

Taxation, household chores and spouses' market labour supply: a discrete choice model for French couples

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Abstract

In this paper, we analyze the impact of taxation on the spouses' allocation of time to market work and unpaid household work. 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 family 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 model is estimated using data from the French Time Use Survey on 2,360 married and unmarried couples.

We find that spouses' time allocation decisions are responsive to financial incentives, such as changes in the tax system or other changes that lead to different net wages. The sensitivity of one's time allocation to the own wage is much larger than the sensitivity to the wage of the spouse. Tax policy simulations suggest that moving from the current French system of joint taxation for married couples to separate taxation of each spouse would go in the direction of equalizing market and non-market work of husbands and wives.

1. Introduction

In this paper, we analyze the impact of taxation on the spouses' allocation of time to paid and unpaid work. Taxation affects the rewards from work and may thus impact not only on market labour supply but also on the provision of unpaid household work. In particular, within a two-adult household, taxation may influence not only the individual trade-off between paid work and informal house work but also the balance between paid and unpaid work of the two spouses. For example, if secondary earners, often the women, are taxed at a higher marginal rate than primary earners, who are often the men, this may reinforce specialization patterns of women in household work and of men into paid market work. Ignoring household production, and thus setting all the time invested by individuals on house work as implicitly equal to pure leisure, may seriously bias the estimates of the wage elasticity of labour supply. This is especially true for two-adult households, where one spouse may specialize in the labour market and the other in household work, so that ignoring house work would lead to the strong assumption that spouses are "unconditionally" available for market work and that there is no consumption of household produced goods.

We expand on, for example, 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 as well as unpaid house work. The use of a discrete choice specification enables us to incorporate non-linear taxes in the household budget set. To our knowledge, this is the first empirical application that attempts to provide a comprehensive treatment of the effect of taxation on spouses' allocation of time to paid and unpaid work by allowing for discrete choices of time use allocation. An advantage of the model is that it accounts for participation as well as hours decisions for all activities considered - paid work of husband and wife can be zero and nonzero, and the same applies to unpaid house work. An additional feature of this study is that we model jointly the behaviour of the two adults in the household.

The model we adopt can be seen as a reduced form approximation to models that impose an explicit structure with household production, both in a unitary and in a collective approach to describing spouses' time allocation choices. We do not explicitly model household bargaining between spouses. We do not observe the value of household production but only the time inputs used for household production and therefore do not explicitly model consumption of home-produced goods and services.

Earlier studies in this area, Apps (2003 and 2006) and Apps and Rees (1988, 1996, 1997 and 2005), showed that taxation may strongly affect spouses' allocation of time to paid and unpaid work. This is particularly true for women, since they usually are the secondary earner in the household. The empirical literature on the topic is still scant however, mainly for the reason that many time use data sets do not collect any information on wages and income.

Kooreman and Kapteyn (1987) present a utility maximizing model of time allocation of spouses, distinguishing a large number of time uses. They use American time-use data to estimate the model and conclude that it is indeed important to disaggregate "leisure" into different components. Kalenkoski, Ribar and Stratton (2008), estimate the impact of wages on childcare time of British parents. Hersh and Stratton (1994) use a global time use question from the Michigan Panel Study of Income Dynamics to investigate the relationship between housework of spouses and wages. Bloemen and Stanca (2008) estimate spouses' allocation of time to market work, childcare and housework, simultaneously with employment and gross wages, for two-parent households in France. Their study does not allow for taxation to affect outcomes.

Earlier studies on the impact of taxation on spouses' market labour supply for France have concluded that the labour supply elasticities are quite small (Bourguignon and Magnac, 1990; Donni and Moreau, 2007). We are not aware of any empirical studies on French data that incorporate household production as well as taxes.

One of the things we do in this study is to simulate how a shift from a joint taxation system, currently in place in France, to a system of separate taxation would affect spouses' allocation of time to market and non-market activities. This extends the work of, for example, Steiner and Wrohlich (2004) and Callan, van Soest, and Walsh (2007), 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.

For our analysis we use 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 so that we have time use information for both spouses in a couple. The choice set in our model has over fourteen

thousands points for each couple, since we distinguish eleven discrete paid market-work intervals and eleven discrete unpaid-work intervals for each spouse, leading to 121 x 121 combinations of paid work and non-market work intervals. We perform a sensitivity analysis for the number of points and find that the results are qualitatively similar for a smaller choice set of 256 points.

As expected, we find that children - and young children in particular - strongly and significantly increase the chances that the wife does a lot of housework, at the cost of either paid work or leisure. For men, the effects of children are much smaller and we only find significant effects for very young children. We also find that both spouses' time allocation decisions are responsive to changes in the tax system and to changes in own wage rates. Upward changes in the own wage rate would reduce own house work time, though the effect is smaller than the increase in market hours. The sensitivity of one's time allocation to the spouse's wage rate (cross-elasticities) is much smaller. Finally, our results suggest that moving from joint taxation to separate taxation would go in the direction of equalizing market and non-market work of husbands and wives.

The structure of the paper is as follows. The discrete choice model for market and non-market time allocation of spouses 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. A descriptive analysis is carried out in Section 5 and the estimation results of the model are discussed in Section 6. Section 7 concludes the paper.

2. The model: specification and hypotheses

The model is an extension of the household labour supply model of van Soest (1995). In that model, only two activities of each spouse are distinguished: paid work and everything else ("leisure"). In the current paper, we distinguish three activities: paid work, unpaid household work, and everything else ("leisure"). The discrete choice model is a random utility framework, where the "utility function" for the household depends on both spouses' amounts of time spent on each of the activities and on after tax household income.

Several interpretations of this utility function 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, in a household bargaining framework in which both spouses have their own utility function and achieve some Pareto optimal outcome, 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, e.g., men's or women's wages on, e.g., paid work can be seen as the total effect through individual utility functions and through bargaining weights, which are not disentangled. In that sense our model is reduced form.¹ The time allocated to leisure, paid market work and unpaid household work enters the utility function together with the household after tax income.

Similarly, household production is not explicitly incorporated, but our 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 extra household production. Explicitly incorporating household production would make the model more complicated but would also be quite difficult with the data at hand, which do not contain more information on household production than the time inputs we already use.

The discrete set of combinations for the two spouses 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. The remaining activities, namely leisure, personal care and sleeping are not explicitly modelled. We assume that childcare time and time spent on household chores can be aggregated in just one category of "house work".

Finally, our data have no information on savings or wealth. As a consequence, we have a static model and cannot correct income for savings to make our model consistent with life cycle utility maximization in a two stage budgeting framework (cf. Blundell and Walker, 1986). Besides, in a dynamic framework the basic set up should be extended to incorporate intertemporal consumption of home-produced goods.

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 work, and let t_m^h and t_f^h be their unpaid hours of house work. Gross wage

¹ 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.

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 determines after tax family income y as a function of gross earnings, total non-labour income Y_0 , and the amount of taxes T , which depends on the various income components and on household characteristics X :

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

Here we do not explicitly consider consumption of household production since this is hard to evaluate. Other restrictions are the time constraints for husband and wife, saying that the three activities we distinguish add up to the total time endowment E :

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

The time endowment will be treated as a constant, the same for men and women. The objective function maximized by the household is in principle a function of the six time amounts and of after tax household income. Because of the two time constraints however, we can eliminate one of the time amounts for each spouse. This implies that the objective function can be written 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 formal work is important for the interpretation of V . For example, it leads to the following interpretations of its partial derivatives:

- $\frac{\partial V}{\partial t_m^l} > 0$ if and only if husband's leisure is preferred to husband's paid work, keeping other factors (including husband's house work and family income) constant;
- $\frac{\partial V}{\partial t_f^l} > 0$ if wife's leisure is preferred to wife's paid work, 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 factors constant, including household income, that is, net earnings and other monetary income, but not income in kind from household production. If the activities paid and unpaid work are inherently equally attractive or unattractive, we expect this marginal utility to be positive because housework increases the household product
- $\frac{\partial V}{\partial t_f^h} > 0$ if house work done by the wife is preferred to paid work done by the wife, keeping other factors in the objective function constant.
- $\frac{\partial V}{\partial y} > 0$ if more income is better.

As in Van Soest (1995), only the latter inequality is really necessary for the interpretation of the model. If households would prefer less income, the economic interpretation of the model is lost, whichever interpretation we give to the objective function (unitary framework or household bargaining, household production or not, etc.). Still, there is no need to impose this assumption a priori, we can use a flexible specification of V and simply see which signs of the derivatives our estimates imply. There is also 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 with the more general interpretations that our objective function can have.

To implement the model empirically, we fix the number of discrete combinations of market and non-market work of spouses. We consider 11 discrete choices for each of the two activities considered and for the two spouses: 0, 1, 2, ..., or 10 hours per day. This produces a choice set of $11 \times 11 \times 11 \times 11 = 14,641$ discrete points – all the combinations of paid work and unpaid work time per day of the two spouses that we consider. Observed time use in the data will be rounded to the nearest point. For example, if a husband reports he spent 1 hour and 40 minutes on house work, this is rounded to 2 hours.

Earnings from work of husbands and wives are computed at all choices, extrapolating the hours per day to a five days work week. This gives 11×11 combinations of paid-work time for

each household. The tax function is then applied to obtain household after tax income for each choice (adding household non-labour income).

To check the sensitivity to the rounding procedure, we also consider estimates based upon a smaller choice set of 256 points for each couple in the sample: four discrete paid market-work intervals and four discrete unpaid-work intervals, for each spouse.²

We use a quadratic objective function, as in Callan, van Soest and Walsh (2007), which has the advantage over a specification in logs of allowing for negative incomes:³

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

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 characteristics and of unobserved characteristics,⁴ using the following specification:⁵

$$(5) \quad b_i = \sum_k \beta_{ik} x_k + \xi_i; \quad i=1, 2, 3, 4$$

where the four unobserved heterogeneity components ξ_i ($i=1, 2, 3, 4$) are assumed to be normally distributed with mean zero and diagonal covariance matrix, independent of the x_k and of other exogenous components of the model, such as wage rates and other incomes. These assumptions are made to keep the numerical optimization of the likelihood (see below) practically feasible. For similar reasons, we do not parameterize α_{ij} ($i, j=1, \dots, 5$) or \dots, b_5 and assume they are constant across all households.

² On the basis of an initial inspection of the data, the amounts of time spent on paid work in this specification were chosen as follows: for husbands, 0, 10-450, 460-530, 540+ minutes per day (with mid-points 0, 390, 480, 600); for wives, 0, 10-390, 400-480, 490+ minutes (with mid-points 0, 260, 450, 530). We chose the four categories of house work for each spouse such that frequencies were similar: for husbands, 0, 10- 60, 70-150, 160+ minutes per day (with mid-points 0, 30, 100, 260); for wives: 0- 140, 150-270, 280-430, 440+ minutes (with mid-points 90, 200, 350, 530). In other words, we essentially have five categories; the last two intervals are aggregated for husbands, because of the small number of observations that fall in those time-allocation intervals; while the first three time-allocation intervals are aggregated for wives, for similar (but opposite) reasons, since wives tend to do quite a lot more of housework.

³ Van Soest, Das and Gong (2002) compare this specification with higher order polynomial expansions, and find that the quadratic is flexible enough in a model of individual labour supply.

⁴ More specifically, the x_k s 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.

⁵ The index of the household is suppressed.

Random disturbances are next added to the utilities of all $m=14,641$ (or, under the other specification, 256) points in the household's choice set like in Van Soest (1995):

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

with GEV(I) denoting the type I extreme value distribution with cumulative density $\Pr(\varepsilon_j > z) = \exp(-\exp(-z))$. It is assumed that each household chooses 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 labour income and determinants of taxes, is the following (multinomial logit type) probability:

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

The model is normalized by the magnitude of the common variance of the error terms. The distributional assumptions on the error terms help to simplify the 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) condition on the unobserved heterogeneity terms. In order to construct the likelihood contribution of a given household, they need to be integrated out. The likelihood contribution will then become:

$$(8) \quad \Pr[(t_m^l, t_f^l, t_m^h, t_f^h) = (t_{mj}^l, t_{fj}^l, t_{mj}^h, t_{fj}^h)] = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \Pr(t_m^l, t_f^l, t_m^h, t_f^h | \xi) p(\xi) d\xi$$

where $p(\xi)$ is the density of ξ . We are somewhat sloppy in the notation here by no longer making the conditioning on observed variables explicit.⁶ The likelihood expression thus involves four-dimensional integrals. These can be approximated using simulations. It is therefore straightforward to estimate the model by simulated maximum likelihood. We used Halton draws to do the simulations and used 50 draws for each household and each unobserved heterogeneity term; the results hardly changed when we used a larger number of draws.

⁶ The observed variables include wage rates of non-workers since these are replaced by their predictions from a Heckman two stage model (see below).

3. The French tax system

The French tax system in 1998 consisted of six income brackets with marginal tax rates varying from zero to 54% (see Figure 1). This system was later reformed with the highest rate been gradually reduced to 48% in 2005. In France, married couples are taxed jointly, while unmarried couples must file separate tax declarations.⁷ To determine the income tax brackets that apply, total household income is divided by the so called “family coefficient”, which gives weight one to each married spouse; 0.5 to each dependent child up to two children; and to one for the third child and children of higher birth order. Let Y_t be taxable income⁸, N be the value of the “family coefficient, and T , the income tax payable, then:

$$T=Nf(Y_t/N),$$

where $f(.)$ is the tax function as shown in Figure 1. It follows that children and dependent spouse deductions implicitly increase with household income, which gives the system a regressive feature (see also Bourguignon and Magnac, 1990). Moreover, this system implicitly rewards couples with one breadwinner and one spouse who does not participate. Unmarried couples are penalized in this respect as the family coefficient for a dependent spouse does not apply to their case.

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 2). Their family coefficient (N) is equal to three and their taxable income (Y_t), after various standard deductions is about 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. Now, this implies that the effective tax rate for this household is equal to 3.33% ($1,000/30,000*100$).

⁷ Since the introduction of the “pacs” in 1999 -an official contract of cohabitation- “pacs”ed couples file joint tax declarations.

⁸ 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.

Unmarried parents must choose how to report children, since they will file separate tax forms.⁹ Each partner's tax is determined separately on the basis of the assigned number of children. For example, for a married couple with two children, taxable income is divided by three to determine the various tax brackets that apply. 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 spouses will lead to higher tax rates, unless married 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).¹⁰ 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.

There was no tax credit at the time covered by our analysis. The French tax credit was created in 2001 (see Stancanelli, 2008, for a discussion). Since the tax credit is conditional on total household resources, it may be claimed more easily by unmarried low-earners than by married couples.

To sum up, the main features of the French income tax system in 1998 were the following:

- Relatively few income tax brackets.
- Married couples filed joint tax forms.
- Unmarried spouses filed separate tax declarations.
- To determine the taxable income pieces, taxable income is to be divided by the "family coefficient", whereby spouses count for one –this applies to married couples only- and children count for a half or one depending on the number of children –this applies to married and unmarried households alike, but in the case of unmarried ones, assumptions must be made on whom declares the children for taxation purposes.

⁹ About 20% of couples in our sample are not married.

¹⁰ Payable tax was set to zero if the total tax payable is less than $\frac{1}{2}$ 508 euros and it is reduced by an amount equal to the difference between 508 euros and payable taxes, if payable taxes are less than 508 euros. The boundary for this tax reduction was set at 800 Euros in 2005.

- There was a tax reduction/exemption for households with payable tax amounts of less than approximately 508 euros in 1998.
- There was no tax credit.

The overall income tax burden in France is quite low. Indeed, the bulk of tax revenue is levied in France by means of taxes other than income tax, like Value Added Taxes and Property Taxes.

In general, marginal taxes on secondary earners are relatively high –though not as high as in other OECD countries because income taxation is lower in France than in other European countries. For example, if we take a married couple with two children in 1998 where the husband earns the median wage in our sample (which is equal to about 1.3 times the full-time year round minimum wage), the average household tax rate is zero. If the wife enters the labour market and earns the median wage of women in our sample (which is approximately equal to the full-time year round minimum wage), the average income tax of the household goes up to 3% but the “marginal” tax on the wife’s additional earnings is 7%. If they have only one child, the marginal tax rate on her additional earnings is 8%. Figures 2 illustrates the “marginal” tax on additional wife’s earnings when the husband earns, respectively, the 900 and 2000 Euros per month, for the case of a married couple with one child. We assume constant husband’s earnings level and let the earnings of the wife vary from not working to working and earning an increasing salary, up to 4000 Euros per month.

4. The data for the analysis

Sample selection criteria and general data information

The data for the analysis are drawn from the 1998-99 French time use survey, “Enquête Emploi du temps”, in French, carried out by the National Statistical offices (INSEE), which is the latest available time use survey to date. This survey covers more than 8000 representative households including 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 randomly drawn

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. Another advantage of this dataset is that it collects information on household income, individual earnings, and usual hours of work in addition to the diary.

For our analysis, we only selected couples, either married or unmarried but living together. Single people were dropped from the sample, leaving us with a sample of 5287 couples with and without children. For our estimations, we then selected couples according to the following criteria:

- Both spouses were 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 or a marriage or a party etc.
- Neither spouse had filled in the questionnaire on a weekend day.
- Neither spouse was in full-time education or had retired from the labour market.

This led to a sample of 2360 couples. Table 1 explains how many couples were deleted at each step of the selection process. We kept self-employed people in the sample; their earnings and total household income were reported in the same way as by employees.

The number of children in the household refers to dependent children up to 18 years of age only. Educational dummies are defined for various education levels; the benchmark group are individuals without any formal educational qualification. Information on monthly gross earnings was collected both as a continuous variable and in follow-up brackets for observations that did not provide continuous earnings information.

Almost 89% of the husbands and 67% of the wives in our sample did paid work (see Table 2). About 51% of the husbands employed reported earnings as a continuous variable and 31% of them reported earnings in bracketed intervals. The same figures for wives are 57% and 22%, respectively. Average hours worked per week were equal to about 38 for men and 33 for women, if employed. About 20% of the men and women are self-employed. Married couples represented 79% of the sample, the remaining 21% are cohabiting. The average number of dependent children younger than 18 years per couple was just over one. A

comparison of usual hours of paid work with diary hours of work suggests that the correlations between these two variables are equal to 0.24 for husbands and 0.58 for women.

Hourly wages were computed only for spouses that reported continuous earnings information. We use information on usual hours of work drawn from the main questionnaire to compute hourly wages and information on hours of work from the time diary to construct the dependent variable “time spent on paid work” in the time allocation model. In a separate first stage, we estimated hourly earnings equations for husbands and wives, correcting for selection into employment with a Heckman type of model. Predicted hourly wages are used to predict earnings for individuals out of work or with missing earnings information. The estimation results of the Heckman models available upon request.¹¹

Total household income before taxes was collected only in brackets. We set total household income equal to the mid-point of each interval for taxation purposes and equal to the top boundary (7622 Euros) for individuals 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 spouses. Whenever total household income was found to be less than the total earnings of the two spouses, it was set equal to the total earnings – this occurred in very few cases. The average before tax wage rate was about 10 Euros per hour for men, and almost 9 Euros for women (see Table 2). Average net household income per year was equal to 26,000 Euros. To give an order of reference, the minimum wage per month was slightly less than 1000 Euros at the time.

About 10% of the households in the sample receive some income from unemployment benefits, but only for 2% these benefits represent the main source of income. About 2% of the sample received welfare benefits. The average level of welfare benefits was 2011 French Francs in 1998 and the maximum was 2502.30 FF for singles and 4504.14 FF for someone with two dependent children. In our models, we do not incorporate unemployment benefits and set benefits equal to welfare benefits (following for example, van Soest, 1995).

¹¹ The explanatory variables in the wage equations are educational dummies, log age and its square, and regional dummies. The participation equation includes these variables as well as marital status, the number of dependent children, and dummies for children in the age groups 0-2 and 3-5.

Imputing taxes

There is no information in the survey on after taxes income and earnings. To compute net total household income and net earnings for each spouse, assumptions had to be made for unmarried couples on the part of total income that would belong to each spouse and on how children are reported. As discussed in Section 3, the number of dependent children affects the tax amounts. In the case of a married couple where only one spouse earns some income, the amount of taxes payable will fall, while for unmarried couple this will not matter.

In the case of unmarried couples, we assumed the following:

- Each partner (of course) reports his/her income from work
- Total household income minus the income from work of the wife is reported by the husband, so we assume that all non-work income accrues to the husband.
- If both spouse worked some positive hours, each of them reports some children. To minimize the tax burden, the spouse earning the higher salary reports more children if the number of children was even.
- If both unmarried spouses were out of work, then they split children between each other and when the number of children was odd, we attributed more children to the husband – this occurred in seven cases only.

Then we applied the tax brackets in force at the time to “taxable” income, computed using the approximation that taxable income is 0.72 of total income. For unmarried couples, the total taxes paid by the household were computed by summing the taxes paid by each partner.

Average tax rates per household were then computed by dividing total household taxes by total household income. The average level of the effective tax rate was quite low - about 6% of household income. This is in line with the findings of other studies that use similar data on earnings (see, for example, Bourguignon and Magnac, 1990).

The diary and the allocation of time of spouses

The diary was filled in by each household member on a specific day. The following is to be noted:

- a) It was the interviewer that chose the day the diary should be filled in.

- b) Activities were recorded every ten minutes and a 24 hours span was covered by the diary.
- c) Main and secondary activities were coded – the latter are 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 one as secondary, if any.
- d) About 140 categories of main activities and 100 categories for secondary activities were defined by the survey designers.

Here we only consider activities reported as main activity. For childcare, we have compared responses computed including childcare as main and also as secondary activity, and found that, perhaps surprisingly, the two did not differ much. We have summed total time spent on various activities to calculate total time spent on each activity over the diary day.

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 paper work.
3. Household work as at point 3 and including also semi-leisure time, defined as making jam or knitting, gardening, doing household repairs, or taking out pets.
4. “Leisure” time, including leisure, personal care and sleeping time.

On average men perform more market work and less unpaid house work than women (see Table 2). On average, women perform 80 minutes of total work per day more than men - having defined total as the sum of paid and unpaid work activities. We find that cohabiting couples on average do not pay higher effective taxes than married couples, at least according to our tax algorithm which assumes that unmarried spouses with children fill out their returns such as to minimize the income taxes paid by the couple. As expected, the average effective tax paid falls with the number of children in the household.

Table 3 presents an overview of the distribution of the tax rates in our sample, separately for several subsamples. On average, tax rates are quite low compared to other countries. They are

higher for married couples than for cohabiting couples, but this is not because of the tax rules but because of a composition effect – the group of cohabiting couples has more low income households who have lower tax rates. Similarly, the differences between couples with and without children are a mixture of tax rule effects (leading to lower tax rates for families with children) and compositional effects.

5. Descriptive statistics of time allocation of spouses

The distribution of time allocation of spouses is given in Table 4, distinguishing the following activities:

1. paid work;
2. childcare, which is included in housework, but here also shown separately
3. housework, including childcare as above;
4. housework according to a broader definition, which includes not only childcare but also "semi-leisure" activities, such as gardening, house repairs, taking out pets, knitting, and making jams.
5. total "work", which includes paid work, housework and child care.

The table 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 180 minutes (3 hours) for the "median" wife in the sample. Instead, women perform most of housework, with the "median" wife in the sample spending 250 minutes on it, against 40 minutes for the "median" husband. The picture is only slightly more balanced if a broader definition of housework is adopted, with the median husband doing 70 minutes of housework compared to 270 minutes for the median wife.

Interestingly, a comparison of total paid and unpaid work time of spouses shows that the median wife does 50 minutes more of total work than the median husband. The picture would, however, be different using a different specification of "house work", including "semi-leisure" activities such as gardening, doing house repairs, taking out pets, sewing and producing home-made jams, as under this definition house work time of men increases considerably (see Table 1).

In Table 5 we compare the distribution of time allocation for spouses with children younger than three years. (Note that child care is publically provided and free of charge for children aged three and above in France.) Here the balance of market and non-market time becomes more unequal, with men performing disproportionately more market work and women doing more non-market work. In particular, it is striking that in spite of having one or more small children, over a quarter of the men in the sample spend no time with them on the day the diary was filled in. This picture would change slightly if we had not excluded observations answering the diary on a weekend day (see for example Bloemen and Stanca, 2008, for a specific analysis of time with the children of two-parent households, using the same data). In addition to this, mothers of young children tend to spend considerably more time on paid and unpaid activities than their husbands: at the median she “works” 140 minutes per day more than he does. Overall, fathers of small children are found to perform the same amount of total work as most women in the sample (580 minutes, cf. Table 2, against 720 for mothers of small children).

Table 6 presents the same distributions of time allocation for households where both spouses performed more than 7.5 hours of paid work during the day the diary was asked. Here we see that both husbands and wives tend to spend less time on housework than most other couples in the sample do (cf. Table 4). This is especially true for women, for whom housework time is now roughly halved compared to the complete sample. Interestingly, here the median woman is still doing 70 minutes more of total work than the median man. The total work load of both spouses increases only slightly, by half an hour for women and by 10 minutes for men, relative to the median spouses in the total sample (see Table 4), although men in the highest decile work one more hour than in the same decile of the complete sample. It is remarkable that women employed full-time with a husband also working full-time are found to perform more than one hour of total work more per day, at the median, than (their) husbands.

To better understand within-couple differences in the balance of paid to unpaid tasks, Table 7 gives the share of the husband in the total time allocated by the couple to the given activities. We provide both the mean and the median share, as the mean may be influenced by extreme values of the distribution of husband’s time shares. Indeed, it is found that the median husband in the sample does 61% of the market work carried out by the couple, while on average, husbands do 67% of all market work performed by the couple. The median husband

performs only 13% of the housework done by the couple. This figure increases to 22% if a broader definition of housework is adopted. Finally, considering the total amount of market and non-market work carried out by the two spouses within each household, husbands carry out a substantial though still unequal share of that - the median share is 46.67% and the mean 44.42% —conditional on using a definition of “house work”, which excludes “semi-leisure” activities.

Looking at the share of time allocated to each task by husbands in couples with small children (Table 8), the unbalances are found to increase. Husbands do now all of paid work at the median and 16% of housework. The balance of total time is still unequal, with the median husband doing 44.58% of total work carried out by the household –at least adopting a definition of “house work”, which excludes “semi-leisure” activities.

Table 9 illustrates husbands’ time shares for couples where both spouses work more than 7.5 hours on the day of the diary. The balance of paid work is now more equilibrated with men doing 50.5% of paid work. Still, although the share of housework done by men has increased relative to the complete sample statistics, it remains considerably below 50%: 18% for the median husband. This suggests that the time allocated by husbands to unpaid household tasks is sensitive to the wife’s labour market status and market hours of work. However, things appear to balance out in total, as the median man in these couples is found to carry out 47% of total market and non-market tasks.

The picture would be more balanced if total work were calculated including semi-leisure activities, as that would increase considerably the time husbands spend on “housework” so defined (see Table 1 and following).

6. Estimation Results

We have allowed the (linear) utility of leisure (equal to the day time budget minus paid work and unpaid market work) and of housework time (defined according to the narrow definition, which excludes “semi-leisure” activities) to vary with a number of covariates, characterizing

the individual and the household.¹² These are the age of the individual, marital status, the number of dependent children, and dummies for the presence of young children. A positive coefficient on one of the interactions with leisure implies a positive effect on the marginal utility of leisure and a negative effect on market labour supply (*ceteris paribus*). A positive coefficient on one of the interactions with non-market housework implies a positive effect on the marginal utility of housework. The parameter estimates using the narrow definition of housework are given in Table 10, for the specification allowing for 11 discrete choices (0, 1, 2, ..., 10 hours per day) of paid work and housework for husband and wife – producing 14,641 ($11*11*11*11$) points in the choice set; results for the smaller choice set of 4 discrete choices for each activity – giving a choice set of 256 ($4*4*4*4$) points are similar in many respects; they are available upon request from the authors.

The first block of coefficients is hard to interpret due to the squares and interactions. Therefore, Table 12 presents the average marginal derivatives of the objective 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 positive for all the men in the sample; it is negative for almost 13 per cent of the women. This indicates 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). Interestingly, the marginal utility of house work is positive for almost all observations, except for 2.5% of the men, suggesting that non-market work is more attractive than paid work, possibly because of the implied household production output (which, unlike earnings, is not kept constant; see Section 2).

The coefficients on the interactions of exogenous characteristics with the four activity amounts in the middle part of Table 10 can be interpreted in a similar way as in van Soest (1995), as affecting the marginal utility of each time use and thus making choice options with much time spent on a given activity more or less attractive. For example, the fact that the couple is married rather than cohabiting reduces the marginal utilities of both spouses' leisure

¹² The results using the broad definition are qualitatively similar in most regards. These will be added to the next version of the paper.

but increases the marginal utility of house work for the wife, suggesting that in married couples, women will do less paid work and more house work than in similar unmarried couples. Children - and young children in particular - strongly and significantly increase the chances that the wife does a lot of housework, at the cost of either paid work or leisure. For men, the effects of children are much smaller but we still find significant effects, particularly for very young children. These go in the expected direction: an increasing marginal household utility of more male house work (i.e., childcare), at the cost of mainly male leisure.

The last four lines provide the estimates of the standard deviations of the unobserved random effects ξ of the marginal utilities of leisure time and housework time for each spouse. None of the standard deviations is statistically significant and they are all quite small, suggesting there is no evidence of unobserved heterogeneity. This seems to be a common finding with this kind of models, where, with cross-sectional data, it is hard to disentangle unobserved heterogeneity from noise.

The predicted and actual observed proportions of observations falling in each discrete interval of market and house work considered are presented in Table 12. The model predicts average time spent on each of the four activities quite well, but does not do a good job in predicting the distribution of paid hours of work. In particular, the model underpredicts working zero hours and overpredicts working a small positive number of hours. A plausible reason is that the model does not incorporate fixed cost of work paid work or hours restrictions. Moreover, due to the (time and money) cost of travelling to work, working a few hours per day may not be worthwhile for most people, so that part-timers often work a few days per week rather than a few hours every day. This kind of cost is not incorporated in the model.

Elasticities and policy simulations

To estimate the sensitivity of the spouses' discrete time allocation choices to changes in before or after wage rates and the tax system, we have used the model and the estimated parameter values to compute predicted probabilities under various scenarios. In each scenario, the complete model is simulated and the discrete distribution of the four activities is produced. The baseline scenario corresponds to the actual budget sets used for estimation and produces the distributions presented in Table 12. 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 wages because of the progressive nature of the tax system). Tables 13 presents the changes compared to the baseline scenario, for the benchmark choice sets (11 points for each activity). Qualitative results are largely similar for the choice sets with four points per activity only (results available upon request). The table presents the changes in the participation rate (the probability that some time is spent on a given activity) and the average hours spent on each activity.

The first scenarios are changes in all gross wage rates of men, women, or both, keeping the tax system as it is 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 the increase in gross wage rates because of the progressive taxes weighing relatively heavy on the extra earnings. We focus on discussing the results in Table 13, Table 14 largely gives similar results.

An increase in all women's wage rates of 10% would increase their market participation and hours quite considerably. Participation increases by 1.13%-points, and average hours by 3.80%, implying a own wage rate elasticity of about 0.4 for partnered women. The cross-wage effects on participation and hours of paid work of the husband are negative but very small; the estimated cross-elasticity on male labour supply would be only about -0.02.

Women would react to an increase in their wage rate by readjusting the time allocated to non-market work: participation would go down by almost half a percentage point and hours by 1.68%, giving an elasticity of about -0.17. The time allocated by men to non-market work would go up in response to changes in their wives' wage rate: participation in (narrowly defined) house work would increase by 0.34 percentage points and hours by 1.35%.

The second simulation considers changing the men's gross wage rates by 10%, leaving the women's wage rates as in the benchmark situation. An increase of ten per cent in the wage of husbands would reduce non-participation in market work by partnered men by almost one %-point and increase hours by 2.3%, implying a positive own wage elasticity of about 0.25. 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 0.53%-points and hours by 2.2%.

Interestingly, women's market and non-market work is almost insensitive to an upward change in their husband's wage – cross-elasticities are very close to zero.

Finally, let us look at an increase of 10% in the (gross) wage rates of both spouses. This policy simulation could be taken to be equivalent to a general reduction of taxes, at least to the extent that everyone would pay taxes. Under this scenario, the elasticity of market participation responses of spouses mirrors the reaction to changes in own and cross-wage rates. The response of housework of men and women suggests an overall reduction in the amount performed, especially for women. Participation in housework by men falls by 0.19%-points and hours by 0.89%. For women, we also find a decrease in participation (-0.50%-points) and a large drop in hours (-1.84%).

Next consider a change in the tax system, going from joint taxation of married couples to separate taxation for all (so for unmarried couples, nothing changes). Non-participation (zero hours) in market work would increase by 0.15 percentage points for married men and would fall by almost a half percentage point for women. This is in line with common belief that separate taxation of couples would increase participation of married women. In addition to this, average working hours would increase for women by 3.8%. On the other hand, the move to separate taxation would reduce hours of market time of men by 0.68%.

As far as the impact on non-market work goes, moving to separate taxation for all would increase husbands' participation in non-market work by 0.22%-points. Hours of housework by husbands would increase by 0.44%, at the mean. Overall, the picture is that separate taxation leads to husbands doing less market work and more non-market work compared to joint taxation. As far as wives are concerned, hours of house work would fall by 0.55%, suggesting some kind of re-equilibration of the distribution of non-market work among spouses.

Finally, we considered a reform of the "family coefficient". Under the current system, the households with more than two dependent children pay much less income taxes (see Section 3 for details). We simulate the same weights in the family coefficient for any child, so that the tax burden of households with more than two children does not fall disproportionately. We find that such a reform would have little impact on non-market work of parents, but it would

decrease market work by women because of the increased tax burden: participation would fall slightly (-0.15 %-points) and hours would fall by 0.73%.

Overall these results suggest that spouses are responsive to changes in the tax system and in own wages. The sensitivity of one's time allocation to their spouse's wages (cross-elasticities) is generally much smaller. Finally, it looks as if moving from joint taxation to separate taxation would go in the direction of equalizing market and non-market work of husbands and wives.

7. Conclusions

In this paper, we analyze the impact of taxation on the spouses' allocation of time to paid and unpaid work. 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. Neglecting household production may bias the estimates of the wage elasticity of labour supply. The use of a discrete choice specification enables us to incorporate non-linear taxes in the household budget set. An advantage of this model is that it accounts for participation as well as hours decisions. An additional feature of this study is that we model jointly the behaviour of the household members. The model we adopt encompasses both a unitary and a collective approach to describing spouses' time allocation choices. In this study, we also simulate how a shift from a joint taxation system, currently in place in France, to a separate taxation would affect spouse allocation of time to market and non-market activities.

The choice set has over fourteen thousand points for each couple in the sample, since we have allowed for eleven discrete paid market-work intervals and eleven discrete unpaid-work intervals, for each spouse –letting the choice of hours vary from zero to over 10 hours per day, both for market and non-market work. 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 conclude 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 housework, at the cost of either paid work or leisure. For men, the effects of children are much more modest and we only find significant effects for very young children, in the expected direction: an increasing marginal household utility of more male house work, at the cost of mainly male leisure.

We also find that both spouses' time allocation decisions are responsive to changes in the tax system and to upward changes in own wages. For example, an increase of 10% in the wage of women would increase their market participation by 1.13 percentage points and increase by 3.80% their working hours. An increase of 10% in the wage of men would increase their market participation by a similar extent (0.96 percentage points) and increase hours by 2.2%. Upward changes in own wage would reduce own house work time, though for women the effect is smaller than for market hours. The sensitivity of one's time allocation to their spouse's wages (cross-elasticities) is generally very close to zero, except for non-market time of men that reacts positively to changes in their wife wage: participation increase by 0.34%-points and hours by 1.35%.

Finally, it looks as if moving from joint taxation to separate taxation would go in the direction of equalizing market and non-market work of husbands and wives. As far as women are concerned, participation in market work would increase by almost half a percentage point and hours worked would also increase, by 1.78%. 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.

Next, we considered another reform of the "family coefficient". Under the current system, households with more than two dependent children pay disproportionately less income taxes. We simulated the same weights in the family coefficient for any child, so that the tax burden of households with more than two children does not fall disproportionately. We find that such a reform would have little impact on non-market work of parents, but it would somewhat

decrease market work by women: participation would fall slightly (-0.15 %-points) and hours by 0.73%.

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

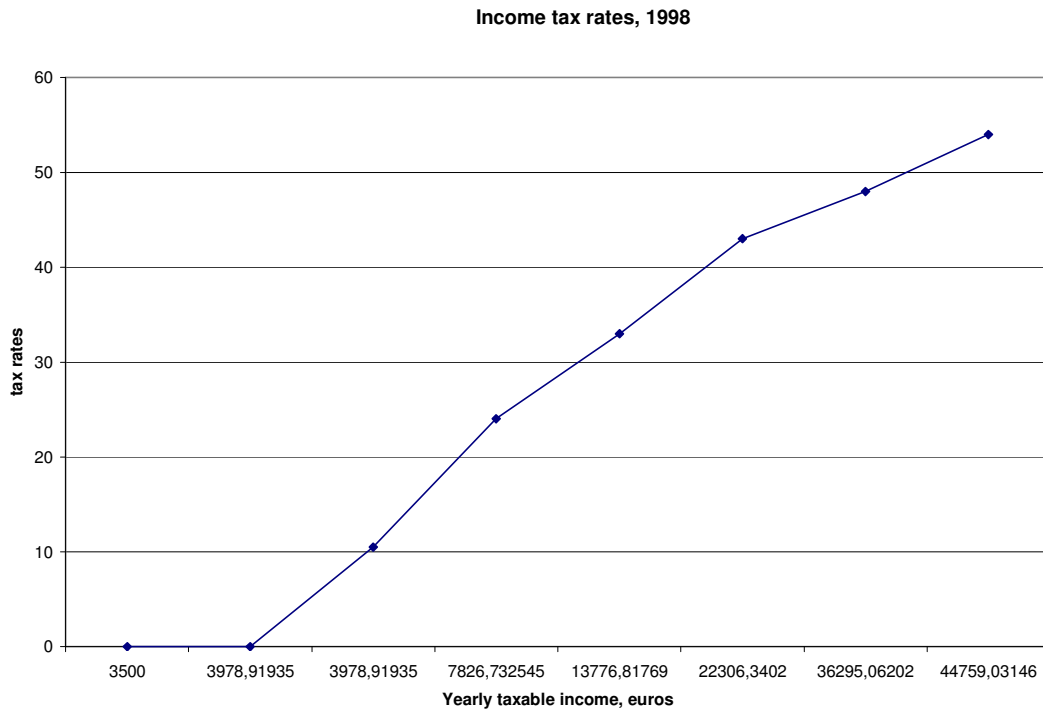


Figure 2. “Marginal” tax rate on wife additional earnings

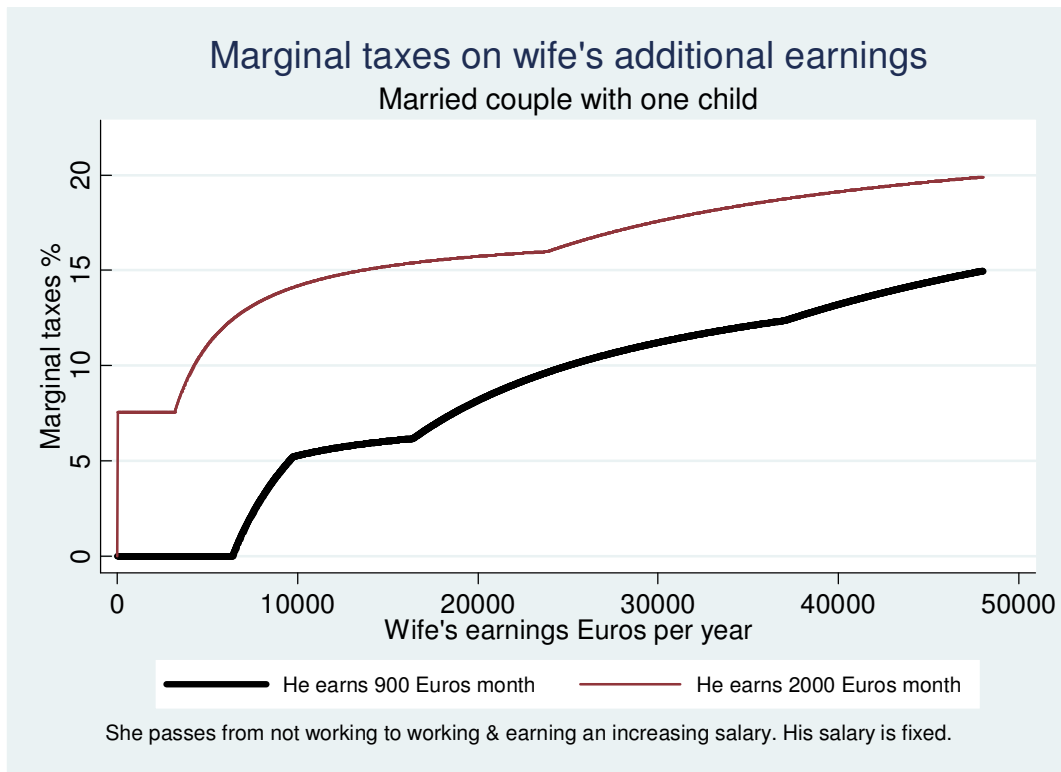


Table 1 Sample selection

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>	2360	47

Table 2. Descriptive Statistics Final Sample

	Husbands		Wives	
	Mean	St dev	Mean	St dev
Age	41.95	9.42	39.62	9.34
Education 1	0.09	0.28	0.11	0.31
Education 2	0.06	0.24	0.10	0.29
Education 3	0.36	0.48	0.27	0.44
Education 4	0.06	0.24	0.05	0.22
Education 5	0.05	0.22	0.09	0.29
Education 6	0.11	0.31	0.13	0.34
Education 7	0.10	0.29	0.10	0.30
French	0.94	0.23	0.95	0.23
Employed	0.89	0.32	0.67	0.47
Unemployed	0.06	0.23	0.08	0.27
Participant	0.94	0.23	0.75	0.43
Self-employed	0.19	0.39	0.20	0.40
Ile-de-France	0.18	0.38		
Regional unemployment rate	11.28	2.35		
Married	0.79	0.41		
Number of children	1.05	1.12		
Dummy child <3 years	0.15	0.36		
Non-labour income, per year	10253.28	15197.24		
Gross hourly wage	10.29	6.26	8.81	5.18
Net income, per year	29819.54	15781.1		
Average Tax %	5.29	4.95		
Usual hours, weekly, for hours positive	37.95	5.28	32.89	9.08
Usual hours, weekly	27.34	19.92	17.93	18.15
Paid work, hours, wk	32.98	19.86	18.91	19.59
Paid work, minutes	395.80	238.31	226.98	235.12
Childcare, minutes	17.07	39.53	60.25	90.56
House work, minutes	68.25	87.93	275.05	168.65
House work (**), min.	117.85	138.70	297.15	179.83
Total work	481.13	215.03	562.27	205.36

The sample size is 2360 couples. Non-labour income and hourly wages are gross of taxes. The median non labour income is 4573.92. Statistics for earnings, household income, wage rates, and taxes are computed over the positive values. House work includes childcare time, which is also shown separately. House work (**) also includes "semi-leisure" activities such as gardening, house repairs, taking out pets, knitting, or making jams. Total work includes paid work, child care and house work.

Table 3. Distribution of Actual Tax Rates for Different Subsamples

	10%	Q1	Median	Q3	90%	Mean	Mean (*)
All couples	0	1.11	3.85	8.65	13.16	5.29 (4.95)	6.75 (4.73)
Married couples	0	1.39	4.49	8.91	13.16	5.71 (5.11)	7.06 (4.77)
Cohabitant couples	0	0	3.12	6.20	8.80	3.75 (3.92)	5.39 (3.65)
Married couples with 1 child	0	2.80	4.49	7.77	10.51	5.53 (4.58)	6.97 (4.06)
Married couples with 2 children	0	1.39	3.21	5.63	8.65	4.01 (3.74)	4.90 (3.57)
The mean (*) is calculated only for couples with positive tax rates. Standard errors are given in parentheses.							

Table 4. Time Allocation of Spouses (in minutes on the diary day)

	10%	Q1	Median	Q3	90%
Husband paid work	0	240	480	550	630
Wife paid work	0	0	180	470	520
Husband house work	0	0	40	100	190
Wife house work	70	140	250	390	510
Husband house work (**)	0	10	70	165	330
Wife house work (**)	80	150	270	440	550
Husband childcare	0	0	0	10	60
Wife childcare	0	0	0	100	190
Husband Total "Work" Time	110	390	530	620	710
Wife Total "Work" Time	280	420	580	700	800

Here house work includes childcare time, which is also shown separately.
House work(**) includes also "semi-leisure" activities such as gardening, house repairs, taking out pets, knitting, making jams. Total "Work" Time includes paid work, house work and childcare time.
Sample size: 2360 couples.

Table 5. Time Allocation of Spouses (in minutes on the diary day).

Couples with young children aged less than three years; 354 couples

	10%	Q1	Median	Q3	90%
Husband paid work	0	270	480	540	600
Wife paid work	0	0	0	400	490
Husband house work	0	30	70	140	230
Wife house work	160	210	380	510	620
Husband house work (**)	0	40	90	180	350
Wife house work (**)	160	220	410	530	630
Husband childcare	0	0	30	70	130
Wife childcare	50	100	160	250	330
Husband Total "Work" Time	180	470	580	670	780
Wife Total "Work" Time	410	590	720	830	970

Here house work includes childcare time, which is also shown separately. House work(**) includes also "semi-leisure" activities such as gardening, house repairs, taking out pets, knitting, making jams. Total "Work" Time includes paid work, house work and childcare time.

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

Couples where both spouses work at least 460 minutes (7.5 hours); 455 couples.

	Percentile				
	10%	Q1	Median	Q3	90%
Husband paid work	470	490	540	600	700
Wife paid work	470	480	500	550	610
Husband house work	0	0	30	70	120
Wife house work	30	80	130	180	230
Husband house work (**)	0	10	50	100	170
Wife house work (**)	40	80	130	180	240
Husband childcare	0	0	0	10	60
Wife childcare	0	0	0	50	110
Husband Total "Work" Time	500	540	600	670	780
Wife Total "Work" Time	560	610	670	760	830

Here house work includes childcare time, which is also shown separately.
House work (**) includes also "semi-leisure" activities such as gardening, house repairs, taking out pets, knitting, making jams. Total "Work" Time includes paid work, house work and childcare time.

Table 7. Husband's share in couple's total time allocated to a given activity (*)

	Percentages			Observations
	Mean	St deviation	Median	
Paid work	66.88	30.96	61.07	2025
House work	20.33	22.86	12.77	2351
House work (**)	26.87	24.49	21.74	2355
Total « Work »	44.42	13.25	46.67	2359

(*) This share is calculated only for couples where at least one spouse spends some time on the activity.
Here house work includes childcare time.
House work(**) includes also "semi-leisure" activities such as gardening, house repairs, taking out pets, knitting, making jams.
Total "Work" Time includes paid work, house work, and childcare time.

Table 8. Husband's share in couple's total time allocated to a given activity (*)

Couples with young children aged less than three years, 354 couples.

	Percentages			
	Mean	St deviation	Median	Observations
Paid work	78.40	28.65	100	297
House work	20.61	18.47	16.51	354
House work (**)	24.83	20.15	20.76	354
Total « Work »	42.47	13.23	44.58	354

(*) This share is calculated only for couples where at least one spouse spends some time on the activity.
 Here house work includes childcare time.
 House work(**) includes also "semi-leisure" activities such as gardening, house repairs, taking out pets, knitting, making jams.
 Total "Work" Time includes paid work, house work and childcare time.

Table 9. Husband's share in couple's total time allocated to a given activity (*)

Couples where both spouses work at least 460 minutes (7.5 hours), 455 couples.

	Percentages			
	Mean	St deviation	Median	Observations
Paid work	51.37	3.92	50.54	455
House work	23.85	24.14	18.18	451
House work (**)	29.22	24.27	27.43	452
Total « Work »	47.36	4.40	47.15	455

(*) This share is calculated only for couples where at least one spouse spends some time on the activity.
 Here house work includes childcare time.
 House work(**) includes also "semi-leisure" activities such as gardening, house repairs, taking out pets, knitting, making jams.
 Total "Work" Time includes paid work, house work and childcare time.

Table 10. Estimation Results: Narrow definition of house work;
11 discrete choices each activity, giving 14,641 points in the choice set of the household

	Coefficient	St error	
(Husband's leisure)^2	0.056	0.003	**
(Husband's house work)^2	0.092	0.007	**
(Wife's leisure)^2	0.035	0.004	**
(Wife's house work)^2	0.043	0.004	**
Income^2*Husband's leisure	0.007	0.002	**
Income^2*Husband's house work	0.017	0.003	**
Income^2*Wife's leisure	0.009	0.002	**
Income^2 *Wife's house work	-0.004	0.002	**
Husband's leisure* Husband's house work	0.122	0.004	**
Husband's leisure* Wife's leisure	0.026	0.002	**
Husband's leisure* Wife's house work	0.002	0.002	
Wife's leisure* Husband's house work	0.002	0.003	
Wife's leisure* Wife's house work	0.000	0.003	
Wife's housework * Husband's house work	0.109	0.003	**
Income	-0.175	0.079	**
Husband's leisure	5.206	1.586	**
Husband's leisure* log age	-4.816	0.862	**
Husband's leisure* log age^2	0.691	0.118	**
Husband's leisure* married	-0.036	0.018	**
Husband's leisure* number children	-0.002	0.008	
Husband's leisure* any child younger than 3	-0.041	0.022	*
Husband's leisure* any child age 3-5 years	-0.003	0.022	
Husband's house work	-3.466	3.594	
Husband's house work * log age	-0.935	1.965	
Husband's house work * log age^2	0.128	0.269	
Husband's house work * married	-0.056	0.036	
Husband's house work * number children	0.036	0.017	**
Husband's house work * any child younger than 3	0.193	0.042	**
Husband's house work * any child age 3-5 years	0.049	0.039	
Wife's leisure	8.394	1.651	**
Wife's leisure* log age	-6.050	0.921	**
Wife's leisure* log age^2	0.828	0.129	**
Wife's leisure* married	-0.053	0.022	**
Wife's leisure* number children	-0.025	0.011	**
Wife's leisure* any child younger than 3	-0.029	0.027	
Wife's leisure* any child age 3-5 years	0.023	0.028	
Wife's house work	0.474	2.054	
Wife's house work * log age	-2.712	1.144	**
Wife's house work * log age^2	0.421	0.159	**
Wife's house work * married	0.096	0.026	**
Wife's house work * number children	0.141	0.011	**
Wife's house work * any child younger than 3	0.275	0.028	**
Wife's house work * any child age 3-5 years	0.095	0.026	**
<i>Standard deviations unobserved heterogeneity terms</i>			
Sigma leisure Husband	0.002	0.014	
Sigma leisure Wife	0.011	0.032	
Sigma house work Husband	-0.015	0.017	
Sigma house work Wife	0.001	0.019	

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

Table 11. Marginal Derivatives of the Objective Function: 11 discrete-choice intervals for paid work and 11 for housework of husband and wife, giving 14641 points in the choice set

	Average marginal utility	Proportion with negative marginal utility
Income	0.554	0.000
Husband's leisure	0.661	0.000
Husband's house work	0.385	0.025
Wife's leisure	0.283	0.127
Wife's house work	1.425	0.000

Note: Marginal derivative with respect to hours of paid work of husbands and wives normalized to zero.

Table 12. Predicted and actual discrete choices of paid and unpaid work
Narrow definition of house work; 11 discrete choices per activity

<i>Hours per day</i>	<i>Husband</i>		<i>Wife</i>	
	<i>Predicted</i>	<i>Actual</i>	<i>Predicted</i>	<i>Actual</i>
Market work				
0	0.1284	0.2186	0.3117	0.4636
1	0.0679	0.0093	0.1431	0.0093
2	0.0443	0.0059	0.0779	0.0161
3	0.0349	0.0076	0.0501	0.0216
4	0.0322	0.0178	0.0378	0.0415
5	0.0342	0.0178	0.0332	0.0335
6	0.0415	0.0246	0.0338	0.0403
7	0.0572	0.0644	0.0396	0.0758
8	0.0892	0.2483	0.0531	0.1640
9	0.1572	0.1763	0.0808	0.0805
>=10	0.3130	0.2093	0.1389	0.0537
Mean	6.469	6.679	3.787	3.833
Non-Market work				
0	0.4410	0.4263	0.0700	0.0322
1	0.2523	0.2797	0.0882	0.0886
2	0.1407	0.1288	0.0995	0.1297
3	0.0784	0.0831	0.1070	0.1623
4	0.0436	0.0394	0.1150	0.1212
5	0.0235	0.0199	0.1227	0.1030
6	0.0118	0.0140	0.1229	0.1034
7	0.0054	0.0047	0.1092	0.0797
8	0.0022	0.0017	0.0832	0.0746
9	0.0080	0.0017	0.0534	0.0449
>=10	0.0003	0.0008	0.0289	0.0606
Mean	1.198	1.199	4.619	4.667

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

	Husbands		Wives	
	Participation (%-points change)	Average Hours (%-change)	Participation (%-points change)	Average Hours (%-change)
	Market work		Market work	
Wage changes				
Wife's wage + 10%	-0.02	-0.18	1.13	3.80
Husband's wage + 10%	0.96	2.32	0.03	-0.17
Both spouses' wage +10%	0.95	2.04	1.15	3.58
Taxation changes				
Separate taxation for the married	-0.15	-0.68	0.45	1.78
Same weight to all children	-0.07	-0.23	-0.15	-0.73
	Non-market work		Non-market work	
Wage changes				
Wife's wage + 10%	0.34	1.35	-0.45	-1.68
Husband's wage + 10%	-0.53	-2.20	-0.05	-0.19
Both spouses' wage +10%	-0.19	-0.89	-0.50	-1.84
Taxation changes				
Separate taxation for the married	0.22	0.44	-0.11	-0.55
Same weight to all children	0.01	0.13	0.02	0.18

Note: The baseline model specifies 11 discrete-choice intervals for paid work and 11 for housework 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. To calculate responses to giving the same weight to all children for taxation purposes. Only couples with two or more children were considered both for the baseline scenario and the simulation.