

DOES INCOME TAXATION AFFECT PARTNERS' HOUSEHOLD CHORES ?

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Does income taxation affect partners' household chores?

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Abstract

We study the impact of income taxation on both partners' allocation of time to market work and unpaid house work in households with two adults. We estimate a structural household utility model in which the marginal utilities of leisure and house work of both partners are modelled as random coefficients, depending on observed and unobserved characteristics of the household and the two partners. We use a discrete choice model with choice sets of 2,401 points for each couple, distinguishing seven market work intervals and seven house work intervals for each partner. The model is estimated using data for France, which taxes incomes of married couples jointly, like, for instance, Germany and the US. We find that both partners' market and non-market time allocation decisions are responsive to changes in the tax system or other policy changes that change the financial incentives. Women's time allocation is more responsive to the own and the partner's wage rate than men's. Tax policy simulations suggest that moving from joint taxation for married couples to separate taxation of each spouse would go a small step in the direction of equalizing market and non-market work of spouses. Selective taxation with smaller tax rates for women than for men would magnify these effects.

Keywords: *time use, taxation, discrete choice models*

JEL classification: *J22, H31, C35*

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1. Introduction

In this paper, we analyze the impact of income taxation on both partners' allocation of time to paid market work and unpaid house work in households with two adults. We account for the fact that spending time on unpaid work may be less or more attractive than spending time on paid work, as well as for household production, i.e., the household goods and services that unpaid house work produces. While theoretical work on the optimal taxation of couples emphasizes the importance of accounting for household production, this paper is, to our knowledge, the first empirical study that attempts to pin down the impact of income taxation on partners' time allocation to market and non-market activities.

The standard static theoretical framework for the analysis of taxation considers individuals who trade off leisure for consumption (equal to income) and thus neglects household production, as well as issues concerning how to model multi-person households (see, for example, Blomquist, 1993, 1996). Although household production is not taxed, (which is unavoidable as its output cannot be observed), incorporating household production into models of optimal taxation is important because the taxation of the rewards from work not only affects the time that spouses allocate to market work but also the time devoted to household production (Boskin 1975; Apps and Rees, 1988, 1999a; Sandmo, 1990), for instance by changing the opportunity cost of non-market time. The scant theoretical literature in this area has focused on the equity-efficiency trade-off of income taxation of couples and on different taxation systems, like joint versus separate taxation of spouses (Apps and Rees, 1999b). The theory does not predict how a change in the own or the partner's net wage will affect the optimal amounts of non-market time. This requires empirical work.

Few empirical studies have been carried out in this area. Leuthold (1983) estimates tax elasticities of non-market work of husband and wife in one and two-earner US households, using a single equation framework and finds that taxation increases housework done by women and reduces housework done by men. Gelber and Mitchell (2009), focusing on American single women and analyzing one time use at a time, conclude that when the economic rewards from participating in the labour force increase, single women's market work increases and their house work decreases. From a different, macroeconomic, perspective, Rogerson (2009) used a model of labour supply that incorporates home production to explain to which extent differences in taxes can account for differences in time allocations between the US and Europe. He concludes that once home production is included,

the elasticity of substitution between consumption and leisure is almost irrelevant in determining the response of market hours to higher taxes.

In this paper we specify a static structural household utility model that allows us to carry out policy simulations and evaluate couples' responses to different income tax scenarios. We expand on Van Soest (1995), who put forward a discrete choice model of hours of market work of spouses, by incorporating the time allocation not only to paid work but also to unpaid house work. The choice of both partners' market and non-market hours is modelled as the outcome of maximizing a household utility function, with house work and leisure of both spouses and after tax family income as its arguments. Each household's choice set has 2,401 points, since we distinguish seven market work intervals and seven house work intervals (including non-participation (zero hours)) for each partner. The use of a discrete choice specification enables us to incorporate non-linear taxes and (social assistance) benefits. The model explains participation as well as hours decisions for all four activities.

We use the model estimates to simulate the consequences of a number of tax reforms for the household's time allocation. For example, we predict how a shift from the current joint taxation system to a system of separate taxation would affect spouses' allocation of time to market and non-market activities.¹ This is interesting because several countries have joint taxation (for example, Germany and the United States,) while others (most OECD countries) have separate income taxation of spouses and a couple of countries give married couples the option to choose between separate or joint taxation (for example, Hong Kong and Spain). We also simulate a move to separate taxation combined with lower tax rates for women ("selective" taxation), which has been advocated as a possible way to achieve a more equitable distribution of household chores and market work (Alesina, Ichino and Karabarbounis, 2009). Additional policy simulations analyze the effects of changing the French system of children allowances and the French tax credit scheme.

For our analysis we use the 1998-1999 French Time Use Survey, with information on individual (gross) earnings, usual hours of work, and total household income, as well as diary information on how household members allocate time to different activities. An important advantage of these data is that the time diary was collected for all individuals in the household so that we have time use information for both partners in a couple.

¹ This extends the work of, for example, Steiner and Wrohlich (2004) and Callan, van Soest, and Walsh (2009), who estimated the influence of a similar reform of income taxation for Germany and Ireland, respectively, but only looked at the impact on market work of spouses.

We find that both partners' market and non-market time allocation decisions are responsive to monetary incentives, such as changes in the tax system or other changes that lead to different net wages. Upward changes in the own wage rate would increase own market work and reduce own house work time. The latter effect is smaller than the former so that leisure would fall. Increases in the partner's wage reduce own market work hours and increase own house work but the cross-wage effects are smaller than the own-wage effects. Own and cross-wage effects are larger for women than men. We conclude that moving from joint taxation to separate taxation would make the distribution of market and non-market work more similar for husbands and wives. This effect would be much stronger under selective taxation with higher tax rates for men than for women.

The structure of the paper is as follows. The model for market and non-market time allocation of both partners is presented in Section 2. The French tax system is briefly described in Section 3. Description of the data used for our analysis follows in Section 4. The estimation and simulation results are discussed in Section 5. Section 6 concludes.

2. The model: specification and hypotheses

The model is an extension of the discrete choice household labour supply model of van Soest (1995). In that model, household production was not accounted for and only two activities of each spouse were distinguished: paid work and everything else ("leisure"). In the current paper, we incorporate household production into the choice set by distinguishing three activities for each partner: market work, house work, and everything else ("leisure"). The discrete choice model is a random utility framework, where the household's utility function depends on both partners' amounts of time spent on each of the activities and on after tax household income. The tax system matters because it affects after tax household income at each possible choice.

2.1 Theoretical set up and hypotheses

Formally, let t_m^l and t_f^l denote leisure of husband and wife, respectively, let t_m^w and t_f^w be their paid hours of market work, and t_m^h and t_f^h their unpaid hours of house work. Gross wage rates per hour of paid work are assumed to be independent of the number of hours and are denoted by w_m and w_f . The budget constraint (1) below gives after tax family income y as a

function of gross earnings, total household non-labour income Y_0 , and the amount of taxes T^2 , which depends on the various income components, on household characteristics X , and on a parameter δ representing the tax system:

$$(1) \quad y = w_m t_m^w + w_f t_f^w + Y_0 - T(Y_0, w_m t_m^w, w_f t_f^w, X, \delta)$$

For the empirical model we will rely on the budget set in equation (1). Conceptually, and for interpreting the results, it is also useful to rewrite the budget set in terms of household income including the value of household production (“full income” y'), evaluated with implicit prices P_m and P_f of the domestic goods or services produced by the two partners:

$$(1a) \quad y' = w_m t_m^w + w_f t_f^w + p_m t_m^h + p_f t_f^h + Y_0 - T(Y_0, w_m t_m^w, w_f t_f^w, X, \delta)$$

In addition, the household faces time constraints for husband and wife, saying that the three activities we distinguish add up to the total time endowment E (set to 24 hours per day for each spouse):

$$(2) \quad \begin{aligned} t_m^l &= E - t_m^w - t_m^h \\ t_f^l &= E - t_f^w - t_f^h \end{aligned}$$

The objective function V maximized by the household is a function of the six time amounts and of after tax household income. Because of the two time constraints we can eliminate one of the time amounts for each spouse and write V as a function of five arguments:

$$(3) \quad V = V(t_m^l, t_m^h, t_f^l, t_f^h, y).$$

The fact that we have eliminated market work is important for the interpretation of V . For example, it leads to the following expectations and interpretations of its partial derivatives:

- $\frac{\partial V}{\partial t_m^l} > 0$ if husband’s leisure is preferred to husband’s paid work, keeping

constant the other arguments of V (including husband’s house work and after tax family income y).

² T also captures social assistance benefits, which can be seen as negative tax payments. See section 3.

- $\frac{\partial V}{\partial t_f^l} > 0$ if leisure of the wife is preferred to paid work of the wife, keeping other factors constant.
- $\frac{\partial V}{\partial t_m^h} > 0$ if house work done by the husband is preferred to paid work done by the husband, keeping other arguments of V constant, including y , (but not y' in equation (1a)). If paid and unpaid work are inherently equally attractive or unattractive, we expect that this marginal utility is positive because house work increases the household product, while income from paid work (y) is kept constant.
- $\frac{\partial V}{\partial t_f^h} > 0$ if house work done by the wife is preferred to paid work done by the wife, keeping other arguments of V constant.
- $\frac{\partial V}{\partial y} > 0$ if more household income is better, keeping time inputs (and therefore also the household product) constant.

As in Van Soest (1995), only the final inequality is really necessary for the interpretation of the model. If households would prefer less income, the economic interpretation of the model would be lost, since we assume the household always chooses a point on its budget frontier, not in its interior. There is no need to impose any restrictions on the second order derivatives of V , such as negative definiteness of the Slutsky matrix. Such second order conditions would be valid in a unitary framework with quasi-convex preferences but not necessarily if the objective function is given a more general interpretation.

Indeed, several interpretations of the utility function V are possible. One is a strict interpretation as a direct utility function of the household, in a unitary labour supply and time allocation framework without household production. But there are less stringent interpretations as well. For example, as already discussed above, the objective function can be interpreted as a semi-indirect utility function in which optimal household production is substituted out and the marginal utility of unpaid house work reflects, among other things, the utility of additional household production. Explicitly incorporating household production would make the model more complicated but would also be quite difficult with the data at

hand, which does not contain more information on household production than the time inputs we already use³.

Similarly, in a collective model in which both spouses have their own utility function and achieve some Pareto optimal outcome (see, for example, Vermeulen, 2002), the utility function can be interpreted as an approximation to the weighted linear combination of both utility functions, with weights depending on each individual's bargaining power. In this case the effect of, for example, men's or women's wages on paid work can be seen as the total effect through both individual utility functions and possibly also through bargaining weights; the three different effects are not disentangled. In that sense our model is reduced form.⁴ The time allocated to leisure, paid market work and unpaid household work enters the utility function together with the household after tax income.

The discrete set of combinations for the two partners in our framework includes the choices of time spent in the labour market as well time spent carrying out household tasks such as childcare and household work. We assume that childcare time and time spent on household chores can be aggregated into just one category of "house work". The remaining activities, namely leisure, personal care and sleeping are aggregated and not modelled separately. Finally, our data have no information on savings or wealth. As a consequence, our model is static and we cannot correct income for savings to make it consistent with life cycle utility maximization in a two stage budgeting framework (cf. Blundell and Walker, 1986).

2.2 Empirical specification

To implement the model empirically, we fix the number of discrete combinations of market and non-market work of spouses. We consider 7 discrete choices for both activities and both spouses, producing a discrete choice set of $7*7*7*7 = 2,401$ points. For each combination of paid hours of the two partners and for given gross wage rates and household non-labour income (see below), the tax and benefits function (see Section 3) is applied to obtain household after tax income for each choice.

We use a flexible quadratic objective function:⁵

$$(4) \quad V(\mu) = \mu' A \mu + b' \mu; \quad \mu = (t_m^l, t_m^h, t_f^l, t_f^h, y)$$

³ Flipo, Fougere and Olier (2007) have some information on the prices of domestic services bought from the market but their dataset contains no information on time use.

⁴ A limitation is that not all factors that may determine the bargaining weights are available in the data. For example, we do not have information on personal non-labor incomes, only on non-labor income for the household as a whole.

⁵ Van Soest, Das and Gong (2002) compare this specification to specifications with higher order polynomial expansions in a model of individual labour supply, and find that the quadratic is flexible enough.

where A is a symmetric 5*5 matrix of unknown parameters with entries α_{ij} ($i, j=1, \dots, 5$), and $b=(b_1, \dots, b_5)'$ is a five-dimensional vector. We assume that b_1, \dots, b_4 are functions of a vector with components x_k , of observed household characteristics and of unobserved characteristics,⁶ using the following specification:⁷

$$(5) \quad b_j = \sum_k \beta_{kj} x_k + \xi_j; \quad j=1,2,3,4$$

where the four unobserved heterogeneity components ξ_j ($j=1,2,3,4$) are assumed to be normally distributed with mean zero and arbitrary covariance matrix, independent of the x_k and of other exogenous components of the model, such as wage rates and other incomes. To keep the numerical optimization of the likelihood (see below) practically feasible, we do not parameterize α_{ij} ($i, j=1, \dots, 5$) or b_5 , assuming they are the same for all households.⁸

Random disturbances are added to the utilities of all $m=2,401$ points in the household's choice set like in Van Soest (1995):

$$(6) \quad \begin{aligned} V_j &= V(t_{mj}^l, t_{ff}^l, t_{mj}^h, t_{ff}^h, y_j) + \varepsilon_j \quad j=1,2,\dots,m; \\ \varepsilon_j &\sim \text{GEV(I)}; \quad j=1,2,\dots,m; \\ \varepsilon_1, \varepsilon_2, \dots, \varepsilon_m &\text{ independent of each other and of everything else} \end{aligned}$$

Here GEV(I) denotes the type I extreme value distribution with cumulative density $\Pr(\varepsilon_j > z) = \exp(-\exp(-z))$. It is assumed that each household chooses the option j that maximizes V_j . The assumption on the error terms then implies that the conditional probability that a given combination j is chosen, given observed and unobserved characteristics, wage rates, other household income, and determinants of taxes, is the following (multinomial logit type) probability:

$$(7) \quad \Pr(V_j > V_k \text{ for all } k \neq j | \dots) = \exp V((t_{mj}^l, t_{ff}^l, t_{mj}^h, t_{ff}^h, y_j)) / \sum_{k=1}^m \exp(V(t_{mk}^l, t_{fk}^l, t_{mk}^h, t_{fk}^h, y_k))$$

The scale of the objective function is fixed by the magnitude of the common variance of the error terms ε_j . The distributional assumptions on the error terms help to obtain the

⁶ More specifically, x_k will include a constant, a quadratic in age, the number of children and dummies for the presence of young children -aged less than 3, or 3-5 years old- in the household.

⁷ The index of the household is suppressed.

⁸ As usual, the utility function is identified up to a monotonic transformation only. This would make it hard to identify the parameters in a more general model.

analytical expressions for the probabilities in (7). The errors can be interpreted as unobserved alternative specific utility components or as optimization errors (e.g., errors in the household's perception of the alternatives' utilities).

The probabilities in (7) depend upon the values of the unobserved heterogeneity terms. In order to construct the likelihood contribution of a given household, these unobserved terms need to be integrated out. The likelihood contribution then becomes:

$$(8) \quad \Pr[(t_m^l, t_f^l, t_m^h, t_f^h) = (t_{mj}^l, t_{fj}^l, t_{mj}^h, t_{fj}^h)] = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \Pr(V_j > V_k \text{ for all } k \neq j | \xi, \dots) p(\xi) d\xi$$

where $p(\xi)$ is the density of the vector ξ of unobserved heterogeneity terms.⁹ This likelihood expression involves four-dimensional integrals, which can be approximated using simulations. This makes it straightforward to estimate the model by simulated maximum likelihood; see, e.g., Train (2003).¹⁰

3. The French tax system

The income taxation system in France in 1998 had joint taxation for married couples, and separate taxation for cohabiting couples.¹¹ Joint taxation of married couples is also the rule in the United States and Germany, among others, but many other OECD countries have moved to a system of individual taxation.

The French tax system in 1998 consisted of six income brackets with marginal tax rates varying from zero to 54% (see Figure 1).¹² Table 1 shows the distribution of average taxes paid as a fraction of total income (based upon administrative data). Although the marginal rates applying to the various income brackets in France are quite high, Table 1 shows that average taxes paid are quite low (much lower than in most other OECD countries). This is because of large standard deductions (roughly 28% of gross household income is not taxed) and because total household income, after standard deductions, is divided by a family-size coefficient *before* applying the tax rates applicable to the various income brackets (see Appendix for more details), so that larger families end up paying disproportionately lower taxes (Bourguignon and Magnac, 1990). For example, a married couple with two children and

⁹ We are somewhat sloppy in the notation here by no longer making the conditioning on observed variables explicit. These include wage rates of non-workers since wages are replaced by their predictions from a Heckman two stage model (see below).

¹⁰ We used Halton draws to do the simulations and used 10 draws for each household and each unobserved heterogeneity term. Using 5 draws produced qualitatively similar results.

¹¹ Since the introduction of the "Pacte Civil de Solidarité et de concubinage (pacs)" in 1999, unmarried couples can also file jointly.

¹² This system was later reformed with the highest rate reduced to 48% in 2005 and 40% by 2010.

income €60,000 pays three times the amount that a single person with income €20,000 would pay. Due to the progressive nature of the system, this is much less than the amount paid by a single person with income €60,000. This also reduces the number of families that face the high marginal rates in the upper tax brackets, making the French tax system much less progressive than the rates as such would suggest. The bulk of tax revenue in France is levied by means of taxes other than income tax, like Value Added Taxes and Property Taxes. There was no tax credit at the time covered by our analysis; the French tax credit was created in 2001 (see Stancanelli, 2008) and we will analyze its effects on partners' time allocation in the simulations. Finally, there was a tax exemption for households with payable tax amounts of less than approximately €254 in 1998 and a small tax reduction¹³ for households with payable amounts between €254 and €508 (the "décote").

The final row of Table 1 describes the distribution of average tax rates (total income tax divided by total household income) of married couples aged less than sixty, which is the same age cut off we will use in our data. It shows that the average tax rate was 5.34% and that over a quarter of married couples did not pay any income taxes.

Figure 2 shows the effective tax rates (the ratio of the tax amount payable over household income) for married couples and single persons with the same level of household income and the same number of children. Here, we let annual income vary from zero up to the exceptionally high amount of €200,000 to illustrate the complete range of effective tax rates. The figure shows that a single person always pays more taxes than a married couple with the same household income. This is due to the family coefficient discussed above.

Figures 3 and 4 show the average tax rate on the female partner's earnings (calculated as the amount of tax payable over her earnings divided by her earnings) for different levels of her annual earnings, varying from zero to €48,000. The figures provide the average tax rate for a married or unmarried couple with no children (Figure 3) or with two children (Figure 4). Annual earnings of the male partner are held fixed at €12 000, €24 000, €36 000, and €48 000 in the four panels of each figure. For married couples, the tax rate on each additional euro depends on the earnings of both spouses, as income is taxed jointly. For childless unmarried partners, subject to individual taxation, the income of the male partner does not matter. For cohabitant partners with two children, we assume that they report children for income taxation purposes so as to minimize the total tax burden payable by the couple –although of course

¹³ The reduction was equal to the difference between the tax payable and €508 for households with payable amounts between €254 and €508; households with income tax payable below €254 would pay no taxes at all. This reduction, called "decote", was slightly reformed in 2001.

they are taxed separately. So, for example, when the female partner does not have paid work, the male partner will report the two children in the income tax declaration form. At some level of the female partner's earnings, each partner will report one child for tax purposes. At very high level of the female's earnings, she may report both children. Indeed, for the calculation of the budget sets of our model, we will assume that unmarried couples choose the assignment of children that minimizes the total tax paid by the household.

It is obvious from these charts, that unmarried women face no disincentive to participate in market work: they do not pay tax over the first hour(s) of paid work. In contrast, married women are confronted with a 'marginal' tax rate on their first hour of paid work that depends on their husband's earnings and can go up to 20%. Only if the husband's earnings are quite low, this tax rate is zero. We can therefore expect that women's participation in paid work would increase if married couples changed from joint to separate taxation. Since in most couples the husband is the primary earner, we also anticipate that such a change would increase hours of market work for married women, while at the same time reducing market hours by their husbands (since under separate taxation, the primary earner's marginal tax rate will usually increase).

4. Data

4. 1 Sample selection criteria and general data information

The data for the analysis are drawn from the 1998-99 French time use survey, carried out by the National Statistical offices (INSEE). This survey is a representative sample of more than 8,000 French households with over 20,000 individuals of all ages –from 0 to 103 years. Three questionnaires were collected: a household questionnaire, an individual questionnaire and the time diary. The diary was collected for all individuals in the household, which is an advantage over many other surveys that only have information on one individual in each household. The diary was filled in for one day, which was chosen by the interviewer and could be either a week or a weekend day. This was the same day for all household members. Selected couples, married or unmarried but living together, gave a sample of 5,287 couples with and without children. We then applied the following criteria to select our estimation sample:

- Both spouses younger than 60 – the retirement age in France in 1998-99.
- Both spouses had filled in the time diary.

- Neither spouse had filled in the time diary on an “exceptional day”, defined as a special occasion such as a vacation day, a day of a wedding or another party, etc.
- The time diary was filled in on a week day.
- Neither spouse was in full-time education, in the military, on disability benefits, or in early retirement.¹⁴

This led to a sample of 2,141 couples. Table 2 shows how many households are deleted from the sample in each step. We kept self-employed people in the sample; their earnings and total household income were reported in the same way as for employees.

Table 3 presents descriptive statistics of the main independent and the dependent variables in the analysis. The number of children in the household includes dependent children up to 18 years of age. Educational dummies use individuals without any formal educational qualification as the benchmark group. Information on monthly gross earnings was collected as a continuous variable and in follow-up brackets for respondents who did not provide continuous earnings information.

About 94% of the men and 70% of the women in our final sample did paid work at the time of the survey. Of the employed men, about 51% reported earnings as a continuous variable and 31% reported earnings in brackets. For women, these figures are 57% and 22%, respectively. Average hours worked per week were about 29 for men and 19 for women, including zeros. About 20% of both men and women were self-employed. Married couples represented 79% of the sample; the remaining 21% were cohabiting. The average number of dependent children younger than 18 years per couple was 1.1; 39% of couples in the sample have no children.

Usual hours relate to weekly contractual hours, while the diary data is collected on a specific day, and there is lot of variation in working hours over the different days of the week: few individuals work exactly one fifth of their weekly contractual hours on a given day. To make our results comparable to existing labour supply studies, our variable for paid hours of work will be based on the conventional question on usual paid hours worked per week (from the individual questionnaires) and not on the diary questions.¹⁵

Finally, 360 men and 240 women did not report usual hours, but did report that they were involved in gainful employment. In this case we know that their usual hours are positive. This is taken into account in estimation by adjusting the likelihood contribution for these cases

¹⁴ We keep housewives as well as men who report that housework is their main occupation (less than ten cases).

¹⁵ In very few cases, this led to a sum of house work and paid work hours exceeding 18 hours per day. In these cases, presuming that individuals allocate at least six hours to sleep, personal care and leisure on a given week day, both house work and paid work were reduced proportionally to satisfy the 24 hours constraint.

(taking a sum over the probabilities of choices with positive paid hours combined with the observed unpaid hours).

4. 2 Earnings and non-labour income

Hourly earnings were computed for respondents who reported continuous earnings information, dividing (gross) earnings by usual hours of paid work. The average before tax wage rate was about €9.8 per hour for men and €8.2 for women (see Table 3). We used a Heckman selection model to predict hourly earnings for men and women. The estimation results are available upon request.

Total household income before taxes was collected in brackets (see Table A in the Appendix).¹⁶ We set total household income equal to the mid-point of the reported interval (and to €7,622 per month for households in the top bracket). The level of total household income obtained in this way was then compared to the sum of the earnings of the two partners. Whenever total household income was less than the sum of earnings of the two partners, it was set equal to total earnings – this occurred in very few cases. Non-labour income was then computed as the difference between total household income and total earnings of the two partners.

Table 4 presents descriptive statistics for various income variables. More than 25% have zero other household income. The average non-labour household income is about one fourth of total household income before taxes. The median tax burden is 3.4 % of median household income; the average tax burden is 7.5% of average household income (both of these averages are sensitive to extreme values).

Our measure of other household income cannot be decomposed into income components from various sources. In addition to the amounts, however, the survey has questions on whether several sources play a role and on what is the main source of total household income. See Table B in the Appendix. About 10.8% of the households in the sample receive some income from unemployment benefits, but only for 2.6% these benefits represent the main source of income. About 2.1% of the sample received welfare benefits and for only 0.5% these were the main source of income.

¹⁶ We use the total income variable reported by respondents. We do not use the corrected variable provided by INSEE since these corrections are based upon choices that are sometimes subjective.

4.3 Imputing taxes and benefits

The survey has no direct information on taxes or after tax income. To compute net incomes for unmarried couples, assumptions need to be made on how much non-labour income is received by each partner and how children were assigned to the two partners for tax purposes (See Section 3 and the appendix). We assumed that both partners received 50% of non-labour household income. Moreover, we assumed they chose the allocation of children that minimizes the household's total tax burden (given both partners' hours of paid work and earnings). For each of the 49 combinations of paid working hours we consider, this enabled us to compute total taxes and after tax household income.

Table 5 presents the distribution of the effective tax rates in our sample, separately for several subsamples, computed as the ratio of total household taxes and total household income. The average effective tax rate was about 5.6% of total household income, which is well in line with the administrative data (see Table 1). Average tax rates are lower for married couples (5.5% on average) than for cohabiting couples (6%). Unmarried childless couples on average have the highest tax rates (7.8%), married couples with three or more children the lowest (1.7%). Married couples where the woman does not do any paid work also pay quite low taxes on average (3.3%). The tax differences between the various groups are a mixture of tax rule effects (leading to, for example, lower tax rates for married couples with three and more children) and compositional effects (differences in hours worked and wage rates).

We do not incorporate unemployment benefits since these are temporary and only available to those who lose their job involuntarily. We do, however, account for basic social assistance benefits at the family level. If household income is below the social minimum, we replace it by the social minimum.

4.4 The diary and the allocation of time of spouses

The diary was filled in by each household member on a specific day, the same for each household member, according to the following procedures:

- a) The interviewer chose the day the diary should be filled in.
- b) The diary covered a 24 hours time span, with activities recorded every ten minutes.
- c) Main and secondary activities were coded, where the latter were defined as activities carried out simultaneously with another, primary, activity (for example,

cooking and watching the children). The respondent decided which activity should be coded as primary and which as secondary (if any).

d) About 140 categories of main activities and 100 categories for secondary activities were distinguished in the design of the survey.

Here we only consider activities reported as main activity. We distinguish the following activities:

1. Paid work, whether at home or at the office (not including commuting time).
2. Household work, including time spent taking care of the children, taking the children somewhere, and playing with the children, cleaning, shopping, cooking, doing the laundry, cleaning the dishes, setting the table, and doing administrative work for the household.
3. “Leisure” time, including leisure, personal care and sleeping time.

The distribution of time allocations based upon the 24 hours diary is given in Table 6. It shows that men do the bulk of paid work: the “median” husband in the sample spends about 480 minutes (8 hours) on market work, compared to 240 minutes (4 hours) for the “median” wife. Instead, women perform most of the house work, 240 minutes is the median time women spend on this, compared to 30 minutes for men. Interestingly, a comparison of total paid and unpaid work time of men and women shows that the median woman works 10 minutes more than the median man. The fact that the total average amount of paid and unpaid work is very similar for men and women was already stressed by Burda, Hamermesh and Weil (2007).

To better understand within-couple differences in the balance of paid to unpaid tasks, Table 7 gives the mean and median shares of the male partner in the total time allocated to each activity by both partners together. For paid work, the mean and median shares of the man are 61% and 67%, respectively. The median man performs only 12.5% of the couple’s house work. Finally, of the total market and non-market work carried out in each household, the median share carried out by the man is 47% (the mean is 45%). Though things almost balance out in the end, the man’s share of paid work is disproportionately large, and the opposite is true for his house work. Our model will focus on whether this time allocation is sensitive to changes in tax rates and other financial incentives.

5. Results

5.1 Parameter Estimates and goodness of fit

Several parameters of the utility function (b_1, \dots, b_4 in Section 2.2) can vary with a number of covariates, characterizing the individual and the household; see equation (5) in Section 2. These covariates are the age of the individual, marital status, the number of dependent children, and dummies for the presence of young children. The systematic part of the utility function therefore contains interactions of leisure and unpaid housework of both partners with these covariates.

The parameter estimates of the systematic part of the utility function are given in Table 8. Table 9 provides the estimates of the parameters that determine the distribution of the unobserved random effects ξ in the marginal utilities of leisure and house work time of both partners.

The first block of coefficients in Table 8 is hard to interpret due to the squares and interactions. Therefore, Table 10 presents the average marginal derivatives of the utility function with respect to its five arguments, as well as the fractions of sample observations where the predicted marginal derivative is negative. We find that the objective function increases with the level of household income at every observation in the sample, something that is required for the economic interpretation of the model. For the other marginal utilities, the interpretation in Section 2 should be kept in mind. The marginal utility of leisure is negative for 15 percent of men and almost one percent of women. This indicates that most couples will choose an option with more leisure than paid work if everything else is kept constant (including household income and hours spent on house work). The marginal utility of house work is positive for almost all women and for more than 75% of men, suggesting that non-market work is more attractive than paid work, possibly because of the implied household production output (which, unlike earnings from paid work, is not kept constant; see Section 2).

The coefficients on the interactions of exogenous characteristics with the four time amounts in Table 8 can be interpreted in a similar way as in van Soest (1995). A positive coefficient on the interaction of a covariate with leisure (of either partner) implies a positive effect of the covariate on the marginal utility of leisure (of that partner) versus paid work, leading to a negative effect on paid hours, *ceteris paribus*. A positive coefficient on one of the interactions with house work similarly implies a positive effect on the marginal utility of house work versus paid work. For example, the fact that the couple is married rather than

cohabiting reduces the marginal utility of the male partners' house work, suggesting that cohabiting men will perform more house work than married men. Children - and young children in particular - strongly and significantly increase the chances that both spouses do house work (which includes taking care of children), although the effects are smaller for men than for women.

Predicted and observed proportions of observations falling in each discrete interval of market and house work are presented in Table 11; the comparison of actual and predicted distributions is illustrated in Figure 5. The model predicts average time spent on each of the four activities quite well. The fit of the distribution of hours spent on house work is quite good, while that of market work is less satisfactorily, especially for part-time jobs. This may be due to the fact that individuals cannot freely choose how many hours to work, which explains, for example, the fact that the fraction of men working part-time predicted by the model is too large.

5. 2 Elasticities and policy simulations

To estimate the sensitivity of the spouses' discrete time allocation decisions to changes in the own or the partner's wage rate and the tax system, we have used the model and the estimated parameter values to simulate the distribution of hours of paid and unpaid work of both partners under various scenarios. In each scenario, the discrete distribution (with 2,401 mass points) of time spent by each partner on each activity is simulated. The baseline scenario corresponds to the budget sets used for estimation; this is also the scenario that was used to simulate the predicted probabilities in Table 11. The other scenarios change something in the budget set, either because of a change in the tax rules or because of a change in the gross wage rates (which then, keeping the tax system constant, leads to a somewhat smaller change in net wage rates because of the progressive nature of the tax system). Table 12 presents participation rates (the probability that some time is spent on a given activity) and average hours spent for each activity of each partner in each scenario, including the baseline. Table 13 presents the changes in the participation rate and in the average hours compared to the baseline scenario.

The first three alternative scenarios change gross wage rates of women, men, or both men and women, with the tax system as in the baseline scenario (with joint taxation for married couples and separate taxation for cohabiting couples). These simulations essentially compute something similar to wage elasticities, though it should be noticed that the changes in net

wage rates are somewhat smaller than those in gross wage rates, because of the progressive taxes weighing on the extra earnings.

An increase in all women's wage rates of 10% would increase the women's market participation and hours substantially. Participation increases by 0.28%-points, and average hours by 6.62%, implying an own wage rate elasticity of about 0.66 for partnered women. The cross-wage effect on hours of paid work of the husband is small and negative - that on participation is virtually zero. Women also respond to the increase in their wage rates by readjusting the time allocated to non-market work: participation in non-market work would go down by 2%-points and hours by 4.4%, giving an elasticity of women's house work for their own market wage rate of about -0.44. The time allocated by men to non-market work would go up in response to their partner's wage rate increase: men's participation in house work would increase by 0.11%-points and hours by 0.37%. This positive effect of women's wages on their husbands' non-market work is in line with earlier findings by Bloemen and Stancanelli (2008), who used the same data but a very different (less structural) model.

The second simulation considers changing the men's gross wage rates by 10%, leaving the women's wage rates as in the benchmark situation. A 10% increase in the wage rates of husbands would reduce non-participation in market work of partnered men by less than one %-point and would increase their hours of paid work by 4.4%, implying a positive own wage elasticity of about 0.44. Making paid work more attractive for men goes at the cost of their unpaid house work: participation in non-market work by men would fall by almost one %-point and hours would fall by 2.63%. Interestingly, women's participation in market and non-market work is rather insensitive to an upward change in their husband's wage - the effects are -0.2 %-points for market work and +0.5% points for house work. The cross-wage elasticity of women's market work is equal to almost -0.2; that of house work is +0.1.

In the third simulation, gross wage rates of both spouses are increased by 10%, keeping the tax system in place. This policy simulation is similar to a general reduction of taxes, except that the latter would leave those with low earnings who do not pay taxes unaffected. The effects of this scenario are approximately the sum of the effects of the previous two scenarios, combining own and cross-wage rate elasticities. Hours of formal work of both partners will rise as market work is rewarded better (the substitution effect dominates the income effect). This goes at the cost of leisure but also of house work: Hours of house work fall by 2.2% for men and by 3.3% for women.

The fourth simulation shows what happens if the tax system for married couples changes from their actual system of joint taxation to the system of separate taxation actually in place

for unmarried couples. (For unmarried couples nothing would change which is why they are not included in this simulation.) As expected from Figures 3 and 4, participation in market work increases for women and falls for men, and the opposite result is found for house work. Average hours of market work would fall by 1.5% for married men and increase by 3.2% for married women. On the other hand, house work hours would increase by almost 1% for married men and would fall by more than 2% for married women. Overall, the results therefore imply a step towards a more equal distribution of market and non-market work among spouses. As shown in Table 12, however, this is only a small step.

The simulation of “selective taxation” combines a change from joint to separate taxation with reducing tax rates for women by 10%. The effects go in the same direction as those of going from joint to separate taxation but are much larger in size. In particular, market hours of women would increase by 9.8 % and their house work hours would fall by 6.4%; men would reduce their market hours by 2.3% and increase their house work hours by 1.3%.

Because the children coefficients represent a large tax discount in France and make the system less progressive (see the earlier discussion; Section 3), we have simulated suppressing these coefficients altogether. This represents of course an extreme and not very realistic policy change, leading to much higher tax rates for families with children. The effects are simulated only for couples with children since for childless couples, nothing would change. Market hours would fall and house work would increase, with larger effects for women than for men.

Finally, we have simulated implementing the French tax credit scheme according to the first 2002 version –this measure was introduced in 2001-2002 and thus posterior to the time the time use data were collected. See, for example, Stancanelli (2008) for details. The amounts paid are quite small compared to, for example, the American Earned Income Tax Credit (EITC). The average payment was about 250 Euros per year in 2001, about one tenth of the American EITC. A peculiarity of the French tax credit is that it is paid to the individual rather than the household, so that if both partners’ earnings are low, both partners can claim the tax credit. On the other hand, the credit is conditional on total household resources, implying that unmarried low-earners are more often eligible than married couples: in many married couples, earnings of the primary earner are so high that the secondary earner is not eligible, irrespective of her earnings level (see, for example, Figure 2 in Stancanelli, 2008).

We find basically no effect of the tax credit on married spouses’ market and non-market allocation of time. The effects on participation in market or non-market work are basically zero (in line with the findings of, for example, Heim (2009) for the United States) and those

on market hours are tiny, negative for married men and positive for married women. The impact on non-market hours is also very small and negative for both husband and wife. Stancanelli (2008), assuming that the husband participation rate is unchanged, finds moderate positive employment effects for cohabiting women (significant only at the 10% level) and small negative employment participation effects for married women (significant only under certain specifications).

Overall these results suggest that spouses are responsive to financial incentives like changes in the tax system or gross wage rates (notice that wages are affected not only by taxation but also by an all range of other policies). The sensitivity of one's time allocation to their spouse's wage rate (cross-elasticities) is generally much smaller than that to the own wage rate. Finally, it looks as if moving from joint taxation to separate taxation would go a small step in the direction of equalizing market and non-market work of husbands and wives. Selective taxation with lower tax rates for women than for men would magnify these effects.

6. Conclusions

In this paper, we study the impact of taxation on the spouses' allocation of time to market work and unpaid household work. The taxation of income affects not only market labour supply but also the time spouses allocate to household chores, in spite of the fact that non-market production is not taxed (and cannot be taxed since it hard to measure). There is no clear theoretical prediction on the influence of different income taxation systems on spouses' time allocation decisions. The theory is also unable to conclude univocally on how a change in the own or the spouses' wage will affect spousal non-market time. Empirical estimation is needed to shed light on these issues.

To our knowledge, there are no earlier empirical studies of the impact of income taxation on spouses' time allocation to market and non-market activities. We estimate a structural model which allows us to carry out policy simulations and evaluate spouses' responses to different income tax scenarios. We expand on Van Soest (1995), who put forward a discrete choice model of hours of market work of spouses by allowing for time allocation to paid work and unpaid household activities. We use a discrete choice model, in which every choice opportunity is characterized by hours spent on paid work of both spouses, hours spent on unpaid house work of both spouses, and household after tax income. Marginal (dis-)utilities of leisure and house work are modelled as random coefficients, depending on observed and unobserved characteristics of both spouses. The model fully accounts for participation as well as hours decisions, for all four time allocations considered. The use of a discrete choice

specification enables us to incorporate non-linear taxes in the household budget set. The choice set has 2,401 points for each couple in the sample, since we have allowed for seven discrete paid market-work intervals and seven discrete unpaid-work intervals, for each spouse.

We use for the analysis a time use dataset for France that has the advantage of surveying individual (gross) earnings, usual hours of work and total household income, in addition to collecting diary information on how household members allocate time to different activities. The time diary was collected for all individuals in the household.

We find that spouses' marginal utilities increase significantly with the level of household income. The average marginal utilities of men's and women's leisure are both positive, indicating that the average couple will choose an option with more leisure than paid work if everything else is kept constant (including income and hours spent on house work). The marginal utility of non-market work is also positive for men and women. Children, and young children, in particular, strongly and significantly increase the chances that the wife does a lot of house work, at the cost of either paid work or leisure. For men, the effects of children are also significant for husbands' house work. Cohabiting men do significantly more house work than married men, everything else equal.

Our estimates imply that both spouses' time allocation decisions are responsive to changes in the tax system and to upward changes in own wages. Upward changes in the own wage rate would increase own market work and reduce own house work time, though this effect is smaller, in absolute value, than the increase in market hours. Increases in the partner's wage (cross-wage effect) reduce own market work and increase own house work. Own and cross-wage effects are larger for women than men. For example, an increase of 10% in the wage of women would increase their market participation by 0.28%-points and increase by 6.62% their working hours, implying an own wage elasticity of about 0.66. An increase of 10% in the wage of men would lead to qualitatively similar effects but smaller in size. Non-market time of men reacts positively to changes in their wife wage but the size of this effect is small: participation increase by 0.11%-points and hours by 0.36%.

Finally, it looks as if moving from joint taxation to separate taxation would go in the direction of slightly equalizing market and non-market work of husbands and wives. As far as women are concerned, participation in market work would increase by 0.20%-points and hours worked would also increase, by 3.21%. For husbands, the picture is one of doing less of market work and more of non-market work, in response to a change in the tax system, from joint to separate taxation. Imposing separate taxation and proportionally lower taxes for

women (selective taxation) would magnify these effects. In particular, market hours of women would increase by 9.8 % and their house work would fall by 6.4%; men would reduce their market hours by 2.3% and increase their house work hours by 1.3%.

Because average tax rates are quite low in France, we would expect these effects to be larger for other OECD countries that currently enforce joint taxation of spouses, like Germany or the United States. In light of the results gathered in this paper, it is not clear that giving couples a choice of whether to opt for joint or separate taxation (the case of Hong Kong and Spain, for instance) is the best way out of the ‘dilemma’, whether to tax partners ‘incomes separately or jointly .

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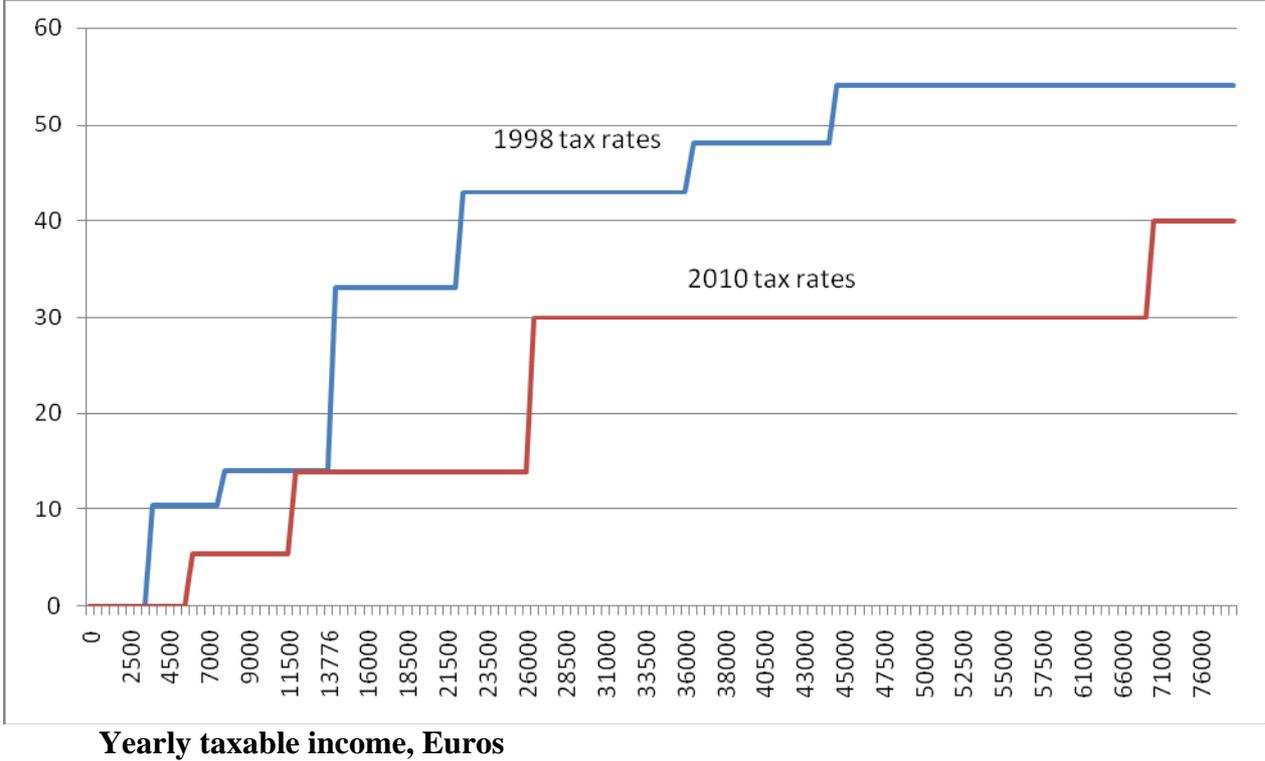
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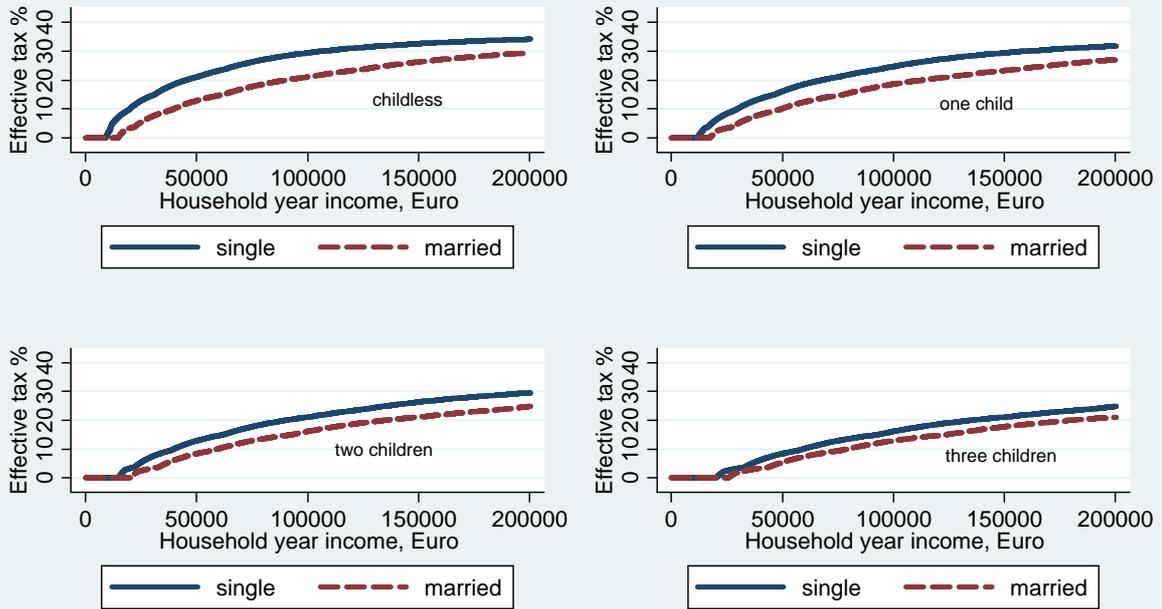
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Figure 1. Income tax brackets and tax rates for France in 1998, and 2010.



Note: The income brackets are all in current Euros, meaning that we do not account for changes in purchasing power or inflation between 1998 and 2010.

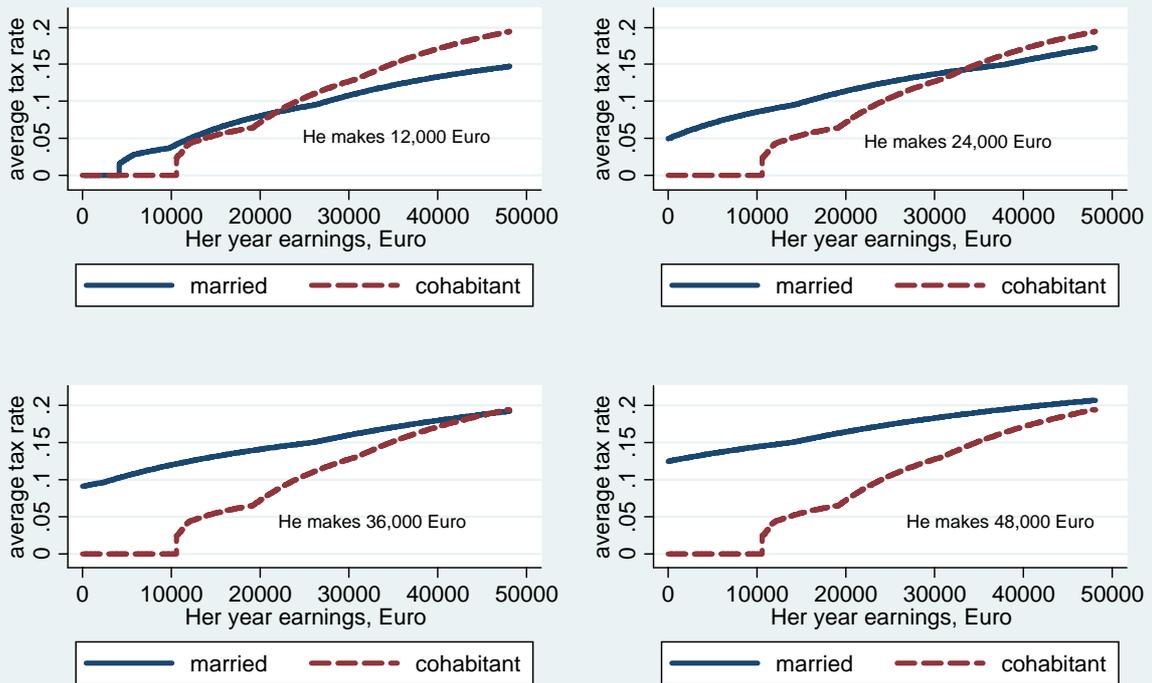
Figure 2. Effective Tax Rate: Married Couple vs Single Person
(Tax amount payable divided by household income)



Here the single person has the same number of children as the married couple.

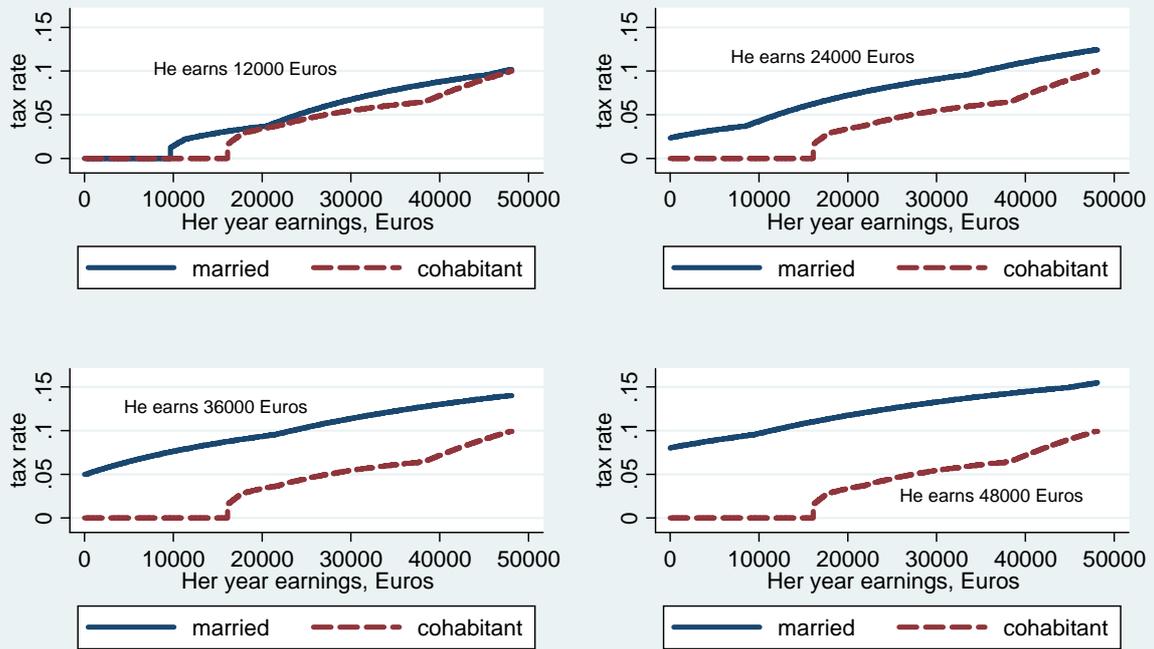
Note: The average year income in the sample is about 32000 Euro; the first quartile of income is 21000 Euro and the third quartile is 37000 Euro.

Figure 3. Average tax rate on the female partner's earnings. Childless couple



Note: For cohabitant women, the earnings of the partner do not matter.

Figure 4. Average tax rate on female partner earnings. Couple with two children.
 Cohabitant partners report children for tax purposes so as to minimize the total tax burden



The average tax rate is equal to the income tax payable on her earnings divided by her earnings. It varies with each extra Euro earned.
 For cohabitant partners, children are reported by each partner so as to minimize the total tax burden of the couple. For example, when she works zero hours he reports 2 children.

Table 1 Administrative files: distribution of average effective income tax paid percentages

Distribution of tax payers	10%	25%	50%	75%	90%	Mean (SE)
<i>All Married couples :</i>						
Average effective tax rate	0	0	3.29	8.55	13.44	5.12 (7.00)
<i>Single people:</i>						
Average effective tax rate	0	0	0	7.29	12.53	3.89 (14.96)
<i>Married couples aged less than 60 years:</i>						
Average effective tax rate	0	0	3.48	8.79	13.75	5.34 (6.55)

Source: « Enquête Revenus Fiscaux », government income tax files, INSEE 1998.
The average effective tax rate is calculated as the amount of taxes paid divided by the level of total household income, net of social security contributions of employers and employees.

Table 2 Sample selection

Selection Criterion	Households remaining	Households dropped
<i>Original sample size</i>	8186	
<i>Dropping single people</i>	5287	
<i>Dropping couples with one or two spouses older than 59 years</i>	3819	
<i>Keeping in households where both spouses filled in the time diary</i>	3564	245
<i>Dropping spouses that filled in the time diary on an exceptional day</i>	3269	295
<i>Dropping spouses that filled in the time diary on a Saturday or Sunday</i>	2407	862
<i>Dropping people in full-time education or (early)-retirees or doing military service</i>	2141	266

Table 3 Descriptive Statistics

<i>Variables</i>	<i>Husbands</i>		<i>Wives</i>	
	<i>Mean</i>	<i>St dev</i>	<i>Mean</i>	<i>St dev</i>
Age	41.55	9.01	39.25	8.98
Elementary school or less	0.08	0.28	0.10	0.30
Lower secondary, vocational	0.06	0.24	0.10	0.30
Lower secondary	0.37	0.48	0.28	0.45
Upper secondary vocational	0.06	0.24	0.05	0.22
Upper secondary	0.05	0.22	0.09	0.28
University short degree	0.11	0.32	0.13	0.34
University degree or higher	0.12	0.32	0.10	0.30
French nationality	0.94	0.23	0.95	0.22
Employed	0.94	0.32	0.70	0.47
Self-employed	0.19	0.40	0.21	0.40
Ile-de-France	0.18	0.39		
Regional unemployment rate	11.28	2.35		
Married	0.79	0.41		
Number of children	1.10	1.12		
Dummy child <3 years	0.16	0.37		
Dummy child 3-5 years	0.15	0.36		
Gross hourly wage predicted	9.53	3.61	7.52	2.89
Gross hourly wage actual	9.83	5.85	8.24	4.94
Usual hours, weekly	29.23	16.62	19.46	17.64
Usual hours, weekly (excluding the zeros; only for the employed)	37.94	5.30	32.98	9.01
Paid work, hours, daily	6.96	3.77	4.00	3.92
Paid work, (diary) minutes	417.68	238.31	240.44	235.52
House work, minutes	65.27	85.29	272.92	169.19
Total work, minutes	482.95	197.72	513.37	163.73
"Leisure" (including sleep time and personal care), minutes	909.59	171.57	904.76	155.34
The sample size is 2141 couples. Hourly wages are gross of taxes. Total work includes paid work, and unpaid house work.				

Table 4 Descriptive Statistics. Income variables, Euros per year

	<i>Q1 (25%)</i>	<i>Q2 (Median)</i>	<i>Q3 (75%)</i>	<i>Mean</i>	<i>St deviation</i>
Total earnings, per year	11891.02	21952.66	32014.29	23454.45	17563.92
Non-labour income, per year	0	1829.39	9512.82	7536.52	13407.49
Total income, per year	21952.66	28812.86	37136.58	31716.79	18185.26
Net income, per year	21108.06	26782.82	34426.37	29187.06	14868.48
Total tax burden, per year	0	987.13	3136.45	2415.93	3583.81

The observations number is 2141.

Table 5 Distribution of Average Effective Tax Rates for Different Subsamples

	<i>10%</i>	<i>Q1</i>	<i>Median</i>	<i>Q3</i>	<i>90%</i>	<i>Mean</i>	<i>Mean (*)</i>
All couples	0	1.39	4.49	8.64	13.16	5.63 (4.96)	6.93 (4.61)
Married couples	0	1.39	4.49	8.64	13.16	5.52 (4.94)	6.89 (4.59)
Married couple with housewife	0	0	1.39	4.49	10.51	3.29 (4.62)	5.68 (4.82)
Married couples 1-2 children	0	1.39	3.30	6.95	10.51	4.65 (4.10)	5.77 (3.79)
Married couples ≥ 3 children	0	0	0	2.81	5.77	1.76 (2.68)	3.95 (2.73)
Cohabitant couples	0	1.89	5.18	8.80	13.16	6.06 (5.02)	7.09 (4.70)
Cohabitant childless couples	0	4.08	7.54	11.39	14.34	7.85 (5.17)	8.60 (4.77)

The mean (*) is calculated only for couples with positive tax rates. Standard errors are given in parentheses. The average effective tax rate is equal to tax amount paid as a proportion of total household income.

Table 6 Time Allocation of Spouses (in minutes on the diary day)

	<i>10%</i>	<i>Q1</i>	<i>Median</i>	<i>Q3</i>	<i>90%</i>
Husband paid work	0	360	480	550	640
Wife paid work	0	0	240	480	520
Husband house work	0	0	30	100	180
Wife house work	70	140	240	390	510
Husband Total “Work”	130	420	530	610	680
Wife Total “Work”	280	410	540	630	700
Husband “leisure”	740	810	880	970	1170
Wife Total “leisure”	730	790	880	1000	1120

Note: Total “Work” Time includes paid work and house work. Remember that leisure also includes sleep time. Sample size: 2141 couples.

Table 7 Husband’s share in couple’s total activity time (*)

	<i>Percentages</i>		
	<i>Mean</i>	<i>St deviation</i>	<i>Median</i>
Paid work	66.88	30.96	61.07
House work	19.82	22.69	12.50
Total « Work »	46.76	15.38	48.78
Leisure	50.08	4.94	50.27

(*) This share is calculated only for couples where at least one spouse spends some time on the activity.

Note: Total “Work” Time includes paid work, house work, and childcare time.

Table 8 Estimation Results: Direct Utility functions

<i>Explanatory variables</i>	<i>Coefficient</i>	<i>Standard error</i>	
(Husband's leisure)^2	-0.1076	0.0060	**
(Husband's house work)^2	-0.2286	0.0124	**
(Wife's leisure)^2	-0.1111	0.0115	**
(Wife's house work)^2	-0.0162	0.0085	*
Income^2*Husband's leisure	0.0546	0.0034	**
Income^2*Husband's house work	0.0255	0.0042	**
Income^2*Wife's leisure	0.0440	0.0048	**
Income^2 *Wife's house work	0.0259	0.0036	**
Husband's leisure* Husband's house work	-0.1100	0.0065	**
Husband's leisure* Wife's leisure	0.0472	0.0033	**
Husband's leisure* Wife's house work	0.0252	0.0036	**
Wife's leisure* Husband's house work	0.0334	0.0044	**
Wife's leisure* Wife's house work	-0.0064	0.0052	**
Wife's house work * Husband's house work	-0.0322	0.0089	**
Income	-0.0016	0.2220	
Husband's leisure	8.2748	2.8524	**
Husband's leisure* log age	-3.7245	1.5633	**
Husband's leisure* log age^2	0.5916	0.2150	**
Husband's leisure* married	-0.0408	0.0310	
Husband's leisure* number children	0.0297	0.0135	**
Husband's leisure* any child younger than 3	-0.0145	0.0394	
Husband's leisure* any child age 3-5 years	0.0359	0.0380	
Husband's house work	6.4915	4.7947	
Husband's house work * log age	-2.2348	2.6362	
Husband's house work * log age^2	0.3804	0.3632	
Husband's house work * married	-0.1050	0.0479	**
Husband's house work * number children	0.1317	0.0234	**
Husband's house work * any child younger than 3	0.2583	0.0584	**
Husband's house work * any child age 3-5 years	0.0980	0.0549	*
Wife's leisure	52.0886	6.7489	**
Wife's leisure* log age	-27.783	3.6866	**
Wife's leisure* log age^2	3.8745	0.5139	**
Wife's leisure* married	-0.1312	0.0673	*
Wife's leisure* number children	0.2262	0.0350	**
Wife's leisure* any child younger than 3	0.0050	0.0819	
Wife's leisure* any child age 3-5 years	0.3350	0.0814	**
Wife's house work	33.9922	5.4760	**
Wife's house work * log age	-18.983	2.9954	**
Wife's house work * log age^2	2.6953	0.4168	**
Wife's house work * married	0.0009	0.0561	
Wife's house work * number children	0.3030	0.0275	**
Wife's house work * any child younger than 3	0.2942	0.0663	**
Wife's house work * any child age 3-5 years	0.3007	0.0639	**

** : significant at two-sided 5% level; * : significant at two-sided 10% level.

Table 9 Estimation Results: Individual random effects terms

Leisure Husband	0.109**
House work Husband	0.141**
Leisure Wife	0.043**
House work Wife	0.039**
Leisure Husband House work Husband	0.838**
Leisure Husband Leisure Wife	0.135**
Leisure Husband House work Wife	0.151**
House work Husband Leisure Wife	-0.143*
House work Husband House work Wife	0.200
House work Wife Leisure Wife	0.996**
**: significant at two-sided 5% level; *: significant at two-sided 10% level.	

Table 10 Model results: Marginal Utilities

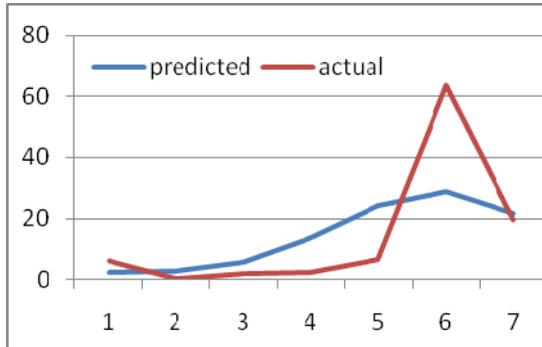
	<i>Average marginal utility</i>	<i>Proportion with negative marginal utility</i>
Income	3.4490	0.000
Husband's leisure	1.1063	0.1485
Husband's house work	0.6247	0.2405
Wife's leisure	0.1989	0.0850
Wife's house work	1.2020	0.0009
Note: Marginal derivatives with respect to hours of paid work of husbands and wives were normalized to zero. Results of the model are given in Table 8.		

Table 11 Predicted and actual discrete choices frequencies

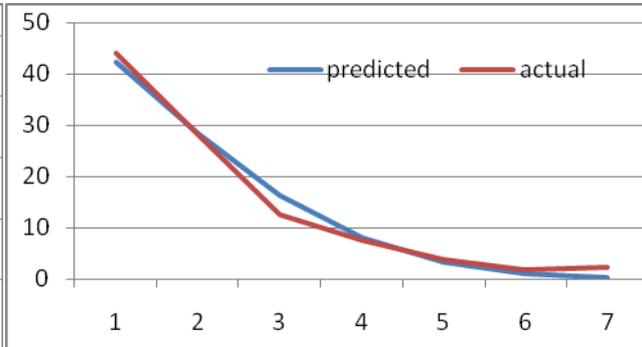
	Husband		Wife	
	<i>Predicted</i>	<i>Actual</i>	<i>Predicted</i>	<i>Actual</i>
Market work				
0 hours	0.0242	0.0713	0.2825	0.3333
Mean hours	6.8517	7.0464	4.3511	4.4078
Non-Market work				
0 hours	0.4524	0.3250	0.0707	0.0733
Mean hours	1.0740	1.0878	4.6285	4.5415
Note: Hours are per working day. We only include week-days diaries in the sample. Market hours are based on usual hours of work. We divide them by five to get usual daily working hours. Hours were set to missing for those observations reporting no usual market hours but declaring to be employed in gainful employment. The likelihood function includes a term to control for these observations (360 men and 245 women).				

Figure 5. The fit of the model: predicted and actual frequencies for the seven discrete choices

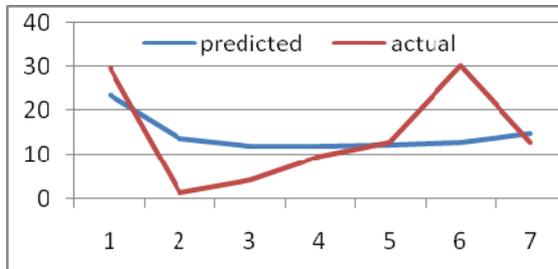
Paid Work Men



Unpaid Work Men



Paid Work Women



Unpaid Work Women

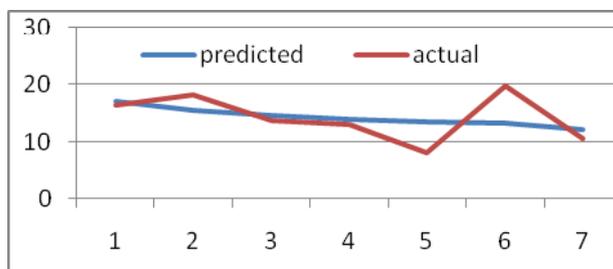


Table 12 Estimated probabilities at 0 hours and mean hours

	<i>Husbands</i>		<i>Wives</i>	
<i>Simulations</i>	<i>Participation</i>	<i>Average Hours</i>	<i>Participation</i>	<i>Average Hours</i>
	<i>Market work</i>		<i>Market work</i>	
<i>Wage changes</i>				
<i>Baseline full sample (Table 8)</i>	0.9758	6.8517	0.7663	4.3511
<i>a)Wife's wage + 10%</i>	0.9770	6.7962	0.7940	4.6391
<i>b)Husband's wage + 10%</i>	0.9832	7.1523	0.7643	4.2703
<i>c)Both spouses' wage +10%</i>	0.9840	7.0946	0.7922	4.5536
<i>Taxation changes</i>				
<i>Baseline : only married couples</i>	0.9785	6.9254	0.7624	4.2882
<i>d)Separate taxation for the married</i>	0.9764	6.8229	0.7832	4.4263
<i>e)Selective taxation for the married</i>	0.9776	6.7675	0.8105	4.7091
<i>Baseline: couples with children</i>	0.9703	6.9050	0.7249	3.9599
<i>f)suppressing children coefficient</i>	0.9670	6.7084	0.7082	3.8176
<i>Baseline: full sample (Table 8)</i> <i>Introducing the (2002) tax credit</i>	0.9759	6.8509	0.7665	4.3522
	<i>Non-Market work</i>		<i>Non-Market work</i>	
<i>Wage changes</i>				
<i>Baseline full sample (Table 8)</i>	0.5772	1.0740	0.8300	4.6285
<i>a)Wife's wage + 10%</i>	0.5782	1.0780	0.8102	4.4254
<i>b)Husband's wage + 10%</i>	0.5679	1.0458	0.8346	4.6769
<i>c)Both spouses' wage +10%</i>	0.5693	1.0508	0.8155	4.4765
<i>Taxation changes</i>				
<i>Baseline : only married couples</i>	0.5636	1.0299	0.8497	4.8125
<i>d)Separate taxation for the married</i>	0.5670	1.0396	0.8424	4.7092
<i>e)Selective taxation for the married</i>	0.5680	1.0433	0.8233	4.5048
<i>Baseline: couples with children</i>	0.6099	1.1833	0.8806	5.2210
<i>f)suppressing children coefficient</i>	0.6150	1.1995	0.8877	5.3280
<i>Baseline: full sample (Table 8)</i> <i>Introducing the (2002) tax credit</i>	0.5772	1.0740	0.8299	4.6274
Note: The baseline model specifies 7 discrete-choice intervals for paid work and 7 for house work of husband and wife. To calculate responses to separate taxation for married couples. Only married couples are considered, both for the baseline case and for the new policy scenario. Case e) corresponds to simulating simultaneously a)and d).				

Table 13. Responses to own and cross wage changes and to taxation changes

	<i>Husbands</i>		<i>Wives</i>	
	<i>Participation (%-points change)</i>	<i>Average Hours (%-change)</i>	<i>Participation (%-points change)</i>	<i>Average Hours (%-change)</i>
	<i>Market work</i>		<i>Market work</i>	
<i>Wage changes</i>				
Wife's wage + 10%	0.0012	-0.8102	0.0278	6.6194
Husband's wage + 10%	0.0074	4.3864	-0.0020	-1.8572
Both spouses' wage +10%	0.0082	3.5448	0.0259	4.6546
<i>Taxation changes</i>				
Separate taxation, for the married	-0.0021	-1.4801	0.0207	3.2189
Selective taxation, for the married	-0.0008	-2.2805	0.0481	9.8144
Tax credit, effects for the married	0.0003	-0.0971	0.0000	0.0153
Suppression children coefficients	-0.0033	-2.8459	-0.0167	-3.5940
	<i>Non-market work</i>		<i>Non-market work</i>	
<i>Wage changes</i>				
Wife's wage + 10%	0.0011	0.3690	-0.0198	-4.3862
Husband's wage + 10%	-0.0093	-2.6275	0.0046	1.0476
Both spouses' wage +10%	-0.0079	-2.1588	-0.0144	-3.2841
<i>Taxation changes</i>				
Separate taxation, for the married	0.0034	0.9389	-0.0073	-2.1462
Tax credit, effects for the married	0.0000	-0.0110	0.0000	-0.0516
Selective taxation, for the married	0.0043	1.2989	-0.0264	-6.3946
Suppression children coefficients	0.0051	1.3721	0.0071	2.0496
Interpretation: In response to an increase of ten per cent in women's wages, her market participation increases by 2.78 percentage points and her labor supply increases by 6.62%. The uncompensated own wage elasticity of market work is 0.66.				

Appendix

Notes on how to calculate income taxes in France

To determine the income tax brackets that apply, a number of standard deductions are first applied, and, next, total household income after deductions, say Y_t , is divided by the so called “family coefficient”, say $n(\theta)$, which is a function of household composition, θ . The weights are one for the husband, one for the wife, 0.5 for the first child; 0.5 for the second child; and one for the third child. The income tax payable, T , reads then:

$$T = n(\theta) f(Y_t / n(\theta)),$$

where $f(\cdot)$ is the tax function as shown in Figure 1. For example, for a married couple with three children, taxable income Y_t is first divided by four ($n(\theta) = 4$), to determine the various tax brackets that apply; and then at the end, the tax payable is multiplied by four. Taxable income, once a number of standard deductions have been made, represented roughly 72% of gross household income in 1998. This has changed very recently, with reductions been somewhat different.

Take for example, a household with two married adults and two dependent children and total household income equal to 30,000 Euros -which is roughly equal to the average level of household income in our sample (see Table 4). Their family coefficient, $n(\theta)$, is equal to three and their taxable income, after various standard deductions, (Y_t) is 21,600 Euros (i.e. 72% of Y). Thus $Y_t/3$ is equal to 7200 Euros. Up to about 3979 Euros, the tax rate is zero. Applying the 10.5 tax rate to the difference between 7,200 and 3979, we get 338 Euros, and multiplying this by 3, we get a total income tax of about 1000 Euros for this household. The average tax rate for this household is equal to about 3.3% ($1,000/30,000*100$).

Unmarried parents (about 20% of couples in our sample are not married) must choose how to report children, since they will file separate tax forms. Each partner’s tax is determined separately on the basis of the assigned number of children. We assume that they have perfect foresight and choose who reports the children in a way that minimizes the total tax burden. In the case of an unmarried couple with two children, if one spouse declares both children, then his/her total taxable income is divided by two; if each spouse declares one child, then the

taxable income of each of them is divided by 1.5. Presumably the tax brackets applicable to unmarried partners will lead to higher tax rates, unless unmarried couples can allocate children in such a way that they can minimize the tax burden. It is possible to think of situations where unmarried couples end up paying lower tax amounts than married couples with similar levels of income. For example, there is a tax exemption or reduction for households with payable tax amounts of less than approximately 508 euros in 1998 (“la décôte” in French). Low-earners in dual-earners couples can benefit twice from this deduction while married spouses with similar earnings levels may not be able to benefit at all.

Table A Main sources of household income

Household income contains income from the following:	Sample frequency %	The <i>principal source</i> of household income is income from :	Sample frequency %
Earnings from work	90	Earnings from work	84.8
Self-employed income	14.70	Self-employed income	10.38
Pensions or rents	3.99	Pensions or similar rents	0.51
Unemployment benefits	10.80	Unemployment income	2.60
Welfare benefits (“RMI”)	2.13	Welfare benefits (“RMI”)	0.46
Financial dividends	16.32	Financial dividends	0.42
Other	41.77	Other	2.73
<p>The sample size is 2141 couples. The various categories of household income were defined by the survey makers. The category “other” includes children and housing subsidies, as well as alimentation money for divorced spouses, to our intuition.</p>			