

One way of measuring the time cost of children: their influence on couple's total working hours

Olivia Ekert-Jaffé,
Ined, Paris, 133 boulevard Davout 75020 Paris
ekert@ined.fr

Abstract

This article attempts to estimate the time cost of children for couples who do not forgo any income, on the basis of the INSEE 1998-1999 time use survey. Having a child involves an increase in domestic work and/or the dedication of occupational income to pay for childcare. The reduction in “time for oneself”—leisure and personal care, i.e. 24 hours less working hours paid or unpaid— is modelled for a dual-earner couple in full-time employment who do not use childcare services to increase their leisure time. Taking a couple in full-time employment avoids income endogeneity bias, since income is reduced by career interruption and part-time employment. These estimates account for this selection by full-time paid work. The article shows that time cost is roughly 1 hour 30 minutes a day for a child aged 3-14, and is 2 hours 20 minutes a day longer for each younger child. As this cost rises, the more fathers sacrifice some of their free time. The father and mother of two young children thus each have only 10 hours of free time (including sleep) per day. The time cost of a large family is equivalent to a full-time job on the labour market. Work-life balance policies and family pension entitlements only cover a small part of this cost.

The author wishes to thank UNAF for its help in producing the report (2002) and the paper presented to the Journées de Microéconomie Appliquée (2003), “The cost of time devoted to children”, written jointly with Christine Barnet-Verzat, some of whose points are used here and whose data is part of the database constructed for this article. Thanks are also due to two anonymous referees, Noël Bonneuil, Robert Breunig, Elisabeth Cudeville, Dominique Meurs, Alain Monnier, Catherine Sofer and Isabelle Terraz. The author assumes full responsibility for her approach.

1. Introduction

The vast majority of estimates of the private cost for parents are based solely on analyses of household consumption (Ekert-Jaffé, 1994). However, the cost of a child cannot be reduced to a direct monetary cost, namely the expenditure they cause. Their upbringing requires time (Girard, 1958; Becker, 1991), shown most obviously in the impact on working life. The presence of a child, especially a young child, often causes the mother to reduce her working hours, leading to a loss of income for the household, carefully measured by economists¹. But this financial loss is only part of the time cost of the child and concerns only some mothers. What of those who pursue an uninterrupted career or who are homemakers? The presence of children in a household not only affects working life but also causes upheavals in time-use in all types of activity: domestic work, leisure and even personal care. Some activities increase (housework, shopping, for example) and new activities make their appearance (looking after the children, helping with schoolwork), at the expense of others such as leisure, sleep or working hours. Parents may also choose to increase their working hours in order to pay for their children's education. This article evaluates the time cost of a child on the basis of the behaviour of couples where both members are employed full-time.

Another widely studied aspect of a child's time cost is the time devoted to practical child care and educational activities, key to their development (Leibowitz, 1974; Gronau, 1977; Sayer, Bianchi *et al.*, 2004; Chalasini, 2007; Gutierrez-Domenech, 2007; Bianchi, 2000; Sayer, Gauthier *et al.*, 2004). However, this is still only a partial estimate of the child's time cost since it does not allow for the additional time spent on collective activities such as cooking, housework, laundry, shopping due to the presence children (Barrère-Maurisson *et al.*, 2001). Furthermore, it is possible to look after children while doing housework, doubling the time devoted to them (Sayer, Gauthier *et al.*, 2004; Fedick *et al.*, 2005). Concerning this aspect, the daily life of mothers with children is extensively described (Reid, 1984; Girard, 1958; Stone et Juster, 1985; Algava, 2002; Brown *et al.*, 2004). But these descriptions cannot be used to evaluate the upheavals caused by children in a parent's use of time, because that would require a comparative approach (Craig, 2007; Bittman *et al.*, 2008). In France, for example, couples with a child of 3 and over spend on average 1 hour 40 minutes a day more on household work than couples with no children (Brousse, 1999).

These average figures are not equivalent in child time cost because they do not account for the variety of couples' decisions that alter that cost: one member of the couple may work outside and pay for housework, reducing the time spent with the child and thus the imputed time cost. This expenditure is already included in the monetary cost, but it is important to remember the extra paid working hours that substitute for household time. Measuring the time devoted to children thus presents conceptual difficulties similar to those demonstrated for measuring private monetary cost. As in the case of the monetary cost, it is not possible to break down directly what is due to the child. One method used in evaluating private monetary cost is to use as a household welfare indicator the expenditure on goods for adults alone, their clothes, for example. Then total consumption of a household with a child is compared with that of a childless household that consumes the same volume of adult goods. In a similar way, this article proposes a household welfare indicator for evaluating time cost.

Two methodological advances are proposed for measuring a child's time cost for the couple:

¹ Research into this financial loss is the subject of an abundant literature: more than 50 entries on EconLit.

1. Instead of directly measuring the time allocated to different household tasks (the substitution of household for market-market time, or multitasking), the issue is addressed indirectly by considering the remaining free time available to parents, including time spent eating and sleeping². This latter is a direct measure of the parental cost, in terms of free time, of bringing up children, on the assumption, shared by all estimations of child costs not based on panel data, that free time provides the same well-being for couples with children and without children³. This figure takes into account the effect of both the number and the ages of children, making it possible to identify economies of scale with respect to the number of children.

Specifically, the time cost of a child is calculated as the difference in parental free time⁴ between a household with a child and an otherwise identical household with no children, excluding any differences in unemployment or inactivity⁵. Bearing this last point in mind, simultaneous models are generated for male and female free time, and women's decisions to work full-time.

Full-time working couples. Time devoted to children has three possible trade-offs: (i) Less time spent in paid work, and hence lower income which cannot be measured accurately in the data, (ii) Childcare expenses, (iii) Less free time, which is equal to the time cost of children for full-time dual-earner couples who use no child care. However, due to time constraints, women with young children are often forced to work fewer hours in paid employment and are therefore likely to be absent from this sample, resulting in sample selection. While appreciating that women who remain in full-time work are likely to have a good reason for doing so (which may in particular correspond to their wage), not taking this selection into account will result in underestimation of the cost of children. Jointly modelling male and female labour supply corrects these estimates for any such selection bias, and leads to calculations of the time cost of children based on the free time of full-time dual-earner couples which should be valid for all couples (Lee *et al.*, 1980).

Section 2 of this article analyses the concepts used and presents the choice model and its hypotheses. The data and econometric methods are described in Section 3 and the results of estimates of the influence of the child on parents' free time are given in Section 4. The conclusion proposes an evaluation of a child's time cost.

2. Theoretical bases: time for oneself

Measuring a child's time cost: towards a concept

Moving from measuring the time devoted to children to evaluating the cost to parents is not a simple task. Because

- this cost is not the sum of the activities devoted to the child;

² In the rest of this article, "leisure", "free time", "personal time" and "time for oneself" are used as synonyms. These terms refer to the time left after household and paid work have been deducted.

³ This large assumption, essential for any useful remarks, is discussed with the results.

⁴ Free time is 24 hours minus total (paid and unpaid) work hours and associated travel time. Cost in terms of free time measures the converse of time spent by parents for their children. In addition, adult time used for bringing up children includes external childcare, which can be viewed as a gift of time.

⁵ In the rest of this article, economically active refers, inaccurately, to the employed.

- it is possible to do a number of tasks at the same time;
- labour-market time may substitute for household work.

A criterion is needed to allow for the loss of welfare due to the care and upbringing of a child. The work may be done by the parents or paid for by them.

Childcare and household services paid for by parents

Some of the work of caring for children may often be done by an outside person paid by the parents. Like frozen food, dry cleaning and labour-market services for saving household working time, this expenditure is already included in the various estimates of a child's monetary cost: this monetary cost increases by 8% of income when mothers are employed (Ekert-Jaffé, 1998) according to a model that allows interaction between women's income and work (estimated from the 1995 INSEE household budget survey), but this expenditure is poorly recorded in standard models, with no interaction, based on homemakers. Since it comes from paid work, it is also the result of a household's choice to substitute work on the labour market for household work (Becker, 1973; Gronau, 1977) for which a more detailed explanation would be useful⁶. In a time account rather than a cash account, external childcare will be offset by time in paid work and possibly by leisure time. (i) By counting hours of paid work, our time use survey makes it possible to integrate the effort of parents who are able to work longer hours to lighten their budget constraints and finance expenditure for their children. This overtime was not included before, because the estimate of what parents paid for their children was calculated from constant income. In short, controlling for working hours and wages, childcare expenses cause a drop in living standards already included, albeit inaccurately, in household budget surveys, but the increase in hours of paid work for parents compared with childless couples is included here in the time cost of the child. (ii) In addition, the time freed up by paying for external care is also included in a child time cost since it is domestic time devoted to childcare that is paid for by the parents. Our evaluation of child cost thus includes a complete balance sheet of time use, which is not added directly to the monetary cost.

Activities sacrificed for the child: an opportunity cost

The presence of a child radically alters the parents' use of time, with some activities disappearing or shrinking and others appearing (Barnet-Verzat, 1994). This may involve:

1. Reduction in paid working hours, leading to a loss of income. This cost comprises two components: an immediate loss of income with the reduction or loss of a wage (Anxo *et al.*, 2002), and a deferred loss, since even a temporary break in paid work means a loss of experience and therefore a lower wage when work resumes, with effects lasting into retirement (Ribout, 1985; Meurs *et al.*, 2009). Some French and international studies have analysed and evaluated this cost (Ekert, 1983; Riboud, 1985; Calhoun and Espenshade, 1988; Joshi, 1994, 1998; Ekert-Jaffé 1994; Barnet-Verzat, 1996; Meurs *et al.*, 2007). The time-use survey is insufficiently detailed concerning women's entire working lives to be able to measure this loss of income accurately enough. A sample needs to be selected of men and women working full-time, for whom this loss may be supposed to be virtually nil. The selection must then be considered in the econometric procedures (see below).

⁶ However, it is impossible to distinguish exactly the extent of these substitutions in a ***budget survey***, since Browning and Meghir (1991) have shown that the demand for consumer goods is not separable with respect to women's activity, whether or not it is substituted for household work.

2. Sacrifice by the couple of a household activity for the child.

Close analysis of household time budgets clarifies this point. Maurin (1989) shows that there are three basic sorts of time in daily life: paid work, domestic work and time away. To these he adds “time off”: sleeping, eating and watching television. Children do not count as a category because “there are no children’s days as such: days on which one devotes a lot of time to children are usually days when one spends a lot of time cooking, doing housework and laundry”. This observation reflects the importance of multitasking. It is possible to cook a meal while ensuring that a child does their schoolwork or talk to the child while doing the housework. The cost of the child is indissociable from household work and it is not possible to account for the sacrifice of household work for the couple, because to measure it would require a specific survey of the purpose and beneficiary of each task, nor can one account for household work productivity (Sofer *et al.*, 2008), which may vary if children are present. By counting the volume of household work irrespective of its purpose or simultaneous tasks, our method produces an understated evaluation of the cost of a child.

3. Reduction in parent’s leisure time

This article’s criterion of welfare includes everything in a 24-hour day that is not paid or unpaid work. It shows how the presence of children increases the total amount of paid and unpaid work, and consequently reduces leisure in the broadest sense, including personal care. This is the work of bringing up children, financed by free time. The free time is usually the extended leisure time that economists associate with individual welfare. It includes personal care, because the 80-hour working weeks for families in the 1950s observed by Girard (1958) necessarily impinged on personal care.

The reduction in leisure time exactly equals a child’s time cost for those couples who do not reduce their paid working hours and do not employ outside child carers. Otherwise, one would have to add wage loss on one side — as studied by economists⁷ — and childcare costs on the other⁸ — another topic of study. For that reason this study concerns the leisure time of couples in full-time employment. Allowance is made for the fact that this group is selected by their decision to work. The model simulates a limitation to childcare time, so that it does not exceed paid working hours and does not increase leisure time. One might also consider the likely improvement in the productivity of household work where there are children. At all events, this research produces an underestimate of a child’s time cost.

For fathers and mothers in full-time employment, *a child’s time cost is measured by the lack of time for oneself, or personal time, defined as the sum of the cost in paid and household work subtracted from free time.* First, the article examines the determinants of the free time of married men and women in full-time employment, since it is basically individual and each person enjoys their free time according to their own characteristics and those of their spouse. But bringing up children is done by the couple and any evaluation of its cost cannot depend on substitutions in time between the parents. For that reason *parental time*⁹ and the sum of both parents’ time are defined. Then the couple’s free time is examined and from that is deduced the child’s time cost.

⁷ The time use survey used cannot provide an estimate of this wage loss.

⁸ If one is examining the total time devoted to children irrespective of the monetary cost, which is poorly documented.

⁹ The term “parental time”, which often refers to parental tasks in interaction with children, is taken here in the broader sense.

Is bringing up children a leisure activity?

To state that a reduction in leisure time is part of the child's time cost requires a rigorous definition of what are leisure activities. Kahneman and Krugel (2006) show that in terms of the feelings experienced *during* the activity, working hours and hours spent looking after children — apart from trips outside the home — are similar and equally unpleasant. According to Juster's surveys (1985), on the other hand, both professional work and time devoted to children are the respondents' preferred activities. Is this the contradiction between specific feelings (stress) and the general value ascribed to an activity? But this is not the issue.

Is going out to the park with a child or talking to them work or leisure? Activities devoted to children may be qualified as very pleasant since they provide great satisfaction (Juster, 1985; Juster and Stafford, 1991), but are nonetheless work. Comparison with the workplace explains this. If someone likes their paid work, it is still work and cannot be included in leisure. On the other hand, doing gymnastics for oneself is a leisure activity, whether for pleasure or medical necessity. The line between work and leisure does not depend on the pleasure gained from an activity. Nor is it monetary remuneration, because domestic work is not paid. It depends on the purpose of the activity concerned. For economists, work produces wealth and is one of the factors in a production function. Its remuneration depends on the (marketable) use of the product. It may be remunerated by an employer, who then owns it; it may also have a private purpose, such as cooking, do-it-yourself, restoring an old house or bringing up a child. The issue of the ownership of the product of the work does not interfere with the definition of work as opposed to leisure. But it is central to the social status assigned to it. A handyman saves the work of a professional; the restorer of a house can sell the product of their work. Bringing up a child, a future citizen, is also of value to society as a whole (Peters, 1995; Ekert-Jaffé, 2001; Cremer *et al.*, 2008). In this study, almost all the activities devoted to children are considered to be work.

Even if the question of the pleasure gained from the activity is secondary — whether work is productive is independent of the pleasant or unpleasant nature of the task, and this article is examining the “production cost” of children, who require time and money — family trips out are included as leisure, considering that the element of play is more important than the educational aspect¹⁰. So choices had to be made. In the nomenclature used here, domestic time includes all domestic work and all activities for children, including “travel with children” and games outside, except for family meals and trips out; professional time includes travel to and from work; and leisure time is all the rest. Although these hypotheses produce something of an underestimate of the time cost of a child, the aim was to avoid an overestimate, since this article addresses personal time, an aspect often omitted in the literature and likely to increase the cost.

¹⁰ It is true that going to a show or eating out with one's children contains a large educational component; We decided to rely on the parents' declarations in this respect. Nous avons pris le parti de nous fonder sur la déclaration des parents en la matière. This article opts for the play aspect. Otherwise, the parents would be left with very little leisure time at all. Clearly the time cost calculated in the study is an under-estimate. A deliberate choice was made not to correct it so that the magnitude of the time cost of a child found in this study could not be contested. Time for oneself in this study is what is left after subtracting paid work, commuting, domestic tasks and child care — including conversation, reading, serving the children's meals or going to the park, when the parents consider that they are playing, etc. The exact INSEE activity coding is available on request.

3. Data and empirical methods

The estimates are based on the time use survey, which is described in the first section. Then, using the initial elements correlating female activity and leisure time, the article examines how the women working full-time are selected and how the leisure of women not working full-time can in no way be used to measure the cost of a child. The empirical model and the explanatory variables are then explained.

Time use survey

INSEE's time use survey was carried out in 1998 and 1999. The information was collected in diaries in which the respondents noted the duration of their activities during the day. This method records activities when they occur, reducing risks from errors of memory.

In order to allow for variations in activities over the week, the sample contained roughly the same number of diaries for each day of the week. Seasonal variations were also considered and identified, since the survey was administered in 8 waves over the year from 16 February 1998 to 14 February 1999 (omitting the holiday period, 3-17 August).

The sample included 3,598 couples who filled in at least one time use diary. All the individuals over 15 years of age in the household were asked to do so.

The sample used here comprises 2,788 couples with 0, 1, 2 or 3 children under 15 in which the man, aged under 60¹¹, worked full-time¹². In 47% of the cases, the woman was also working full-time. On average they had one child, and of these couples, 13% had a child under 3. The other couples divided equally (25%) between women working part-time (1.98 children on average, and 18% with at least one under 3) and the economically inactive (1.98 children and 23% with at least one under 3). In this sample, 292 questionnaires contained non-responses that made them partly unusable¹³ and another 48 questionnaires were eliminated by robustness tests, since the estimated wage values based on this sample¹⁴ were

¹¹ The under-60s are the vast majority of parents with children under 19 (35 households in which the head of household was over 60 and had children under 19 were removed from the sample). Very large families (4 or more children) are too few to constitute a statistical base (it would be 3% of this sample).

¹² The unemployed and retired were excluded so as not to introduce concepts extraneous to this study: where the retired might be seeking work but cannot find any, they are forced into leisure by the market, as are the unemployed — evidence that the value of their time is less than the wage offered — with or without children. Since their leisure time corresponds to a financial loss, it cannot be a good criterion for calculating the cost of a child. In addition a specific analysis would be required to take account of time spent looking for work, which is outside the scope of this study.

Households in which the reference person or spouse was a student were also excluded from the sample, because accurate data of their income were not available. Also excluded were the 48 men working part-time, on the assumption that this part-time work was imposed on them (and a model cannot be constructed with 48 cases); however, the sample is big enough to model women's choice of activity. In every case, the free time gained corresponds to a financial loss.

¹³ As much information available as possible was used: modelling the decision to estimate women's full-time wage used 2,781 questionnaires.

¹⁴ See table in appendix for the details of the wage estimates.

too far from the observed values (more than 30 centiles). The working sample therefore comprised 2,447 couples.

Respondents’ professional activity, children and leisure time: selected raw data

How much time do the parents in the sample spend on their children (Table 1) and how does their leisure time vary? This depends first of all on the woman’s professional activity and the selection of women by professional activity is clearly apparent: large families are more common where the woman does not go out to work or only part-time. The first factor of discrimination to observe is that women’s investment in a job reduces their personal time. Inactive women naturally have a lot of leisure time, more than other women and more than their spouses¹⁵. This greater availability holds for those with children too, although inactive mothers devote more time than working mothers to their families¹⁶. Where they have three children, they have on average 15 hours 41 minutes time for themselves a day, compared with 17 hours 18 minutes if they have no children. The more involved women are in paid work, the less absolute personal time they have, and in the case of those with small families, less compared with their husbands. For example, childless women working full-time have 14 hours 44 minutes’ personal time and their husbands 15 hours 28 minutes. Women working part-time arrange their working hours so as to maintain their personal time at around 15 hour 15 minutes, whether they have no children or one.

The selection of women by economic activity is clear: there are more large families among inactive or part-time working women, and the time apparently “devoted to the children” covers a range of realities, not always due to the children. A woman may spend more time on domestic work because she has children or because she belongs to a generation that is more house-proud. A high value for this time may also be associated with lower socio-occupational categories, for whom the value of domestic production is higher than what the women could earn on the labour market. Conversely, domestic help, high domestic productivity or lower homemaking standards may increase leisure time. The determinants of available time were analysed *ceteris paribus*, using the most parsimonious model that best explains the variations in time use of couples working full-time.

Table 1. Spouses’ personal time per day (including weekends) in hours and minutes, according to woman’s economic activity and number of children under 15.

	Both working full time	Wife working part time	Wife inactive	Total
--	---------------------------	---------------------------	---------------	-------

¹⁵ It is already known (Levy-Garboua and Lemmenicier, 1980; Gronau, 1977) that for a given family size, inactive women sleep longer than the others.

¹⁶ Their husbands too have more time than other men, and oddly see their leisure time increase if they have on child — the effect of the heterogeneity of couples with a single earner, the variety of men’s work arrangements, and the specialization of wives in domestic matters.

Types of couples								
	Man	Woman	Man	Woman	Man	Woman	Man	Woman
Total sample (with or without children)	15 h 10	14 h 30	15 h 16	14 h 59	15 h 16	16 h 42	15 h 19	15 h 13
<u>Couple's children</u>								
0 children	15 h 28	14 h 44	15 h 32	15 h 14	15 h 17	17 h 18	15 h 30	15 h 26
1 child aged 3 - 14	15 h 11	14 h 23	15 h 31	15 h 14	16 h 00	17 h 04	15 h 28	15 h 14
- aged under 3	14 h 50	14 h 18	15 h 11	15 h 20	16 h 36	16 h 40	15 h 21	15 h 08
2 children aged 0 - 14	15 h 00	14 h 23	15 h 08	14 h 33	15 h 32	16 h 23	15 h 11	14 h 58
- of which 1 under 3	13 h 36	13 h 41	14 h 53	14 h 47	14 h 48	15 h 49	14 h 30	14 h 53
3 children aged 3 - 14	13 h 55	13 h 36	14 h 21	13 h 48	14 h 41	15 h 41	14 h 22	14 h 26
Sample size	1182		634		631		2447	
% couples with 2 children	46		60		66			

Interpretation: Among dual-earner couples, 46% have 2 dependent children; on an average day (weekday or weekend), the man has 15 hours 10 minutes' personal time (including sleep) and his spouse has 14 hours 30 minutes.

Population of reference: couples aged under 60 of whom the man works full-time, where the completed questionnaire is fully usable and meet robustness conditions.

Source: INSEE Enquête Emploi du Temps 1998-1999.

A woman may be economically inactive because her health is poor or because labour has high disutility for her and she settles for what her spouse earns, or again because she has a large family it is difficult to balance with a job, which interferes with the object of this study. Table 1 shows that women bringing up three children of whom two are young are more often inactive, and consequently excluded from the sample of couples working full-time, than childless women. Those who remain are selected by higher wage or arrangements that enable them to minimize the time devoted to the children. This selection must be allowed for in calculating a child time cost valid for all women. The model examines what this cost would be if the women who reduced their paid working hours had been included in the sample of full-time working women.

Empirical model

Equations and estimation method

The task is to estimate the leisure time of spouses controlling for income in a reduced model containing both the simultaneous allocation of women's leisure and working hours and the interdependence of men and women's time use. Each of these points is addressed in a separate econometric model, since the calculations could not provide a convergent model covering them both. Although estimating men and women's leisure time separately reduces the effectiveness of the procedure, each of the estimates takes into consideration the characteristics of both spouses and an interaction of their time use mediated by the woman's paid work. On the other hand, it is essential to integrate the sample selection caused by a woman's decision to go out to work, since the leisure time observed is only equal to leisure time controlled for income for couples both working full-time¹⁷.

These equations are standard in the labour supply literature: the dependent variable l_f , (or l_m ¹⁸) for full-time working couples, expressed as a proportion of a 24-hour day, is estimated simultaneously at y the employment of the woman, varying from 0 (for inactive women) to 1 (for full-time working women).

The latent variables $l_{f,i}^*$ and y_i^* express for the woman in couple i her leisure time and her advantage in having a job, of standardized gain equal to or higher than unity if the woman has an advantage in having a full-time job. These are modelled simultaneously:

$$l_{f,i}^* = f_0 + f_1 \ln w_{f,i} + f_2 \ln w_{m,i} + \mathbf{f}_4 \mathbf{n}_i + \mathbf{f}_5 \mathbf{z}_i + u_i \quad (1)$$

$$y_i^* = \gamma + \eta Z_i + \varepsilon_i \quad (2)$$

where w_m and w_f are the hourly wages of the men and women, N the number and age-groups of the children.

Observed are l_f , the leisure time of full-time working women, and y_i , the woman's employment as a proportion of full-time, directly recorded in the survey. To identify the model, Z must contain an instrument variable, which explains the woman's employment y_i without affecting her leisure time l_f (or her wage); the local unemployment rate was chosen, which proves to be a sound instrument.

A low wage may be the result of low investment in work and a lot of leisure time. Wages therefore also reflect decisions based on households' choices for time use, since couples both working full-time probably earn higher wages. First, therefore, exogenous wage variables must be constructed, namely such as influence time use with no reverse effect. For the wage instrument, there are socio-occupational categories which prove to influence wages but not leisure time.

The wage equations

$$\ln w_{j,i}^* = \alpha + \beta X_{j,i} + v_{j,i} \quad ; \quad j = f, m ;$$

are estimated simultaneously at (2), then introduced into the model using the augmented regression method.

The standard deviations and tests were obtained by bootstrapping.

3.2.2. Explanatory variables (or what does leisure time depend on?)

¹⁷ For whom childcare hours are modelled as nil.

¹⁸ The equations given here estimate women's leisure time; the equations for men are similar, and y_i represents their spouse's decision to work.

The relevant variables are *the number and age of the children in the household (number of children in each age-group)*. To determine the most appropriate nomenclature, a number of models were estimated varying the number of children and dividing points between the age groups. It turns out that children of over 14 do not represent a burden for their parents in terms of time for themselves. The model presented here focuses therefore on the number of children under 15. The age groups are under 3 and 3 to 14¹⁹. The use of an outside childminder increases parents' leisure time. However, because this childminder is paid by the couple, the child's time cost must be calculated without the childminder's hours. The childminder's hours are used as a control variable.

The *other control variables* are the time of year and day of the week of the interview, socio-occupational categories, educational level, type of town — as lifestyle characteristics — average age of the spouses, to characterize their cohort, and a set of economic data and others expressing gender relations.

Gender relations. According to economic theory, time use is sensitive to the relations within the couple (Becker, 1991; Grossbard, 1993, for example). These are captured by two variables: (i) the age difference between the spouses reflects the man's power compared with the woman. It may also reflect a more traditional couple; (ii) Legal status reflects the woman's power: a couple in a common-law couple is generally more egalitarian than a married couple (Ekert-Jaffé and Sofer, 1996).

Non-work income, too inaccurately measured, proved to be non-significant (thresholds above 0.5) and is not considered in the empirical section²⁰.

Construction of an exogenous wage (X content)

The theory section indicates that leisure time depends on the spouses' wage rates, which are recorded here as full-time monthly income (171 times the hourly wage). To instrument the data — i.e., in this case replace full-time income by estimated income exogenous to leisure time, where the decision to work is not relevant — the man's income was estimated by detailed social category, detailed educational level, age and square of age (Mincer, 1963)²¹. The woman's full-time wage was then estimated in the same way simultaneously with her decision to go out to work (Appendix 2).

The leisure time of each of a couple working full-time and a woman's decision whether or not to enter the labour market, full-time or part-time²², are estimated by a bivariate Tobit model

¹⁹ In terms of time for oneself, the 3-to-5 age-group does not differ significantly from the 6-to-14 group. However, a 3-to-5 age group is distinguished for modelling women's decision to go out to work.

²⁰ Non-work income was estimated from the household's work income and total income using the simulated remainder method, controlling for SOC, type of household, type of town, man's age-group, housing status. The results contain numerous measurement errors and proved to be non-significant (for couples both working full-time).

²¹ Clearly, social category or the decision to extend education may be endogenous to leisure time; however, this is the result of decisions dating from adolescence. Although there is an obvious reverse effect of leisure time on wages, its effect on social category or higher education is probably less convincing; at all events, nothing better can be done with these data.

²² Another equivalent method is to introduce the Mills ratios — Heckman method (1978) revised by Greene (1983) — to allow for the endogenous selection in the sample. The choice

(see above). In line with the theoretical model, women’s working hours are expressed as a proportion of full-time employment (as stated by women respondents): it is 0 for the economically inactive and 1 for women working full-time. It is estimated from the sample of 2,448 households. For each of the spouses, leisure time is expressed as a proportion of the 1,440 minutes of a 24-hour day, and varies from 0 to 1. For these equations, the sample is restricted to the 1,148 women working full-time (Table 2).

Next, to calculate the time cost of a child, in a similar manner, using a bivariate Tobit model, the proportion of time available is estimated from the 2,880 minutes in the 48-hour day of a couple, and women’s activity (proportion of full-time work).

Each variable is analysed with respect to the reference base. This is a wage-earning man living in a large town, married to a working wife with a lower-secondary qualification, no children, interviewed on a weekday between 15 February and 27 September 1998²³.

To demonstrate the size of the sample selection bias, the leisure time of dual-earner couples are estimated, for the purposes of comparison, without considering the selection by decision to work, but simultaneously for fathers and mothers (Table 3).

Table 2. Personal time of spouses working full-time as a proportion of a 24-hour day, bivariate Tobit model, with leisure time estimated simultaneously with woman’s activity.

Variables (reference couple)	Man’s free time ^a		Woman’s free time		Woman: proportion of full-time employment (0 -1)
	Coefficient	Pvalue	Coefficient	Pvalue	Coefficient

was made to use greater modern computer power and directly estimate the simultaneous equations by the maximum likelihood method.

²³ These categories were constructed using econometric tests of regressions comprising detailed categories. For example, the tests show that there is no significant difference between the value of leisure time of higher professionals and manual workers, after controlling for qualifications and wage. Similarly, there is no significant difference between the various survey waves from 15 February to 27 September (omitting the first half of August); the term “winter” is used for the period from 27 September 1998 to 14 February 1999, which differs significantly from the other periods, which can also be aggregated.

^a Estimated simultaneously with his wife’s proportion of full-time employment (available on request).

Constant	-1,0237^b	0.000	-1,7101	0,9767	4,39336
<u>Couple's children (0 children)</u>					
1 child aged 0 - 14	-0,0306	0.001	-0,0310	0,000	
2 children aged 0 - 14	-0,0672	0.000	-0,0494	0,003	
3 children aged 0 -14	-0,0922	0.000	-0,0704	0,004	
<u>Age group (3 - 14)</u>					
Number of children aged 0 - 2	-0,0617	0,001	-0,0473**	0,013	-0,75978
Number of children aged 3 - 5					-0,55962
Number of children aged over 5					-0,29015
Childminder x number of children aged under 18	0,0146**	0,020	0,0084	0,112	
<u>Children aged over 14</u>					
Number of children aged 15 - 25	-0,002	0,655	0,0057	0,184	
<u>Survey day (weekday)</u>					
Weekend	0,1895	0,000	0,14475	0,000	
Winter	-0,0219	0,001	-0,0162	0,003	
<u>Couple's characteristics</u>					
Centred average age of spouses	-0,0031	0,308	-0,0051	0,010	
Age difference between spouses ^c	0,0017	0,241	0,0018*	0,091	
Living in town of pop. 20,000-100,000	0,0136**	0,033	0,0118**	0,031	
<u>Man's characteristics</u>					
Self-employed	-0,0693	0,000	-0,0312	0,007	
Secondary school qualification but no tertiary education	0,0101*	0,010	-0,0107	0,143	
Log (estimated monthly wage)	-0,0185	0,246	-0,0007	0,527	-0,27613
<u>Woman's characteristics</u>					
No qualification	0,0063	0,548	0,0137	0,295	-0,73313
Secondary qualification	-0,0413	0,311	-0,0578**	0,044	0,23893
Tertiary education	-0,0655	0,388	-0,1043*	0,064	0,98468
Log (estimated monthly wage)	0,2105	0,357	0,2778*	0,062	-0,27613
Woman's age	-0,159**	0,029	0,1467*	0,091	-0,00163
Woman's age squared					-0,00325
Unemployment rate in travel-to-work area					-0,0286
<u>Sigma</u>					
Log likelihood	-1542		-1342		1,326
					-1362

^b The coefficients differ significantly from 0 at the following thresholds: **bold**=0.01; ** = 0.05; *=0.1..

^c Man's age less woman's age.

Interpretation: Compared with a childless man with the same characteristics, a man's free time is reduced by 0.0357 x 24h when he has a single child aged 3 – 14. In the reference couple, if the man has a monthly wage of FRF **11,175** (Log=9.32) and the woman **FRF 8,867** (Log=9.09), the man has (-0.0184 x 9.32 + 0.2824 x 9.09 – 1.7951)=0.60 x 24h, 14 hours 24 minutes free time on a weekday.

Correlations with proportion of full-time employment	0.88	0,3	0,88*	0,010	
Number of observations					2448

4. Results: time cost of children as measured by parents’ “time for themselves”

What then is the time cost of a child, *ceteris paribus*? First the essential determinants of time for oneself are examined, which do not depend on the number of children and are used here as control variables, and then the influence of children on parents’ leisure time (Tables 2 and 3; Table 2 reproduces the estimated values as a proportion of a 24-hour day, and these are converted into hours and minutes per day in Table 3, for easier use). The leisure time of the members of the reference couple according to the number of children is then simulated on the basis of these regressions and a time cost per child is calculated on the basis of the estimated leisure time of the couples (Table 4). Our estimate of child cost is then given for the reference couple, *ceteris paribus*, applying to the time the average wage rate of childless women working full-time and showing it as a proportion of the total full-time wage of childless couples (Table 5).

Determinants of personal time for a full-time dual-earner couple: socio-economic elements

On weekdays, a reference couple of two working spouses has an average of 27 hours’ time for themselves, 56% of the 48 hours of the couple’s day (Table 4). On weekdays at least, this time appears to be fairly well distributed between spouses. The spouses’ free time is also highly correlated: *ceteris paribus*, “workaholic” men live with “workaholic” women, with a correlation coefficient of 0.41. The control variables (Table 2 and 3) also operate in the same direction for both spouses, although each is mainly sensitive to its own attributes. However, the effect of the couple’s characteristics mainly concerns women, and men have more rest time than their spouses at the weekend.

Women in younger couples have less free time (–7 min for each year less for women) and free time rises slightly with the age gap between spouses (+3 min per year): for a given job, older couples work longer, and the woman more than the man (at home and at work), but take more personal time where the woman is even younger than the man. Do younger cohorts work less and share tasks more equally? Economic theory (Grossbard, 1993) explains how the difference in age (man–woman) may also indicate spouses’ characteristics on the marriage market that lead to a higher quality of life.

This time for oneself does not depend on the legal status of the spouses but is indeed affected by the seasons (half an hour a day less for each spouse in winter) and the day of the week (+4.5 hours for the man and +3 hrs for the woman at weekends in Table 3). Gender inequality is large, since at the weekend a woman works one and a half hours more than her spouse. Free time also depends on the size of town: quality of life is known to be higher in mid-sized provincial towns and this is shown by time for oneself in urban areas of 20,000 to 100,000 population, for both men (+20mn) and women (+28mn).

Free time depends on men’s socio-occupational category (strangely, not on working women’s). The self-employed — farmers and self-employed — who have longer than average working days, consequently have less leisure time (–100 min per day). The same is true for their spouses, but only half as much (–45 min per day). On the other hand, the man’s other

characteristics have no effect: neither educational level nor estimated wage²⁴. But women's educational level and wages appear to influence their free time. The higher a woman's educational level, the less free time she will have: it was already known that more qualified women increase both their presence in the market and the quantity of their domestic work (Roy, 1989). Educational level in this case expresses the high cost of time or expectations concerning one's domestic work or children's upbringing. Controlling for educational level and labour market participation, a women's wage appears to have a positive influence on her free time²⁵. Higher income makes it possible to eat out, use cleaning services, etc., to reduce the time spent on domestic tasks and increase leisure time. Women with higher wage rates may also have higher productivity in both their working and domestic lives, giving them more leisure time.

Table 3 shows the extent of endogeneity biases: for example, if we do not consider women's selection by going out to work, women's characteristics do not enter into play, since reverse effects confuse the direction of causality. We have seen that women with higher qualifications have less leisure (negative effect of educational level, Table 2). But conversely, a woman who does not like housework will increase both her leisure time and her investment in professional life and education, and will consequently gain a higher qualification; which produces an opposite positive effect from free time to qualification; the model integrating the fact that this woman is more likely to work full-time eliminates this reverse effect²⁶. So these spurious

Table 3. Personal time for full-time working spouses, in minutes: biases due to sample selection -Spouses' free time in minutes in regressions not allowing for woman's activity (bivariate woman-man model) compared with results in minutes from Table 2 regressions, which allow for simultaneity in decisions concerning free time and paid working hours.

	Man's personal time in minutes	Woman's personal time in minutes
Estimation method: simultaneity of woman's	No	No

²⁴ First only the observed wage was entered into the model. If a negative influence of this observed wage was found, this was a reverse effect: those more involved in their work have both less leisure time and higher wages. Controlling for this past investment by a man in his work by estimating wages (Mincer, 1963), the man's hourly wage rate does not influence free time.

²⁵ This may seem strange, since economists consider potential wages to be an indicator of the value of a woman's time. Not controlling for qualifications, any rise in this potential wage would rather be an incentive for a woman to work more in the market to earn more and reduce her domestic time and leisure time: however, these are women who already have a full-time job and adjustment of working time on the labour market is controlled by the activity equation. This positive effect of potential wage on leisure time expresses rather the preference for leisure that rises with wealth. For economically inactive women, the same regressions do indeed show a negative effect of potential wage.

²⁶ Controlling for educational qualifications, a woman's higher wage implies greater involvement in her past and present professional work, longer presence on the labour market and consequently less leisure time. Here too, the reverse effect of free time on income disappears if the propensity to go out to work is controlled for.

activity (AF) Variables (reference couple)	simultaneity	Simultaneity	simultaneity	Simultaneity
Constant	1979	-2375	581	-3664
<u>Couple's children (0 children)</u>				
1 child aged 0 - 14	-40	-44	-42	-45
2 children aged 0 - 14	-89	-97	-68	-71
3 children aged 0 -14	-128	-133	-103	-101
- Number of children aged 0 - 2	-47	-89	-27**	-68**
Childminder per child under 14	27	21**	19**	12
- Number of children aged 14 -25	0	-4	6	8
<u>Survey day (weekday)</u>				
Weekend	291	273	227	208
Winter	-34	-32	-30	-23
<u>Couple's characteristics</u>				
Average age of spouses	0.9	-4,5	-2	-7
Age difference between spouses (M-W)	-0.1	2.4	0.2	3*
Living in 20k-100k pop. town	22**	20**	21**	17**
<u>Man's characteristics</u>				
Self-employed	-83	-100	-33	-45
Secondary school qualification but no tertiary education	18	15	-9	-16
Log (estimated monthly wage)	0.1	-26.7	15.7	-1.1
<u>Woman's characteristics (below secondary level)</u>				
No qualification		9		20
Secondary school qualification	-2	-59	5	-83**
Tertiary education	21	-94	-15	-150**
Log (estimated monthly wage)	66.0	303	-7.4	400*
R2 adjusted	0.29		0.29	
Correlation man-woman	0.41		0.41	
Number of observations			1,178	

The figures in **bold** differ significantly ($P < 0.05$) when simultaneity is included. Pvalues are obtained by bootstrapping

Interpretation: *Ceteris paribus*, ignoring the selection of full-time working women and their specific arrangements, the free time of the father of a child aged 3 to 14 is 40 minutes less per day than for a man in the reference couple, surveyed on a weekday. If the child is under 3 and is looked after by an outside childminder, the reduction is $40 + 47 - 27 = 60$ minutes per average day (weekday or weekend).

effects are controlled by simultaneously modelling the decision to work (as % of full-time) and free time.

It was verified in the model that there was no interaction between these main determinants and children: according to these modelled data, a self-employed person with children sacrifices no more or less of their own free time for them than other categories of population. Unlike monetary cost (Ekert-Jaffé and Trognon, 1994), a child's time cost appears not to depend on income or socio-demographic characteristics.

To evaluate the time devoted to children, the results are now presented of the model directly analysing the couple's free time (Table 4, last column, and Table 5). How this time is divided up between the spouses is based on the simultaneous modelling of the behaviour of each spouse (Tables 2, 3 and 4).

The cost of a child in terms of parents' free time is clearly apparent

The last column of Table 4 shows that *full-time dual-earner parental couples with one child aged 3-14 lose 1.4 hours per day of free time on average*. For two children, this loss increases to 2.6 hours, which is almost twice as high as the one-child figure, indicating that economies of scale are only 11% for second children; these are further estimated to be 7% for the third child (and so 18% lower than the figure for the first child). Each child under the age of 3 "costs" an extra 2.4 hours, so that parents with one young child (under 3) therefore lose $1.4+2.4=3.8$ hours, and a family with two children one of whom is under 3 loses $3.1 + 2.4=5.5$ hours per day, which is to be compared to the average figure of 5.0 hours per day for full-time paid work in 2009 (151/30).

Comparing the costs for full-time mothers and fathers in Table 3 and 4 shows that the time cost of the first child is equally shared (0.7 hours for both parents). Bringing up children includes a number of activities that do exhibit substantial economies of scale: preparing meals and playing with children, for example, which do not take much more time when there are more children. There may even be time savings, when older children take care of younger ones, for example. These economies of scale only seem to occur for mothers. Relative to the time cost of one child, mothers spend 40% less time for the second child, and 32% less for the third.

Table 4. Effect of children on the daily free time of couples who are both in full time employment.

Variables (reference group)	Husband's free time in hours		Wife's free time in hours		Couple's free time in hours	
	Estimated coefficient for average day	Free time an on a weekday	Estimated coefficient for average day	Free time an on a weekday	Estimated coefficient for average day	Free time an on a weekday
Reference couple at mean wage*		13.5		13.5		27.0
<u>Children (no children)</u>						
1 child aged 3-14	-0.73	12.8	-0.75	12.7	-1.4	25.6
1 child aged 0-2	-2.21	11.3	-1.87	11.6	-3.8	23.2
2 children aged 3-14	-1.61	11.9	-1.19	12.3	-2.6	24.4
2 children, 1 aged 0-2		10.4		11.2		22.0
2 children aged 0-2		8.9		10		19.7
3 children aged 3-14	-2.21	11.3	-1.69	11.8	-3.8	23.2
3 children, 1 aged 0-2		9.8		10.4		20.9
Childminder per child	+ 0.35		+ 0.20			
		13.5		13.5		27.0

*The reference couple has no children, lives in a large town (100,000+ inhabitants), and was interviewed during the week between 15 February and 27 September 1998. Both spouses are in full-time paid work: the man earns about 1,680 euros per month, and his partner's monthly wage is 1,150 euros. Each panel in the above table refers to results from a separate regression (which explains why the estimated effect on couple's free time is not exactly the sum of the effect for the husband plus that for the wife).

Brousse (1999) has shown that, as families grow, spouses tend to specialize, with one remaining at home and the other being in paid work. However, this growing specialization may not necessarily reflect how the time cost of children is shared between spouses. The greater the total burden of work for women in full-time employment, the more their husband will increase his hours of paid work, perhaps by taking a job with a longer commute or by working more overtime. However, despite this specialization, the husband may also spend more time on domestic tasks. With two or more children, while the market-market roles of men and women become increasingly differentiated, their time budgets become similarly

constrained (with around 12 hours per day of free time for both parents, when they have two children aged 3+, and less than 11 hours when one of these children is under age 3), perhaps more constrained for the fathers. During the week, the difference in free time between husband and wife is less than 11 minutes. Thus, the cliché of fathers watching the television while their wives take care of the children and cook dinner seems seriously outdated in 1998, at least for full-time working couples.

The loss of free time for women due to family demands is taken equally from leisure and personal care (sleep, meals, etc.). *Fathers' care time remains unaffected if the child is aged 3+. However, younger children or larger families also affect their hours of sleep.* Having three children “costs” both the mother and the father a little over one hour of personal care; the corresponding figure for a young child is around one hour and a half for both parents.²⁷

The time cost of children depends on their age. A child under 3 costs two and a half times as much as a child aged 3-14: the extra cost of a child under age 3 is 1.1 hours for the mother and 1.4 hours for the father, giving a total cost of around 4 (roughly $1.1+1.4+0.75+0.75$) hours per day for a single young child. On the other hand, the time cost of children aged over 14 is zero. Adolescent children are even associated with greater leisure time for the couple (either because older children take care of younger children, or because adolescents encourage their parents to substitute leisure for domestic work).

Discussion: the influence of the wife's job.

These time costs of children are larger than those commonly found in the literature (Gustafsson *et al.*, 1994; Bradbury, 2008; Sousa-Poza *et al.*, 2001; Anxo *et al.*, 2002, and Craig and Bittman, 2008). This is due to the attempt here to calculate a *time cost*, independently of any monetary cost, i.e. capturing the fact that free time gained by withdrawing from full time work is obtained at the expense of income. The decision to become employed is also taken into account: the greater the family demands on a woman's time, the more a woman's decisions to continue working full-time will be deliberate. Those who continue to work are likely to be very devoted to their work, to have made special arrangements for their children's day-care, or indeed not to have the choice of stopping work, due to their need for income. Many women with substantial family demands on their time will stop full-time work, and will thus be missing from the sample of full-time women workers. This selection must be taken explicitly into account when calculating the time cost of children in order to produce figures that are applicable to the entire population of women. This process doubles the additional time cost of children under the age of 3 relative to that of older children for both the father and the mother (Table3). On the other hand, these figures do not depend on specifying a woman's wage²⁸. The lower figures often found in the existing literature may well thus reflect sample selection.

Indeed these figures may still be under-estimates, since family meals and trips out with the children have been counted as time for oneself, by considering them more as leisure; and yet these activities contribute to children's development and could be counted as parental tasks. On the other hand, they might be over-estimated, like all measurements of child cost that are not based on panel data and assume interpersonal comparability of utility. This study is based on the hypothesis of stable preference for free time between childless couples and those with children. This is a big assumption. If people who became parents took less leisure time than

²⁷ Tables are available from the author on request.

²⁸ Models that do not consider wage endogeneity produce the same results for the cost of a child.

others even before they had children, these results would merely express differences of preference and would not be due to the fact of being parents. Only panel data could validate them and reveal any unobserved heterogeneity correlated with the composition of the household. Two remarks may be made that contradict this possibility and support these estimates: (1) when all their children are over 14, the model shows that parents' free time is equal to that of childless couples; (2) even if future parents already spend more time on paid work, one may suppose that couples have some intuitive idea of the time they will need to devote to children, so those who work more would be prepared to have more children than those who prefer leisure time and do not want to change their life styles. The issue is the work of bringing up children and not a question of preference or pleasure.

It can also be seen that this decision not to work full-time concerns women as much as men: women's decision to go out to work also affects their spouse's use of time. In this respect, a woman who works part-time or stays at home reduces the time constraints of both spouses. There are two possible interpretations: (i) the desire to reduce her spouse's time constraints contributes to the woman's decision to withdraw from the labour force; (ii) women who have a heavy work burden live with men who work more — we have seen that spouses' free time is correlated.

Conclusion. The time cost of a child: an attempt at quantification

If this model is reliable, in order to identify a time cost of a child comparable to a monetary cost, Table 5 evaluates the value in two ways.

- The loss of free time may be compared with the free time of an equivalent childless couple with the same characteristics. The base couple on an average wage has 27 hours. By this standard, the cost of a child may appear quite low: the 4 hours per day of a young child are only 15 % of this free time. For large families, however, this constraint is a large one, up to one-third of the free time of the equivalent couple. But this proportion does not properly reflect the constraints on parents: by paying 25% of the free time of a childless couple, the parents of 3 children, one of whom is under 3, with a childminder have 22 hours a day for themselves, or roughly 11 hours each. Eleven hours for the full-time working mother for sleeping, personal care, eating and, perhaps, a little leisure (Table 4). If her health is not up to it and she cannot or will not put up with this pace, she has to choose between a part-time job, with the lower standard of living that implies, or having fewer children.

- If these results are to be translated into monetary terms, we must look to economic theory. For working people, the cost of time equals their hourly wage. At women's mean wage rates, lower than men's, three children, one of whom is under 3, cost 1,500 euros a month (Table 5, 2nd column), which is half a couple's average wage²⁹ (Table 5, 3rd column)! Bringing up a large family is a full-time job. One child over 2 years of age "costs" 368 euros a month, or 12% of the couple's wage; a younger child's time cost in monetary terms is 902 euros, or 30% of their wage. Indeed, this rough evaluation, does not take account of the fact that in terms of cost (= "value" of time), an hour for an uneducated woman is not the same as an hour for a highly educated woman. We modelled this time cost directly for each couple – the total child time cost as a ratio of the time capital of the couple's day, with each member of the couple valuing their time at their own wage rate – (see appendix table). These figures hold: the cost of a child aged 3-14 is equal to 13% of the couple's full-time wage, that of a child

²⁹ In this calculation, we allowed for the increase in men's hourly wage as the number of children rises, which increases the denominator slightly as family size increases, and reduces the time cost by 2.4%, 2.9% and 3.6% for families with 1, 2 and 3 children.

aged under 3 represents 35% of their wage, while that of three children, one of whom is under 3, represents 58% of their wage.

Table 5. Free time of full-time working spouses simulated as a proportion of an equivalent childless couple; comparison with the monetary cost of a child

	Couple's personal time cost				Monetary cost Scale used by INSEE and OECD
	% free time Childless couple	Cost evaluated in terms of wife's mean monthly wage in euros	Cost as proportion of mean couple's wages	Estimated Cost, evaluated in terms of individual spouse's wage, as a proportion of full time wage	
Base value: Reference couple on average wage	100	1,150	1	1	1
<u>Couple's children aged under 15</u>					
1 child aged 3 - 14	6	368	0.12	0.14	0.20
1 child aged 0 - 2	15	902	0.30	0.35	0.20
1 child aged 15 - 18	Not significant		0	0	0.33
2 children aged 3 - 14	11	700	0.23	0.24	0.40
2 children with 1 aged under 3	20	1,234	0.41	0.47	
2 children aged under 3	29	1,841	0.61	0.70	
3 children aged 3 - 14	17	1,023	0.34	0.35	0.60
3 children with 1 aged under 3	25	1,577	0.51	0.58	
3 children with 2 aged under 3	34	2,080	0.70	0.80	
Childminder per child aged 0-14	-2	123			

This can be compared to the drop in the couple's standard of living, the value of which is addressed in an extensive literature but is based on a consensus. If we use the INSEE and OECD figures, the needs of a child under 15 are estimated to be 20% of the wage of an equivalent childless couple (Hourriez and Olier, 1998), a figure that is 33% for an older child. It would appear, therefore, that the time cost of a very young child is much greater than their monetary cost, and the time cost of a child aged 3 to 14 is 60% of the conventional monetary cost. At all events, a child occupies a central position for a couple: for a large family, or where there is a child under 3, the children count for more than the adults.

Spouses' time use also depends on the working status of each spouse. Free time often varies in the same way: the self-employed and their spouses, and the parents of large families or small children where the woman works full-time, both have their free time reduced. Whereas in a childless couple, both spouses have 13.5 hours of personal time in weekdays while the man has 18 hours and the woman 16.5 hours on a week-end, this difference tends to shrink as the family burden grows.

The time cost of children is fairly well shared. To be consistent, the system would need to ensure that women share with men the returns of bringing up their children.

By subsidizing crèches and various types of childminding, the government eases the work-life balance. But this policy only covers a tiny amount of the time cost of a child. The overwhelming proportion is paid by the parents. As economists such as Becker (1991), Wachter and Willis (1973) have surmised, the child is primarily a consumer of their parents' time. This article has attempted to quantify this proportion, not supported by the authorities. It comes to as much as or even more than the full cost of supporting an unemployed adult. Some of this time, it is true, is marketed time and is invested in retirement contributions that will increase pensions. But with the specialization of roles, this is of benefit primarily to men. Domestic time provides no such return; except for a pension bonus in France for mothers, which is small compared with the sums represented by parents' work, but of crucial importance as an at least symbolic recognition of the unpaid work done by mothers to the advantage of the community as a whole³⁰.

³⁰ Peters (1995) shows how a child is the source of positive externality, that they produce a collective benefit by financing retirement pensions, which are a burden only for parents. On this basis, Cremer, Gahvari and Pestieau (2008) propose what an appropriate pension system should look like.

References

- ALGAVA Elisabeth, 2002, "Quel temps pour les activités parentales ? ", *Etudes et Résultats, DRESS*, 162, p. 1-12.
- ANXO Dominique, FLOOD Lennart and Yusuf KOCOGLU, 2002, "Offre de travail et répartition des activités domestiques et parentales au sein du couple : une comparaison entre la France et la Suède", *Economie et Statistique*, 352-353, p.127-150.
- APPS Patricia, REES Ray, 2001 "Household Production, Full Consumption and the Costs of Children", *Labour Economics*, 8, p. 621-648.
- BARNET-VERZAT Christine, 1994, *Le Coût Temporel de l'Enfant*, thèse pour le doctorat en Sciences économiques, Université de Nantes.
- BARNET-VERZAT Christine, 1996, "Estimation de la Perte de revenu Salarial de la Femme en Présence d'Enfants", *Economie et Prévisions*, 122(1), p. 69-81.
- BARRÈRE-MAURISSON M-A., BUFFIER-MAUREL M., RIVIER S., 2001, *Le Partage des Temps et des Tâches dans le Ménage*, Paris, La Documentation Française, 143 p.
- BECKER Gary S., 1965, "A Theory of the Allocation of Time", *The Economic Journal*, vol. 75, p. 493-517.
- BECKER Gary. S., 1991, *A Treatise on the Family*, Harvard University Press, 288 p.
- BIANCHI Suzanne, 2000, "Maternal Employment and Time with Children: Dramatic Change or Surprising Continuity?", *Demography*, 37(4), p. 401-414.
- BITTMAN Michael et CRAIG L, 2008 , 'The Incremental Time Costs of Children: An analysis of children's impact on adult time use in Australia', *Feminist Economics* 14 (2): 57-85.
- BLAU David and ROBINS P. 1989, "Fertility, Employment, and Child-Care Costs", *Demography*, vol. 26, n° 2, p. 287-299.
- BLUNDELL, Richard , CHIAPPORI Pierre-André and MEGHIR 2005, "Collective Labour Supply with Children", *Journal of Political Economy*, vol. 113, 6, p.
- BROSSOLET C., 1992, *Fondements de la division du travail dans les modèles économiques du ménage*, Arguments, 225 p.
- BRADBURY, Bruce, 2008, "Time and the Cost of children", *Review of Income and Wealth*, Vol 54, 3, p.305-323

BROUSSE Cécile., 1999, "La Répartition du Travail Domestique entre Conjoints, Permanences et Evolutions entre 1986 et 1999", in *France, portrait social*, Insee.

BROWN Elisabeth. et FOUGEYROLLAS-SCHWEBEL D., 2004, *L'organisation des temps sociaux des pères et des mères*, DARES.

BROWNING Martin., 1992, "Children and Household Economic Behavior", *Journal of Economic Literature*, vol 30, p. 1434-1475.

CALHOUN C. A. et ESPENSHADE T. J., 1988, "Childbearing and Wive's Foregone Earnings" *Population Studies*, vol. 42, p. 5-37.

CANTWELL M., SANIK M., 1993, "Leisure before and after Parenthood", *Social Indicators Research*, vol. 30, p.39-147.

CARR T. J., 1983, *The Effect of Fertility Decisions on Pecuniary and non Pecuniary Compensation : Final Report*, Princeton ; Washington : Mathematica Policy Research, 62 p.

CHALASANI Satvika, 2007, "The changing relationship between parents' education and their time with children", *International Journal of Time Use Research*, Vol.4, 1, p.93-117.

CHIAPORRI Pierre-André, 1994, «Modèles collectifs de comportement des ménages », in *Familles et niveau de vie : observation et analyse*, O. Ekert-Jaffé (Ed.), Congrès et Colloques, 14, John Libbey et INED, Paris, 77-88.

CRAIG Lyn., 2007 *Contemporary motherhood – The impact of children on adult time.*, Ashgate, London.

CRAIG Lyn et Michael BITTMAN, 2008, "The Incremental Time Costs of Children: An Analysis of Children's Impact on Adult Time Use in Australia", *Feminist Economics*, 14, 2, 59–88, 2008.

CREMER, Helmuth, GAHVARI, Firouz and PESTIEAU, Pierre, 2008, "Pensions with Pensions with heterogenous individuals and endogenous fertility", *Journal of Population Economics*, 21, 961-981.

DATCHER-LOURY L., 1988, "Effect of Mother's Home Time on Children's Schooling" *The Review of Economics and Statistics*, vol. 70, n° 3, p. 367-373.

DUMONTIER F., PAN KE SHON J-L., 1999, "En 13 ans, Moins de Temps Contraint et plus de Loisirs", *Insee Première*, n° 675.

EKERT O. 1983, « Activité féminine prestations familiales et redistribution », *Population*, 3, p.503-526.

EKERT-JAFFÉ O., 1994, «Chiffrer une évolution du coût de l'enfant ? Changement de société, mise en cause des concepts », *Population*, 6, p.1389-1418.

EKERT-JAFFÉ O., 1998, "Le coût de l'enfant : des résultats qui varient selon les types de familles et les hypothèses formulées », *Santé Solidarité*, 2/3, 47-58.

EKERT-JAFFE Olivia, TROGNON Alain, 1994, " Evolution du coût de l'enfant avec le revenu : une méthode ", in *Familles et niveau de vie : observation et analyse*, O. Ekert-Jaffé (Ed.), Congrès et Colloques, 14, John Libbey et INED, Paris, 135-164.

FEDICK Cara B., GAUTHIER Anne H., PACHOLOCK Shelley, 2005, "Methodological issues in the estimation of parental time – Analysis of measures in a Canadian time-use survey", *International Journal of Time Use Research*, Vol.2, 1, p.67-87.

FERBER M. A. et BIRNBAUM B. G., (1980), "Housework : Priceless or Valueless?", *The Review of Income and Wealth*, vol. 26, p. 387-400.

FERMANIAN J-D, LAGARDE S., 1999, "Les Horaires de Travail dans le Couple", *Economie et Statistiques*, n° 321-322, p. 89-110.

FINNIE R. et MARTEL N., 1993, *La pénalité du bébé : l'effet de la fécondité sur le salaire des femmes*. Canada, cahier de recherche n° 93-06 du Groupe de recherche en politique économique, 19 p.

GIRARD A., 1958, « Le budget-temps de la femme mariée dans les agglomérations urbaines », *Population*, 4, p. 591 à 618

GREEN William H., 2003, *Econometric Analysis*, fifth edition, Pearson Education International.

GRONAU R., 1973, "The Effect of Children on the Housewife's Value of Time", *Journal of Political Economy*, vol. 2, 2^{ième} partie, p. S168-S199.

GRONAU R., 1977, "Leisure, Home Production and Work. The Theory of the Allocation of Time Revisited", *Journal of Political Economy*, vol. 85, n° 6, p. 1099-1123.

GRONAU R., 1986, "Home Production- a Survey", in O. ASHENFELTER et R. LAYARD (éditeurs) *Handbook of Labor Economics*, volume I, Elsevier Science Publishers BV, p. 274-304.

GROSSBARD-SCHECHTMAN Shoshana A. , 1993, *On the Economics of Marriage - A Theory of Marriage, Labor and Divorce*, Westview Press, Boulder, Co.

GUILLOT Olivier., 2002, "Une analyse du recours aux services de garde d'enfants", *Economie et Statistiques*, n° 352-353, p. 213--230.

GUSTAFSSON Björn et Urban KJULIN, 1994, "Time Use in Child Care and Housework and the total Cost of Children", *Journal of Population Economics*, 1994, 7, p. 287-300.

GUTIERREZ-DOMENECH , 2007, "Parental Employment and Time with children,"", document de travail 01/2007, la Caxia , Barcelone.

HECKMAN, James J ., 1979, "Sample Selection Bias as a Specification Error." *Econometrica* 47 (January 1979): 153-61.

HERSCH J., 1991, "The Impact of non Market Work on Market Wages", *The American Economic Review (papers and proceedings)*, vol.81, n° 2, p. 157-160.

HILL M. S., 1979, "The Wage Effects of Marital Status and Children", *The Journal of Human Resources*, vol. 14, n° 4, p. 579-594.

HOURLIEZ J.M. et OLIER L. 1998, « Niveau de vie et taille du ménage : estimation d'une échelle d'équivalence. ». *Economie et Statistique*, 308/310, p. 65-85.

HUNT J. C. et KIKER B. F., 1984, "Parental Time Devoted to Children in Two- and One-Wage-Earner Families", *Economics of Education Review*, vol. 3, n° 1, p. 75-83.

JENKINS Stephen P. et O'LEARY Nigel C., 1995, "Modelling Domestic Work Time", *Journal of Population Economics*, p. 265-279.

JOSHI H., 1990, "The Cash Opportunity Costs of Childbearing : an Approach to Estimation Using British Data" *Population Studies*, vol. 44, p. 41-60.

JOSHI H., (1998), "The Opportunity Cost of Childbearing : more than Mother's Business", *Population Economics*, p. 161-183.

JOSHI H. et DAVIES H., 1994, "The Foregone Earnings of Europe's Mothers", in *Familles et niveau de vie : observations et analyses*, O. EKERT-JAFFÉ (éditeur), Ined et JOHN LIBBEY.

JOSHI H., PACI P., WALDFOGEL J., 1996, "The wages of Motherhood : better or worse?", London School Economics Working paper.

JUSTER, F. Thomas. 1985. "Preferences for Work and Leisure," in *Time, Goods, and Well-being*. F.T. Juster and F.P. Stafford, eds., Ann Arbor, MI: Institute for Social Research, University of Michigan, p. 333-51.

JUSTER F. Thomas et STAFFORD Frank. P. 1991, "The Allocation of Time : Empirical Findings, Behavioral Models and Problems of Measurement", *Journal of Economic Literature*, vol. 29, p. 471-522.

KAHNEMAN Daniel et KRUEGEL Alan. 2006, "Developments in the Measurement of Subjective Well-Being", *Journal of Economic Perspectives*, vol. 20, 1, p. 3-24.

KIM Kyoo 2006, "Sample selection model with a common dummy endogenous regressor in simultaneous equations: A simple two-step estimation." , *Economics Letters*, 91, 280-286.

- KOOREMAN Peter. et Arie KAPTEYN. 1987, "A Disaggregated Analysis of the Allocation of Time within the Household", *Journal of Political Economy*, vol. 95, 2, p. 223-249.
- KORENMAN S. et NEUMARK D., 1992, "Marriage, Motherhood, and Wages", *The Journal of Human Resources*, vol. 27, n 2, p. 233-255.
- KRUEGEL Alan. 2007, "Are We Having More Fun Yet? Categorizing and Evaluating Changes in Time Allocation", Brooking Panel on Economic activity.
- KLEVMARKEN A., STAFFORD F., 1999, "Measuring Investment in Young Children with Time Diaries", in *Wealth, Work and Health. Innovations in Measurement in the Social Sciences*, eds. J.P. Smith and R.J. Willis, University of Michigan Press.
- LEE L.F., MADDALA G.S., TROST, R.P., 1980, "Asymptotic covariance matrices of two stage probit or two stage tobit methods for simultaneous equations models with selectivity", *Economica*, vol 48, p.491-503.
- LEIBOWITZ Arleen. 1975, "Education and the Allocation of Women's Time", in F. T. JUSTER (ed.), *Education, Income, and Human Behavior*. New York : McGraw-Hill, p. 171-197.
- LEMMENICIER B., & LEVY-GARBOUA, L. 1980, L'arbitrage autarcie-marché: une explication du travail féminin, *Consommation*, 1, CREDOC.
- LOLLIVIER Stephan, 2002, Endogénéité dans un système d'équations normal bivarié avec variables qualitatives, Insee-Méthodes : Actes des Journées de Méthodologie statistique
- LOLLIVIER Stephan, 2006, *Econométrie avancée des variables qualitatives*, Economica, Paris.
- LUNDBERG S. et POLLACK Robert A. 1996, "Bargaining and Distribution in Marriage." *Journal of Economic Perspectives* 10: 139-158 .
- LUNDBERG S., ROSE E., 1998, Parenthood and the Earnings of Married Men and Women", University of Washington Working Paper.
- LUNDHOLM M., OHLSSON H., 1998, "Who takes care of the Children? The Quantity-Quality Model revisited", Uppsala University, Working Paper n° 23.
- MAURIN E. 1989, "Les journées des chômeurs et des retraités, 42-46. ", *Economie et Statistiques*, 223, juillet-août ;
- McLANAHAN S. et ADAMS J., 1987, "Parenthood and Psychological Well-Being", *Annual Review of Sociology*, vol. 5, p. 237-257.
- MINCER Jacob. 1963, 'Market Prices, Opportunity Cost and Income Effects', in *Measurement in Economics*, C. Christ and al. eds, (Stanford University Press, Stanford, CA).
- MINCER J. et POLACHEK S., 1974, "Family Investments in Human Capital : Earnings of Women", *Journal of Political Economy*, vol. 82, n° 2, 2ième partie, p. S76-S108.

- MINCER J. et POLACHEK S., 1978, "Women's Earnings Reexamined", *The Journal of Human Resources*, vol. 13, n° 1, p. 118-134.
- MONNIER A., 1977, *La naissance d'un enfant : incidences sur les conditions de vie des familles*, Ined, Travaux et Documents n° 81, 231 p.
- MOORE W and WILSON R., 1982, "The Influence of Children on the Wage Rates of Married Women", *Eastern Economic Journal*, vol. 8, n° 3, p. 197-210.
- MURPHY M., 1978, "The Value of Nonmarket Household Production : Opportunity Cost versus Market Cost Estimates", *The Review of Income and Wealth*, vol. 24, p. 243-255.
- NAKAMURA A. and NAKAMURA M., 1992, "The Econometrics of Female Labor Supply and Children", *Econometric Reviews*, vol. 11, n° 1, p. 1-71.
- NEWBY W.K., 1984., A method of moments interpretation of sequential estimators, *Economic Letters*, vol.14, 201-206.
- NICKOLS S. Y. et FOX K. D., 1983, "Buying Time and Saving Time : Strategies for Managing Household Production", *Journal of Consumer Research*, vol. 10, p. 197-208.
- PETERS Wolfgang, 1995, "Public pensions, family allowances and endogenous demographic change", *Journal of Population Economics*, 8, p. 161-183.
- PRESSER H. B., 1989, "Can we Make Time for Children? The Economy, Work Schedules and Child Care", *Demography*, vol. 26, n° 4, p. 523-543.
- RIBAR D. 1992) "Child-Care and the Labor Supply of Married Women", *The Journal of Human Resources*, vol. 27, n° 1, p.134-165.
- RIBOUD M. 1985 , "An Analysis of Women's Labor Force Participation in France: Cross-Section Estimates and Time-Series Evidence." *Journal of Labor Economics* January/1985, Volume: 3 , p:S177-200.
- ROBINSON Warren.C., 1987, "The Time Cost of Children and other Household Production", *Population Studies*, vol. 41, p. 313-323.
- ROY C., 1982, "L'emploi du temps des mères et pères de famille nombreuse", *Économie et Statistique*, n°141, p. 59-68.
- ROY C., (1989), "La gestion du temps des hommes et des femmes, des actifs et des inactifs", *Économie et Statistique*, n°223, p. 5-14.
- SAMUELSON Paul, (1956), "Social Indifference Curves", *Quarterly Journal of Economy* , xxxx.
- SANDBERG J., HOFFERTH S., 2001, "Changes in Children's Time with Parents : United States, 1981-1997", *Demography*, 3, p. 423-436.
- SAYER, Liana C., GAUTHIER Anne H., and Frank F. FURSTENBERG. 2004. "Educational differences in parents' time with children: Cross-national variations," *Journal of Marriage and Family*, 66, December, p.1149–1166.

- SAYER, Liana C., BIANCHI Suzanne M., and ROBINSON. John P., 2004. "Are parents investing less in children? Trends in mothers' and fathers' time with children," *American Journal of Sociology* 10(1), p. 1-43.
- SCHULTZ T. P., 1990, "Testing the Neoclassical Model of Family Labor Supply and Fertility", *The Journal of Human Resources*, vol. 24, n° 4, p. 599-634.
- SCHULTZ T. P., 1986, "The Value and Allocation of Time in High-Income Countries : Implications for Fertility" *Population and Development Review*, supplement, p. 87-108.
- RAPOPORT Benoit, SOFER Catherine et Solaz, Anne " Household Production in a Collective Model: Some New Results" *Cahiers de la MSE, série blanche*, n° 03039, <ftp://mse.univ-paris1.fr/pub/mse/cahiers2003/Bla03039.pdf>
- SOUSA-POZA Alfonso., SCHMID Hans and Rod WIDMER, 2001, "The allocation and value of time assigned to housework and child-care: An analysis for Switzerland", *Journal of Population Economics*, 4, p.599-618.
- STROBER M. H. and WEINBERG C. B., 1980, "Strategies Used by Working and Nonworking Wives to Reduce Time Pressures", *Journal of Consumer Research*, vol. 6, p. 338-348.
- WILLIS R., 1973, "A New Approach to the Economic Theory of Fertility Behavior", *Journal of Political Economy*, vol.81, 2^{ième} partie, p. S14-S64.

Appendix table: Characteristics of the sample :

	Couples' and women's characteristics			Men of the couple	
	Total		Wife in full time job	Total	
	Number	Mean or %	Mean or %	Number	Mean
Age of individual (years)	2497	38,7			40,8
Mean age of couple	2497	39,7	39,8		
Age difference	2497	2,0	2,0		
Married Couple	1980	79	78		
Unmarried couple	517	21	22		
Woman works full time	1182	47	100		
Woman works part time	634	25			
Woman inactive	681	27			
1 child aged 0-2	413	17	13		
2 Children aged 0-2	42	2	1		
Childless	806	32	38		
1 child aged 0-14	699	28	32		
2 children aged 0-14	726	29	24		
3 children aged 0-14	266	11	6		
Number of Children aged 15-25		0,43	0,45		
Diary on weekday	1825	73	72		
Week-end	672	27	28		
Interviewed From February 16 to September 28	1528	61	62		
From Sept, 28,1998 till February, 14,. 1999	969	39	38		
External child care	1036	41		297	
Farmer	21	0.8	1	74	3
Self-employed	43	2	3	219	9
Higher-level occupation	207	8	14	454	18
Intermediate occupation	444	17	27	603	24
Clerical, sales worker	916	36	43	260	10

Manual worker	185	7	12	887	36
Out of labor force	678	27			
Individual income (F/yr)		5544	8867		11168
Rural municipality	721	29	26		
Urban unit 20 000-100 000 inhab.	760	30	30		
Urban unit More than 100 000 inhab.	667	27	26		
Paris, Paris region	349	14	18		
<u>Woman's educational level</u>					
No qualification or don't know	315	13	7		
Lower secondary	1214	49	45		
Secondary	390	16	15		
Tertiary	578	23	33		
<u>Woman's educational level</u>					
No qualification or don't know	305	12	11		
Lower secondary	1318	52	51		
Secondary	308	12	13		
Tertiary	566	23	25		
Number	2497		1178	2497	