}t_2^{1-\delta} + \frac{w_1}{\delta}t_1 \\ \frac{w_1\eta_1}{\gamma_1}L_1 + \frac{w_2\eta_2}{\gamma_2}L_2 & = & t_1^{\delta}t_2^{1-\delta} + \frac{w_2}{1-\delta}t_2 \end{cases} \tag{33}$$

which yield:

$$\begin{cases} w_1(1-\delta)t_1^* & = & w_2\delta t_2^* \\ \frac{w_1}{\gamma_1}L_1^* + \frac{w_2}{\gamma_2}L_2^* & = & w_1+w_2+Y_1+Y_2 \\ \left((\frac{w_1}{w_2})^{1-\delta}(\frac{1-\delta}{\delta})^{1-\delta} + \frac{w_1}{\delta}\right)t_1^* & = & \frac{w_1}{\gamma_1}(\eta_1-\eta_2)L_1^* + \eta_2(Y_1+Y_2+w_1+w_2) \end{cases} \tag{34}$$

For the single mother's programm $\{(28), 29\}$, we have:

$$\frac{w_1}{\gamma_1}L_1^D + w_1\frac{\delta-1}{\delta}t_1^D = w_1 + Y_1 + \beta(w_2(1-L_2^D-t_2^D)+Y_2) \tag{35}$$

where L_2^D and t_2^D are solutions of the man's programm $\{(30), 31\}$.

We denote $t_1^*(L_1^D)$ the value of the Pareto-optimal time devoted to household for the value of leisure $L_1^* = L_1^D$. *For the case* $\delta = 0.5$, the solution of Eq. (33) is:

$$t_1^D = \frac{-\sqrt{t_2} + w_1\eta_1 + ((\sqrt{t_2} - w_1\eta_1)^2 + 8w_1\eta_1(w_1 + Y_1 + \beta(w_2(1 - L_2^D - t_2^D) + Y_2)))^{\frac{1}{2}}}{4w_1} \tag{36}$$

which is used by the man to optimize his utility. The expressions of t_2^D and L_2^D are untractable. A simulation with $Y_1, Y_2, \gamma_1, \gamma_2, \eta_1, \eta_2, \beta$ varying in their appropriate ranges yields the probability that $t_1^*(L_1^D)$ is greater than t_1^D. From the last equation of Eq. (34), the relative importance of the mother's valuation η_1 on children with respect to the father's valuation η_2 changes the results; that is why we condition on their difference. From the data-set of simulated $t_1^*(L_1^D)$ and t_1^D, we estimated the two logistic regressions:

$$\begin{aligned}
\text{logit}(\text{Prob}(t_1^*(L_1^D) < t_1^D | \eta_1 < \eta_2)) &= \underset{(5.7)}{14.7} + \underset{(7.4)}{19.6}\,\beta - \underset{(15.7)}{59.1}\,\eta_1 + \underset{(9.1)}{6.6}\,\eta_2 - \underset{(7.2)}{13.3}\,\gamma_1 + \underset{(5.2)}{4.7}\,\gamma_2 \\
&\quad + \underset{(10.9)}{45.7}\,w_1 - \underset{(1.8)}{19.1}\,w_2 + \underset{(2.0)}{1.8}\,Y_1 - \underset{(2.9)}{9.7}\,Y_2 \\
\text{logit}(\text{Prob}(t_1^*(L_1^D) < t_1^D | \eta_1 > \eta_2)) &= \underset{(2.8)}{19.3} + \underset{(2.2)}{5.3}\,\beta - \underset{(6.0)}{50.6}\,\eta_1 + \underset{(3.9)}{25.0}\,\eta_2 - \underset{(3.2)}{12.3}\,\gamma_1 - \underset{(2.2)}{0.6}\,\gamma_2 \\
&\quad + \underset{(3.0)}{27.4}\,w_1 - \underset{(2.3)}{17.4}\,w_2 - \underset{(0.9)}{2.75}\,Y_1 - \underset{(1.3)}{10.5}\,Y_2
\end{aligned} \tag{37}$$

with standard deviations in parentheses. The first logistic regression conditional on $\eta_1 < \eta_2$ is estimated from 500 points, among which 463 are such that $t_1^*(L_1^D) < t_1^D$ and 37 such that $t_1^*(L_1^D) > t_1^D$; the second logistic regression conditional on $\eta_1 > \eta_2$ is also estimated from 500 points, among which 304 are such that $t_1^*(L_1^D) < t_1^D$ and 196 such that $t_1^*(L_1^D) > t_1^D$. The percent of concordant pairs is 99.5 % for the first regression, 97.5 for the second, so we can hope that these linear models capture the difference between $t_1^*(L_1^D)$ and t_1^D. The four cases $t_1^*(L_1^D)$ less or greater than t_1^D combined with η_1 less or greater then η_2 are represented, although when $\eta_1 < \eta_2$, most often $t_1^*(L_1^D) < t_1^D$. From Eq. (34), the value of Pareto-optimal mother's time devoted to household for $\eta_1 = \eta_2$ is:

$$t_{1,0}^* = \frac{\eta_2(Y_1 + Y_2 + w_1 + w_2)}{\sqrt{\frac{w_1}{w_2}} + 2w_1} \tag{38}$$

The effect of separation again depends on the relative valuations η_1 and η_2 of children by mother and father respectively. The simulation associated with Eq. (37) shows that the following cases are non empty:

- when $\eta_1 > \eta_2$ and $t_{1,0}^* < t_1^D < t_1^*(L_1^D)$, women who are better off after separation with respect to leisure ($L_1 < L_1^D$) are divided between those with children receiving more ($t_1^* < t_1^D$), thanks to the man's allowance, and those with children receiving less ($t_1^D < t_1^* < t_1^*(L_1^D)$).

- when $\eta_1 > \eta_2$ and $t_1^D > \max(t_{1,0}^*, t_1^*(L_1^D))$, all women who are better off with respect to leisure have also their children better off with respect to expenditure

- when $\eta_1 > \eta_2$ and $t_1^D < t_{1,0}^*$, all women who are better off with respect to leisure have also their children worse off with respect to expenditure.

- when $\eta_1 < \eta_2$ and $t_1^D < t_{1,0}^*$, women with very little leisure $L_1^* < (t_1^*)^{-1}(t_1^D)$ are better off with respect to leisure, but their children receive less after separation. Women with more leisure when in couple $(t_1^*)^{-1}(t_1^D) < L_1^* \leq L_1^D$ are better off, and their children receive more.

- when $\eta_1 < \eta_2$ and $t_1^D > t_{1,0}^*$, women with $L_1^* < L_1^D$ are better off and their children receive more after separation .

The effect of separation on children is then ambiguous.

3 Empirical Insight

Table 1 presents the empirical measures of leisure time from the French "Time-table" survey (*Emploi du temps*, Insee 1998-1999). Among couples with both spouses in the labor force, 18 % have two children to care of. The woman has 14.4 hours of leisure time (sleeping included). The sample counts 29 women who alone breed two children: these women have 14.9 leisure hours. Full-time employed mothers of one child under 15 have on average 30 minutes more leisure when they are single parent than when they have a spouse at home. Firstly, one could think of a structural effect, because children of single-parent families are older and subsequently more independent (half children of the sample are 9 years old, whereas the median age is only 7 for children living with both parents). Secondly, the effect could also come from alternated residence, with fathers caring for children in the week-end. In fact, single mothers and fathers in couple have comparable leisure time (4.7 and 4.6 hours in the week-end), versus 3.5 hours for women in couple. Thirdly, single city-dweller mothers have half an hour more than women on the countryside. This can result from denser collective facilities. Fourthly, even childless single men and women have an additional leisure of 25 minutes in comparison to childless couples.

Theoretically, women would encourage their spouse to succeed, to work more in order to increase wealth. Man would work more in the professional sphere, woman more for the household (Pollak, 1985; Becker, 1991). Also, a selection bias comes from the fact that single people and separating couples are also those who invested less than average in living together and had time for themselves.

However, younger women have more leisure in couple (7 minutes by year of age (Ekert-Jaffé, 2010)), and more leisure when they are younger than their partner (2.5 minute for each year of age difference (Ekert-Jaffé, 2010)). This fact is consistent with the explanation that younger generations would share household work, then reflecting the power balance between spouses. Then couples who separate would also be the most non-egalitarian and women wishing more freedom would initiate the separation. This explanation still needs to be supported by empirical evidence which so far is ambivalent (Gupta, 1999), but it is at least consistent with the line of Pareto equilibria of Figure 1 and the computation of the probability of being better off when spouses are separated: those women with less leisure L_1 are more willing to separate, and when they do so, according to Proposition 2.2, they are better off.

4 Conclusion

Contrary to an intuitive belief where single women would be busier than women in couple, we showed that Pareto optimality is sufficient to imply that women can be better off when they are separated. The power balance makes it that the husband can deprive his wife from leisure time, in comparison with the case of separated spouses. We showed that this finding results from Pareto equilibrium theory and is consistent with empirical data. The sole assumption of efficiency of household decisions, the fact that the set of Pareto equilibria is one-dimensional while the set of equilibria for separated couples

Table 1: Leisure Time of women in hours per day (week-end included) with respect to marital status, occupation, and children under 15. All people are under 60, with less than four children under 15, man is full-time employed, all questionnaires are valid and consistent. Sample size in parentheses.

	Full-time employed		Part-time employed		Unemployed		Total	
	single	in couple	single	in couple	single	in couple	single	in couple
Total sample	15.2	14.5	15.7	15.0	18.0	16.7	15.8	15.2
sample size	490	1182	130	634	187	631	807	2447
parity								
0 child under 15	15.1 (388)	14.7 (601)	16.0 (88)	15.2 (216)	18.9 (117)	17.3 (256)	16.0 (593)	15.5 (1073)
1 child aged 3-14	14.9 (65)	14.4 (246)	15.8 (24)	15.2 (116)	17.2 (32)	17.1 (116)	15.8 (121)	15.5 (478)
1 child under 3	— (6)	14.3 (97)	— (2)	15.3 (38)	— (8)	16.7 (47)	— (16)	15.3 (182)
2 children aged 3-14	14.9 (26)	14.4 (143)	— (11)	14.5 (137)	16.5 (18)	16.4 (100)	15.4 (55)	15.2 (380)
2 ch., one under 3	— (3)	13.7 (46)	— (1)	14.8 (49)	— (1)	15.9 (66)	— (5)	14.5 (161)
3 children aged 3-14	— (3)	13.6 (26)	— (2)	13.8 (36)	— (3)	15.7 (36)	— (13)	14.4 (98)
	demographic data (in percent)							
% of couples with at least 2 children under 15	6	20	12	41	16	34	10	29
% of single mothers with at least 1 child under 15	21		32		37		27	
% of women with at least 1 child under 3	2	14	4	17	9	20	4	17

Source: Survey *Insee Emploi du temps* 1998-1999.

is 0-dimensional, and the inegalitarian distribution of leisure time between spouses are sufficient to contain this so far unnoticed but substantial result that separation entails a leisure premium. We extended the theory to the case when parents devote time to children. The same conclusion holds true. In addition, we showed that the effect of separation on expenditures for children is ambiguous, and we enumerated the possible cases, which we showed by simulation that they are non empty.

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