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# The influence of taxes on employment of married women, evidence from the French joint income tax system

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# **The influence of taxes on employment of married women, evidence from the French joint income tax system**

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## **Abstract**

This article estimates the elasticity of participation in the workforce of married women with respect to the rate of income tax. We take advantage of the French joint income tax system and a large tax returns data base to implement a regression discontinuity design.

The negative impact of tax rates on participation is generally strong. This elasticity describes a U-curve along the distribution of income per consumption unit. Participation is more elastic at the lower end of the income distribution. Participation elasticity increases with the wife's age and the age difference between the spouses. It is even greater when the husband is retired. An increase of this elasticity occurs after the third child and subsequent but not for the two first children. When these two first children are young, the elasticity of their mother is even lower.

## **1. Introduction**

Understanding the behavior of married women in the labor market matters both for microeconomic theory and public policy. It sheds light upon differences or inequalities between men and women both as couples and with regard to professional opportunities. While the gender gap in remuneration is still significant (e.g. Altonji and Blank 1999, Blau and Kahn 2000, Bertrand et al. 2009, Bertrand 2011), there are also major differences in workforce participation, and not only because of differences in expected wages. These behavioral differences can be related to many factors, one of which is family structure and child care (e.g. Angrist and Evans 1998), reflected by the importance of access to child care facilities and their cost (e.g. Lefebvre and Merrigan 2008, Baker et al. 2008).

Fiscal policy also plays an important role for the supply of labor, and the aim of the present paper is to precisely assess this role, disentangling it from other motive of (non-)participation to the workforce. Taking advantage of the joint taxation of the French income tax system, it implements a regression discontinuity design to estimate the elasticity of married women's labor supply at the extensive margins with respect to the participation tax rate.

Men and women behaving differently as regards workforce participation may have a significant impact on the determination of optimal fiscal policies. Alesina et al. (2007) argued that an income tax schedule should not solely depend on the level of income, but also should take into account the gender and marital status of the person being taxed. They concluded that if the disincentive for women to work is to be reduced then their tax rate should be reduced.

In this respect the fiscal treatment of married couples in France may prove counterproductive. While married men and women are treated symmetrically, this system of joint taxation – compared with individual taxation – significantly reduces the tax paid on a husband's salary and increases the one paid by the wife once the couple adopts the stance that the husband is the principal wage earner then the wife opts to work, or not. Indeed, the mean of the two members is applied to the progressive tax schedules, and then the resulting income tax is doubled. Therefore, such joint taxation offers a reduction in tax paid by couples where partners have different income. If the husband is the only partner working, the household finances benefit from this reduction, but this benefit disappears as the wife's income increases. Hence this loss of fiscal benefit represents an excessive tax burden on married women's incomes. Despite this disincentive impact of joint taxation, it is maintained in France for equity motives: progressive taxation at the household level to tax in proportion of the ability to pay.

This kind of taxation is subject to debate in the countries where it is set. According to Pearson and Blinder (2012), ten countries still implement this tax system<sup>1</sup> among which France, Germany and the United-States, and several others have transferable allowances generating similar disincentives. The debate over shifting to individual taxation is now important in Germany. In the recent years, three simulations (Steiner and Wrohlich 2004, 2008, Fehr et al. 2013) evaluated ex ante the impact on women employment of such a tax reform. Thanks to reforms already which occurred in other countries,

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<sup>1</sup> These countries are Estonia, France, Germany, Luxembourg, Ireland, Norway, Poland, Portugal, Switzerland and United-States.

some papers evaluated this impact ex post through natural experiment methodologies: LaLumia (2008) on US reform in 1948, Selin (2009) on Swedish reform in 1971 and Kališková (2013) on Czech reform in 2005. These three double difference estimations found substantial impact, mainly on wives of wealthy husbands.

The objective of the present paper is not only to evaluate the impact of this system on the participation of married women to the workforce. It is also to take advantage of joint taxation to estimate the labor supply of married women with regards to taxation. Indeed, it provides an innovative quasi-natural experiment framework to do it: according to assumption that wives' decision as regards to participation occurred after their husbands', the joint income tax system generates discontinuities in the participation tax rates faced by married women. This allows implementing regression discontinuity design estimations. The size of the data base allows implementing separate estimations for numerous sub-samples. Furthermore, thanks to discontinuities for very low income, the present paper estimates specifically the participation elasticity of women at the lower end of the income distribution, which proves very large.

This paper contributes to the literature on labor supply behavior thanks to this empirical strategy and an original and precious tax return data base. The participation of married women in the workforce has already been discussed in other papers, in addition to those specifically evaluating joint taxation impacts. Blundell and Laisney (1988) and Dagsvik et al. (1988) estimated labor supply models using French data and deduced elasticities for the participation of married women in the workforce. Both found a

strong positive effect from net wages (which should correspond to a strongly negative effect of marginal income tax rates) and a weaker negative effect with respect to the wealth of the household. Blundell et al. (1998) applied natural experiment econometrics to fiscal reform in the 1980's in the UK and estimated a stronger negative impact for income on workforce participation of married women with children.

These analyses are general estimations of the elasticity of the labor supply of married women at the extensive margin. They tacitly presume that different married women behave similarly on the labor market. The aim of the present analysis is to assess different elasticity of married women participation to the workforce for different socioeconomic categories of households. This is possible thanks to the large number of observations compiled on the data base: it contains a representative sample of 497,920 tax returns out of the 35,105,854 filed in 2006, with all the information declared but the names and addresses.

Section 2 explains the French income tax system, which proves to be quite complicated, with a large number of exemptions, deductions and reductions. It focuses particularly on the joint taxation system. Considering that the ability to contribute to public finance should be measured at the household level, the sum of income of all the members of the household are taxed together. As average tax rate for households with the same income per consumption units is often lower for singles than for couples under individual taxation, the reverse is true under joint taxation. French tax system also has great impact on the participation tax rate of secondary earners, who are mainly the wives.

Section 3 presents the data used for the present econometrics. It consists in a very rich and original data base: a large sample of 497,420 income tax returns files for 2006 personal income taxation of 2005 income. The weakness of the data base is the lack of variables not related with the calculation of income taxation, even if information on related variables is very precise. Its strength is the number and representativeness of observations – even for small socio-economic categories – allowing estimation differentiated by characteristics of households. Some descriptive statistics are also presented.

Section 4 explains the identification strategy. It is shown theoretically and verified on data that the French joint income tax system creates discontinuities in the wives' participation tax rates along the taxable income per tax unit minus the wife's wages. This last variable is then chosen as assignment variable in the regression discontinuity design. The validity of this approach – the non-manipulation of the assignment variable – is then confronted to literature results, theoretical arguments and empirical tests. Finally the estimation set up is detailed.

Section 5 presents and interprets the results. The regression discontinuity design is implemented for the whole sample and on several subsamples in order to assess the differences in behavior of different kinds of married women. It is established that the elasticity of married women's participation to the workforce with respect to tax rate describes a U-curve along the distribution of income per consumption unit – whatever asset returns only or all income but the women's wage. In addition, this elasticity increases with the wife's age and the age difference between the spouses. It is even greater



when the husband is retired. Last, increase of this elasticity related to children appears only for the third and subsequent children. Reversely, mothers of one or two children are less elastic than other wives while their children are very young.

Section 6 concludes, summarizes the results and compares them to the literature. The overall results are similar, which allows shedding light on one important contribution of the present paper: understanding the differences of behavior between different married women. Last, these results are exploited in order to evaluate the aftermath of joint taxation in terms of participation of married women on the labor market.

## **2. The French joint income taxation system**

In France, with the exception of a few very unusual cases<sup>2</sup>, spousal incomes are jointly taxed, along with any income that the couple's children's might have (according to age and student status). The husband is called "*principal tax unit member*" and the wife is called

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<sup>2</sup> Four cases are possible for married individuals declaring separately: in its first paragraph, article 6 of the general tax code establishes that "*except when clauses 4 and 5 apply, married people are subject to joint taxation on the incomes received by each of them as well as those of their children and dependents.*" The cases where this does not apply are given in paragraphs 4 and 5 of the same article: paragraph 4 establishes that "*spouses are subject to separate taxation: a. When their goods and chattels are separated and they do not live under the same roof; b. When in the case that they are physically separated or divorced, they have been authorized to have separate residences; c. When in the case of abandonment of the marital home by one or the other, they have established separate incomes*" and paragraph 5 discusses income taxation for the year during which the marriage is concluded.

the ``spouse'': subsection 1 of article 6 of the general income tax code explains that ``*this tax is administered in the name of the husband, preceded by the title 'Mr or Mrs'.*" This administrative denomination of the husband as the head of the household for the tax services is not without economic significance. It corresponds to the fact that for a large proportion of married couples, husbands are still primary earners and wives secondary earners.

In addition to the husband and wife, the tax household is constituted of the dependent persons. They are mainly minor children but they also may be young adult children if still student, elderly or disabled adults. A number of tax units (*quotient familial*) is given to each tax household depending on its composition. Husband and wife each count as one unit, the first two dependent persons generally count as half a unit each, the third and subsequent count as one unit each (all cases are presented in table 1).

**Table 1: Description of the French joint income tax system**

The number of family units per fiscal household							
Marital status	Number of dependent people					suppl.	
	0	1	2	3			
Couple (joint tax return) (2 shares)	2.5	3	4			+1	
Couple (separate tax return)	1	1.5	2	3		+1	
Single	1	2	2.5	3.5		+1	
Widow	1	2.5	3	4		+1	
Schedule of marginal income tax rate for 2005 income			Tax bracket		Marginal tax rate		
First bracket			0	4,412	0%		
Second bracket			4,412	8,677	6.83%		
Third bracket			8,677	15,274	19.14%		
Fourth bracket			15,274	24,731	28.26%		
Fifth bracket			24,731	40,241	37.38%		
Sixth bracket			40,241	49,624	42.62%		
Seventh bracket			49,624	...	48.09%		

Notes: The first part of this table represents the number of family units attributed to a household in relation to its composition. Dependent people are mainly children, but they may also be elderly or handicapped adults. This number of tax units then serves to calculate the household's joint tax, according to the marginal tax rate schedule presented in the second part of this table. The thresholds of the brackets are in euros.

The income earned one year by all members of the tax household – net of social contributions, abatement, and tax deductions (the taxable income) – is added up and then divided by the number of tax units to determine the taxable income per tax unit taxed the following year. This taxable income per tax unit is taxed according to a progressive schedule (piecewise linear) constituted with 6 tax brackets in 2014 and with 7 tax brackets at the time of the data used for the present study: 2005. The tax schedule for 2005 income is presented in table 1. The tax schedule has been stable over the period before 2005 except that tax thresholds have been adjusted for inflation. Therefore, even though it is quite complicated, it is intuitively known by French taxpayers thanks to experience. It eventually changed significantly for the 2007 taxation of the 2006 income. This is the reason why the case of the 2006 taxation of 2005 income is chosen for the study.

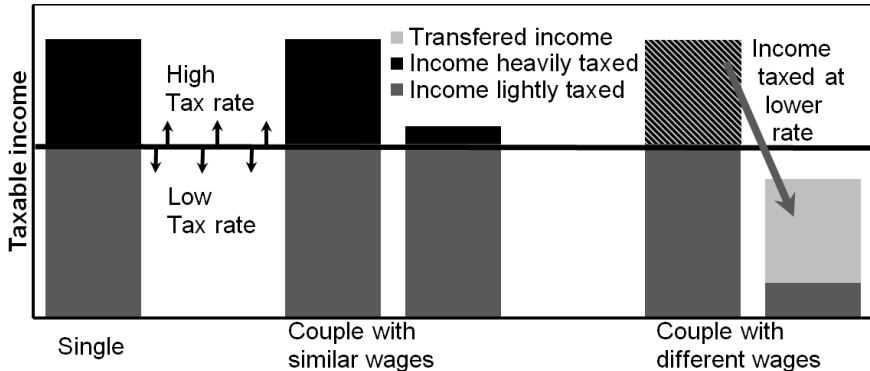
More precisely, let  $q$  denote the number of family units of a given household. Taxable income is  $Z=(1-s)Y_w+Y_o-D$  where  $Y_w$  is the gross wages,  $s$  the social contributions,  $Y_o$  the other income and  $D$  the tax deductions. Taxable income per family units  $z=Z/q$  is taxed according to the tax schedule  $T[\cdot]$ : the 4,412 first euros of  $z$  are not taxed, the following 4,265 euros (8,677-4,412) taxed at marginal rate equals 6,83%, and so on... which gives the gross income tax per tax units  $T[z]$ . The gross income tax for the tax household is  $q.T[z]$  and the net income tax  $\max(q.T[z]-R)-C$  where  $R$  are the total of tax reduction and  $C$  the total of tax credit. For 2005 income taxed in 2006, fiscal expenditure on income tax (deduction, reduction and credit) amounted for 36 billion euros for actual income tax revenue of 58 billion euros (3% of GDP), according to the 2007 fiscal

assessment. Last, there exists a mechanism of tax diminishing for very low tax amount and a minimum of perception.

Consequently, joint taxation diminishes the tax of households with more dependent persons: the tax schedule is progressive and so function  $T[\cdot]$  is convex; hence,  $(q+1).T[Z/(q+1)] < q.T[Z/q]$ . This tax decrease is stronger for higher income households but there exists a ceiling of the tax advantage due to dependent persons. Compared to individual taxation, it also decreases taxation of couples with different incomes<sup>3</sup>. Always because of the convexity of  $T[\cdot]$ ,  $2.T[Z/2] < T[a.Z] + T[(1-a).Z]$  when  $a$  is different to  $1/2$ . As an example, let us consider a couple without dependent children whose taxable income is 20,000 euros. The taxable income per family unit is 10,000 euros. The unit and gross income tax are respectively  $(10,000 - 8,677) * 0.1914 + (8,677 - 4,412) * 0.0683 = 544$  and  $544 * 2 = 1,088$  euros. A single with the same taxable income would pay  $(20,000 - 15,274) * 0.2826 + (15,274 - 8,677) * 0.1914 + (8,677 - 4,412) * 0.0683 = 2,889$  euros.

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<sup>3</sup> However, some couples with similar low earnings may be disadvantaged by joint taxation, if they benefit individually but not jointly from the *decôte* mechanism or the minimum of perception. The amount of the disadvantage keeps low.

**Figure 1: The principle of joint taxation**

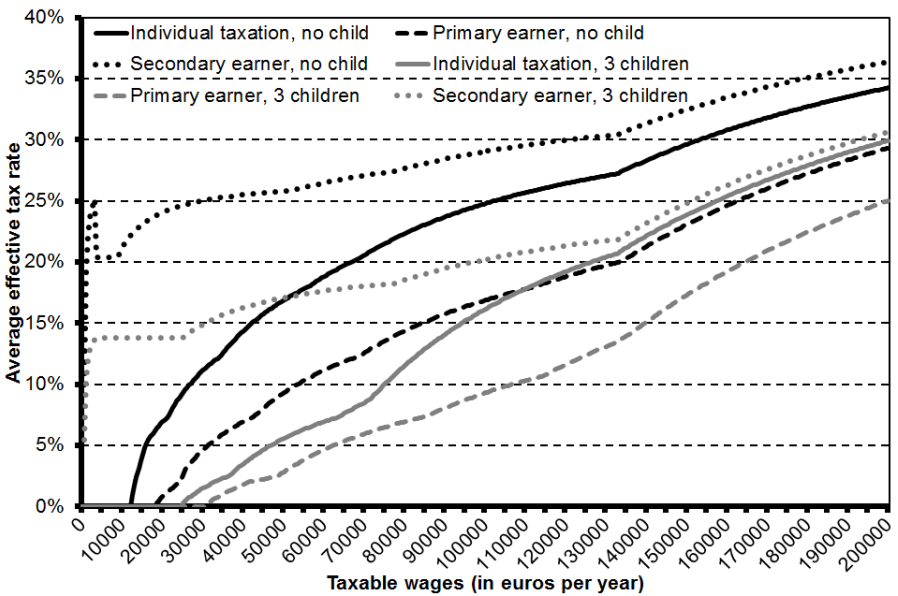
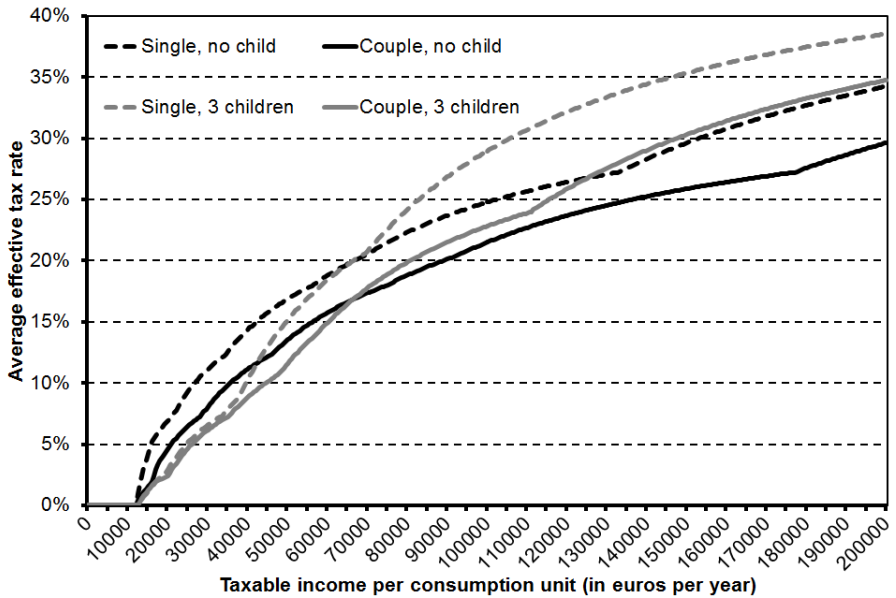
Notes: It is assumed that the tax schedule is made of two brackets, the first one in light grey taxes income at low marginal rate and the second one, in dark grey taxes income at high marginal rate. The principle of joint taxation is to mutualize the low tax bracket of the members of the tax household.

This may be intuitively understood looking at figure 1. Let us consider only two tax brackets. The rationale for progressivity is that first euros of income are more necessary than subsequent ones – due to marginally decreasing utility – and therefore gives to its owner a lower ability to contribute. Therefore, the first bracket gives to taxpayers an amount of income lightly taxed. With individual taxation each individual loads her individual low rate bracket, and subsequent euros of income are tax at the high marginal rate. But with joint taxation, if one member of the couple does not load fully her low rate bracket, the remaining right to be taxed at low rate is transferred to her spouse. Therefore, joint taxation is advantageous for couples compared to individual taxation, if this transfer happens,

that is if one member of the couple does not load the low rate brackets: if the incomes of the members of the couple are significantly different.

The rationale for joint taxation is linked with equity: it is to consider that the members of a family share their household, and therefore that the ability to contribute should be understood at the family level. However, each member of the couple counts for one as there exist economies of scale in the couple's necessary consumption. Therefore, joint taxation has the impact of taxing more single than couples with the same taxable income per consumption units (the usual way to compute consumption units is to give one unit for the first adult, half a unit for subsequent adults and 0.3 unit for children). This is shown in figure 2a which draws the average effective tax rate of the French legislation with respect to taxable income per consumption unit, for different household compositions.

**Figure 2: Consequences of joint taxation**





Notes: author calculation of income tax based on the French tax law for 2005 income taxed in 2006, including earned income tax credit, *décôte* and minimum of perception mechanisms. Consumption units are one for the first adult, 0.5 for the second adult and 0.3 for each child. Primary earner average tax rate is calculated assuming secondary earner does not work. Secondary earner average tax rate is calculated assuming primary earner wage is equal to five times the minimum wage.

Furthermore, even if formally symmetric, joint taxation actually creates a great difference of taxation between the members of the couple. Let us consider that the couple itself is asymmetric vis-à-vis the labor market, and more precisely that a primary earner works if he can and a secondary earner then decides whether or not to participate in the workforce. In that case, joint taxation grants a tax reduction to the primary income earner (before the decision of participation of the secondary earner). In addition, because this tax reduction shrinks as the secondary income earner's salary rises, secondary earners are double taxed by the direct marginal taxation rate and by the marginal loss of this tax advantage. This is illustrated in figure 2b which draws the average effective tax rate of the French legislation with respect to individual wage, depending on primary or secondary earner status. This constitutes a disincentive to participate to the labor market for secondary earners.

The main objective of this paper is not to evaluate the joint taxation (even if the results allow understanding the impact of joint taxation on labor supply) but to use French joint taxation as a natural experiment to estimate the behavior of married women vis-à-vis the labor market. Indeed, the joint taxation system, associated with piecewise linear tax schedules, creates quasi-discontinuities in the

participation tax rate of married women, with the assignment variable being the taxable income per tax unit of the household without the potential wife's wages. The empirical strategy is presented in section 4. Before, section 3 presents the data base.

### 3. Data

This study is based on the analysis of an original data base. It consisted in a large sample of French tax returns for the 2006 personal income tax of the 2005 income. Every year, the French Tax Agency (DGFIP - *Direction Générale des Finances Publiques*) assembles a large sample of tax returns, representative of the whole sample. To insure representativeness for all categories of population – even the less numerous – the data base is built by cluster sampling. The 35,105,856 income tax returns filed in 2006 were divided into 8,424 clusters according to diverse economic, social and geographic criteria: the tax code, the level of taxable income, the principal source of income (salary, independent, returns on assets, pensions), the number of tax units and the local tax administration that first examined the income tax return. Each cluster is given a coefficient of selection  $w$  according to the number and the diversity of the tax returns it contains. Then a simple random sample is implemented on each cluster to select a proportion  $1/w$  of the initial observations of the cluster. Differentiating the sampling ratio allows an emphasis upon very small socioeconomic categories, which could never be reflected in a representative sample if the tax return file were sampled proportionally. Specifically, the sampling weight can extend as far as  $w=1$  (exhaustive cluster in the sample) for tax households with the highest incomes, which permits the inclusion of a significant

number of very wealthy households despite their small proportion among the French population as a whole.

The size of the data base – it contains 497,920 tax returns for the 2006 income tax – and its representativeness, are important assets of this data base. It allows obtaining significant results differentiated for different socio-economic categories. The present paper not only estimates overall elasticity of wife's participation to the market, but also enables to compare the behavior of wives of different socio-economic categories. Furthermore, the tax return files contains very precise figure of the income of the tax household: exact value for each member of the household, per type of income (pension, wages, unemployment benefit, self-employed income, financial asset returns, bonuses, real-estate, plus-value depending of the kind of asset sold...). It also contains information of the composition of the tax household: number, age and status (husband, wife, children, disabled...). In addition, there is a large number of other information linked with the huge number of tax deduction, reduction and credit.

Nevertheless, this data base has also disadvantages. The variables not linked with the calculation of the income tax are missing. For example, there is no direct information on the level of education of the member of the households. However, the empirical strategy gets rid of the disadvantages and takes profit of the advantages of this data base. It is presented in more details in section 4. Neither is there information on wealth of households: there is no data on stock of capital. However, data on income, even capital income, are detailed in the base, and provide a good proxy for wealth.

For the 2006 assessment of 2005 incomes, the total amount of income declared was more than 823 billion euros, of which 63.2% were wages. The bottom 30% of households on the income scale earned 7.8% of all income. The top 30% of households on the income scale earned 62.0% of all income, and the middle 40% of households earned the remaining 30.2%. The top 10% of households on the income scale earned 34.0% of all income, and households in the upper 1% earned 9.9% of all income. Among the 35,105,856 tax households that declared their income in 2006, 12,399,237 were composed of married couples filing jointly.

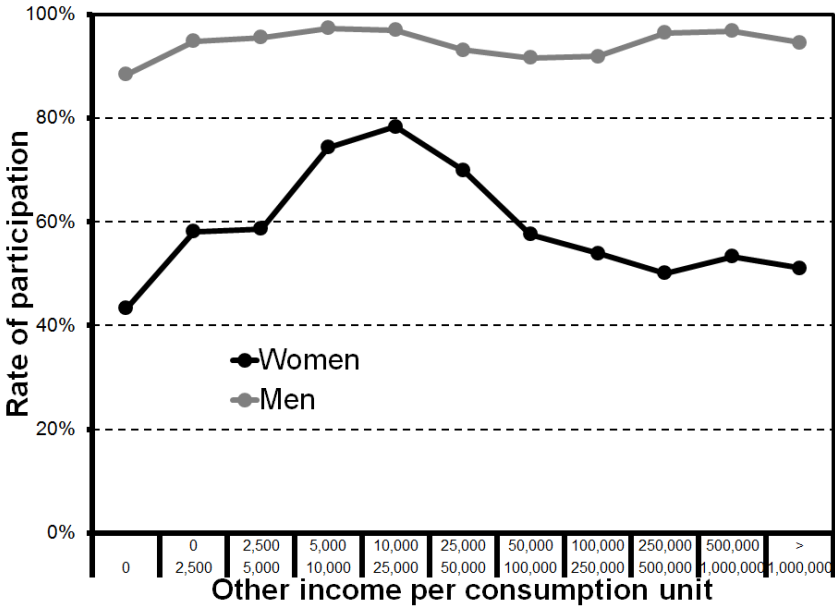
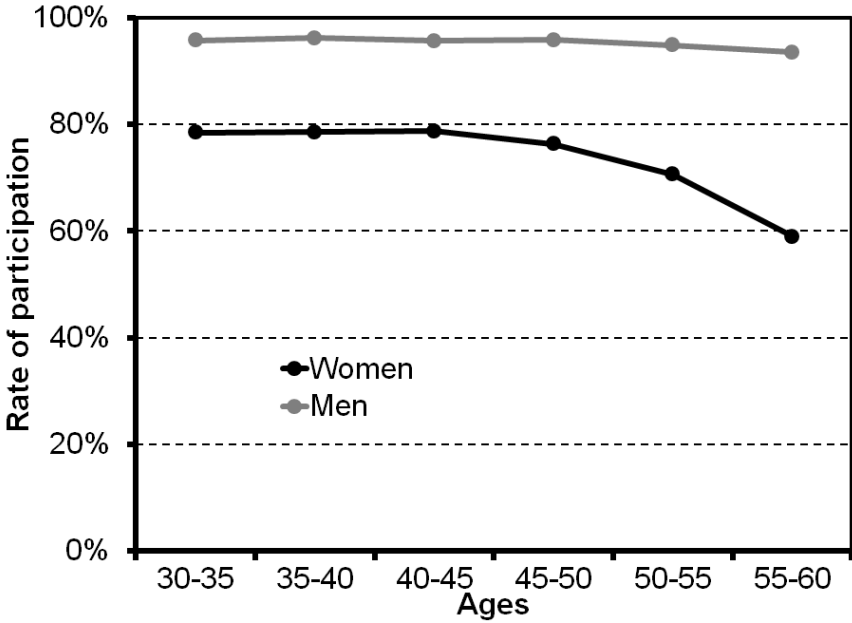
From the full sample, only married couples with a wife aged between 30 and 60 are kept. The age limits are set to be sure to be outside the usual time for education or retirement. In addition, any household with self-employed income is dropped from the data base. Hence, all women may be only salaried, inactive or retired. The existence of social benefit loss due to participation may induce biases that are discussed in the empirical strategy section: the risk of bias is limited to estimation around the first threshold. Therefore, households around this first threshold are dropped from the data base when estimating general elasticity or elasticity for different households depending on their income, age or family composition. The final sample is composed of 93,728 including households around the first threshold and 82,821 observations excluding them.

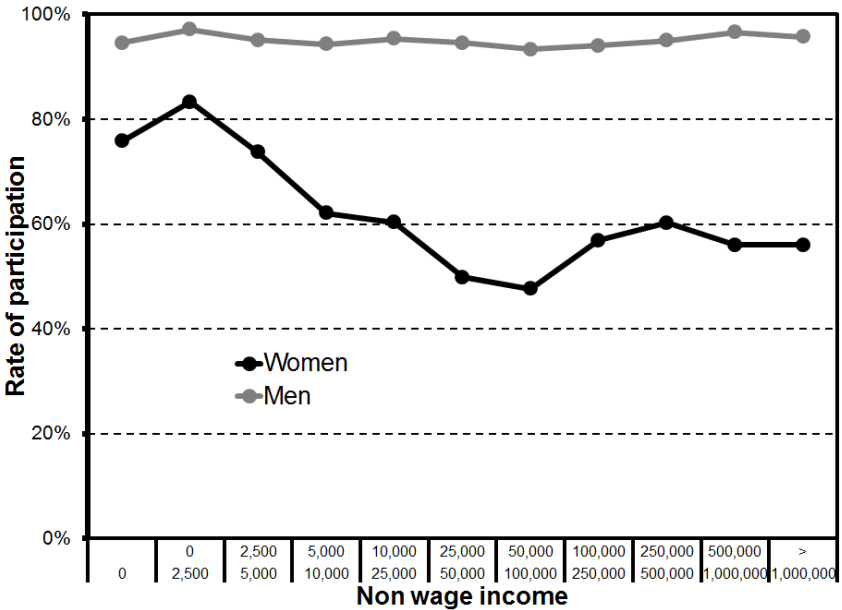
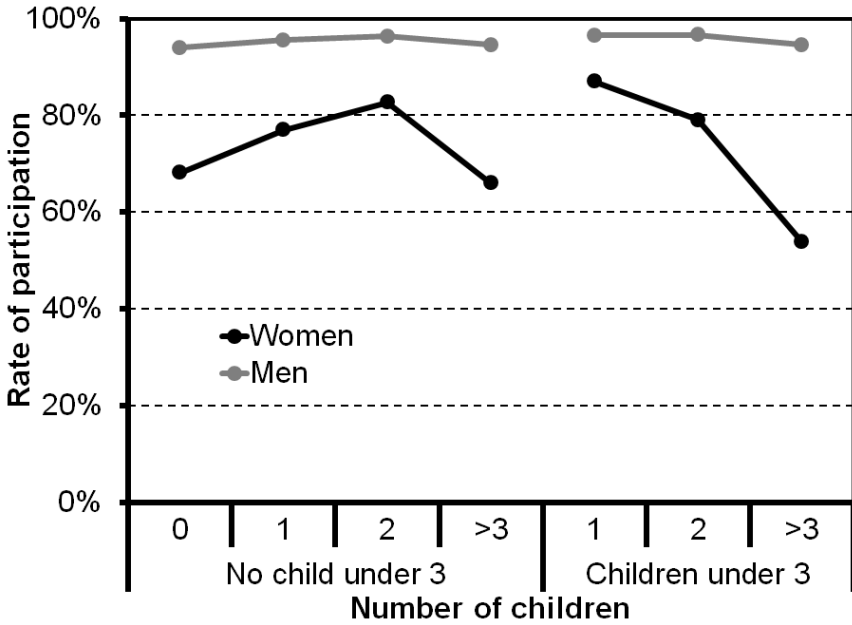
The wives are considered active if they earned during the year a positive amount of wage or unemployment benefit. This is not a perfect assessment of activity, but is altogether precise. The employment benefit considered comes from insurance-based system, under condition of active employment search controlled by the

unemployment agency. Therefore, women earning wages or unemployment benefit are actually active women. It may be that some women earning neither wages nor unemployment benefit are actually searching for jobs but are out right for unemployment benefit. However, this proportion is very small - unemployment benefits are quite generous in France in matters of length. Mainly, it only increases noise, and therefore standard errors in the estimations, but it does not induce estimate bias: this is more clearly explained in the empirical strategy section.

Drawing the variations of the activity rate (among non-retired) with ages, family composition, income other than the wife's wages, and non-wage income (figure 3), it appears that participation rate of wives is very irregular as those of husband is both very stable and very close to 100%. This sustains the identifying assumption presented and defended in section 4 that husband participate if they can then wives chose to participate or not.

**Figure 3: Rates of participation to the labor market**





Notes: Rates of participation of non-retired husbands and wives aged between 30 and 60, with no self-employed income.

Source: DGFIP, sample of French tax returns for 2006 income tax.

This variation of wives' participation to the workforce with regards to age is quite straightforward: it decreases. What is noticeable is that the decline of participation is substantial, and that it begins early. The first decrease is visible for wives aged between 45 and 50, far before retirement, but probably long after child bearing. Multiple explanations of this phenomenon may be given. First, it may be due to a composition effect, older wives live in wealthier households, and more may stop working because the need for more income is weaker. Furthermore, the need to preserve career opportunities in case of income shock during the life-cycle may be an incentive for younger wives to go on working even if they feel no immediate need for income. This last explanation deals with participation motives not directly linked with immediate earnings; there may be also motives more disconnected to earnings: stimulating interest for the job when young and lassitude at work increasing with age. In addition, older wives are less likely to be responsible of young children and therefore freer to arbitrage between income and leisure. Last, they are more likely to be married with a retired husband, which changed the arbitrage in favor of leisure.

Looking at the impact of children, it appears that only the third child (and subsequent children) has a negative impact on participation of mothers, in accordance with the results of Angrist and Evans (1998) showing that it is a causal impact. Furthermore, the third and subsequent children have a stronger negative impact on their



mother's participation when younger than three (public preschool in France begins at age three). The lower participation of mothers of children older than three, compared with mothers of less children, may come from direct impact of child care or from persistence of the effects of leaving the labor markets (e.g.: Lequien 2012). The others differences in participation may be explained by composition effects related to age. Mothers of one child under three participate more than mothers of one child over three, and they are likely to be younger. The oldest wives, with no more dependent children, take part of the no child category, explaining the lowest participation rate of these women.

Last, the income effect – women in wealthier households participating less – is confirmed by figures plotting participation rate with respect to other household income and non-wage income. However, figure for other income (and less strongly for non-wage income) show inversed U curve instead of monotonously decreasing curves. This may come from a very low employability in the very bottom of the income distribution, generating discouragement to participate or very long term unemployment (considered as inactivity in the data base). Nevertheless, the increasing part of the curves represents the small minority of household represented in the data base.

#### **4. Empirical strategy**

As presented in section 2 describing the French joint income tax system, the taxation of the wife's earnings depends on the other income of her tax household. More precisely, considering the

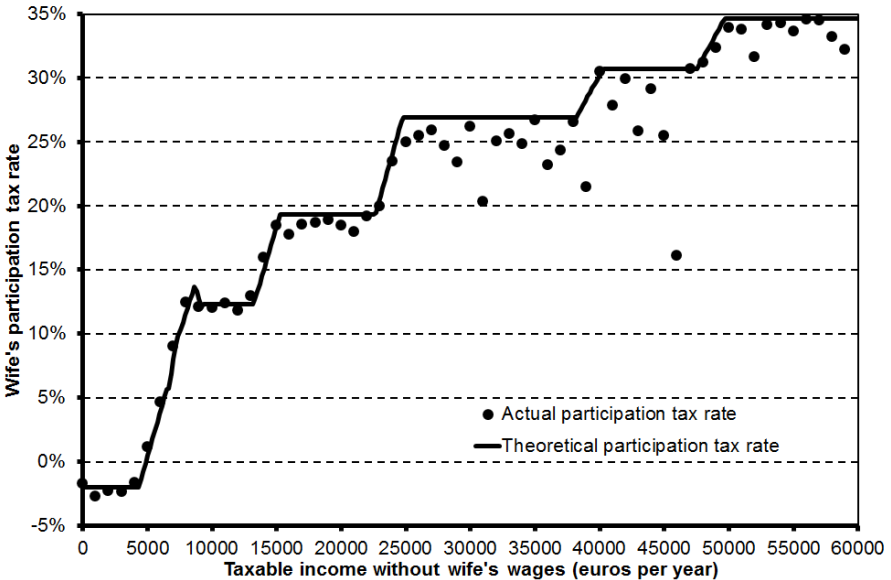
household's taxable income per tax unit minus the potential wife's wage as assignment variable, the wife's participation tax rate meets discontinuity at the thresholds of the tax schedule, between the brackets with different marginal tax rates. This opens the opportunity of estimating married women participation elasticity with respect to taxes through regression discontinuity design. The aim of the present section is to describe and defend this identification strategy.

The first issue consists in defining and calculating the participation tax rate. The very first euros earned by the wife undergo perfect discontinuity at the threshold between tax brackets. However, the participation decision is not made only on the very first euros earned per year. Furthermore, potential wage that may be earned if she participates depends on her productivity, which is known neither for those participating nor those inactive. There is no information on work duration in the data (except for low income through earned income tax credit) and I cannot know if a given annual wage corresponds to part time work at high wage rate or full time work at low wage rate. In top of that, the identification strategy needs an exogenous participation tax rate as regressor. Therefore, a counterfactual arbitrary wage is introduced for calculating the participation tax rates. In addition, the dependent variable is participation (at least very small) or non-participation at all to the workforce, and hence the participation tax rates should concern the first quantum of work which may be supplied by married women. The counterfactual arbitrary wage should be small: it is set to half time at the minimum wage.

Assuming that all information of tax return keep alike (particularly tax deduction, reduction and credit) but that linked with the actual

wife's wage, I calculate income tax of the household if the wife does not work and if she works for the counterfactual wage. This allows calculating the participation tax rate. Figure 4 draws the theoretical participation tax rate (according to tax laws) and the actual average participation tax rate (calculated on the data base) along the distribution of taxable income per tax unit minus the potential wife's wage.

**Figure 4: Participation tax rate along the income distribution**



Notes: The participation tax rate is obtained by comparing counterfactual income taxes of the household if the wife does not work and if she works half time at minimum wage, all other characteristics of the household keeping alike.

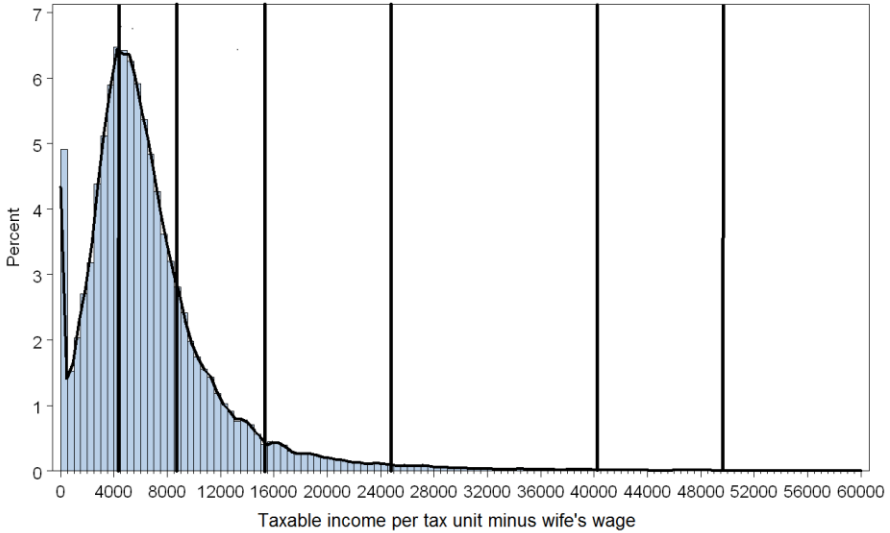
Source: DGFIP, sample of French tax returns for 2006 income tax.

The regression discontinuity design opportunity appears clearly from this figure. The participation tax rates, stable inside the tax brackets, increase very steeply around the threshold between brackets. As similar household in the middle of the brackets face the same participation tax rate, similar households around the thresholds face very different participation tax rate. Actual participation tax rates are very close to theoretical ones in the lower part of the distribution of taxable income, but there is more noise for the upper part. This noise is due to some households with tax reductions that could not be totally reimbursed on the tax without the wife's wages, and which are partially reimbursed on the taxation of the wife's earnings. This is why the actual rate is lower than the theoretical one. This appears mainly for high-middle income because tax reductions are extensively used by higher incomes and the very top income households have enough income tax due to get their full tax reductions. This noise may awaken the significance of the results but does not biased the results as tax reduction and credit do not change the position of the household with regards to the threshold (it is imputed on the tax due after calculation). What is important for the estimation is that the exogenous steep increase of the participation tax rates remains at the thresholds.

The main assumption for the validity of this identification strategy is that the position of the couple vis-à-vis the discontinuity threshold is actually exogenous. This means that the assignment variable – here the taxable income per tax unit minus the wife's wage – is not manipulated by the households in order to be just under or just above the threshold. Rather, according to Lee and Lemieux (2010) concept of fuzzy regression discontinuity design, the method is still unbiased as long as this manipulation is imperfect. However, as shown by

Saez (2010), manipulation of this assignment variable would lead to bunching around the tax threshold. Yet, as shown by figure 5 – drawing the density of the distribution of taxable income per tax unit with and without the wife’s wage, along with the Kernel of this distribution – such bunching does not exist in the French case.

**Figure 5: Kernel of taxable income distribution**



Notes: The histogram plots the distribution of taxable income per tax unit (with or without wife’s wages) with bins of 500 euros. The curve plots a kernel density of the simulated distribution with a bandwidth of 150 euros which fits the histogram. The vertical lines indicate the tax thresholds.

Source: DGFIP, sample of French tax returns for 2006 income tax

Furthermore, Carbonnier et al. (2014) tested a large number of households characteristics around French tax thresholds, among which ages, sex, marital status, household income, wages, ratio of wages over household's income. Neither were there discontinuities at the tax thresholds. This is additional evidence against manipulation because manipulation, even fuzzy, would sort household around threshold between those able or less able to manipulate, generating discontinuities in the characteristics of households.

On top of these empirical evidences, there exists some other argument that no manipulation of taxable income minus the wife's wage is done with regards to the tax thresholds. Even if inequality within couples has decreased progressively since the middle of the twentieth century, the wife being the secondary earner remains a valid hypothesis because of remaining inequalities between men and women relative to the labor supply, for causes both internal and external to the couples. Among the external causes, the gender wage gap is still significant (e.g. Altonji and Blank 1999, Blau and Kahn 2000, Bertrand et al. 2009, Bertrand 2011); it induces both a larger income and a more significant prospective career from the husband's participation in the workforce, which reinforce his primary earner status. From an internal point of view, the inequalities in earner status between the wife and the husband may be seen through their behavior in relation to child care. Lefebvre and Merrigan (2008) and Baker et al. (2008) show that child care costs or allowances have an important influence on the supply of married women's labor, and Piketty (1998) shows conversely that allocations reserved for non-working parents with children are powerful inducements for women with children to leave the workforce. Moreover, Angrist and Evans (1998) find a significant impact of the third child on the participation

of the wife in the workforce, but no impact on the participation of the husband. This highlights the fact that the participation in the workforce of the wife is the adjustment variable in households, which means that a majority of couples considers the wife to be the secondary earner.

In addition, the constraints related to the job market have a differential impact upon each spouse. From the point of view of employment at the extensive margin - married women's workforce participation - the primary earner is simultaneously subject to internal and external pressures to participate in the workforce. The internal pressure arises from the fact that the couple needs income, and the external pressure stems from the social stigma if he does not participate in the workforce. From both the internal and external point of view, the secondary income earner has more freedom to choose whether or not to participate in the workforce. Thus I assume that the primary earner always participates in the workforce and works if he can, while the secondary income earner chooses to participate, or not. This hypothesis is confirmed by descriptive statistics of figure 3: there is almost no variation of the participation rate of non-retired husband (which is very close to 1) but large variations of the participation rate of wives (which is significantly lower than one). This is the hypothesis advanced by Kleven et al. (2009) in their modeling of employment among couples. They offer the additional hypothesis that the imperfections of the job market prevent the secondary income earner from varying their employment at the intensive margin.

The second hypothesis of the present estimation strategy consists in extending this last hypothesis to both members of the couple. Indeed,

the majority of salaried workers are very constrained in the hours they work and cannot deliberately choose to vary their employment at the intensive margin. Donni (2007) remarked that it is very rare for French married men of working age not to work, or fail to seek work. In addition he noted that working husbands often work full-time. Similarly, Bourguignon and Magnac (1990) concluded that there is little flexibility in the duration of work, and all studies of employment at the intensive margin find low elasticities, with the exception of very high incomes. Feldstein (1995) uses a panel of tax returns coinciding with the United States income tax reform of 1986 to measure the elasticity of taxable income, which he finds to be greater than unity; however, this study is directed only to very high incomes and does not control for the ability to select between salaried remunerations or dividends that can operate in certain cases of high income. Saez (2003) separately evaluates the elasticities of taxable income and income from salaries: he finds that taxes have an important impact on taxable income, but an insignificant and more or less negligible impact on income from salaries. He explains this through the rigidities of the job market: salaried workers (with the exception of the highest incomes) have no real prospect of modifying the amount of time they spend at work, in other words, they have no control over their employment at the intensive margin.

Summarizing the hypotheses of the identification strategy, the primary earner of a couple, in practice the husband, works if he can and reports an income over which he has no power of decision. Then, taking into consideration this already available income plus non-earned income and the participation tax rate, the secondary earner, in practice the wife, decides whether or not to work. The secondary



earner's decision has no influence on the employment of the primary earner.

Regression discontinuity design classically consists in regression of the interest variable (the wife's participation to the workforce) on the assignment variable (the taxable income per tax unit minus wife's wage) and on a variable indicating the position with regards to the discontinuity (the participation tax rate).

The dependent variable is the activity status: participating or not. As mentioned earlier, it is not possible to know if the wife works full or part time. The activity status is participation if she earned at least a positive amount of wage or unemployment benefit during the year. As explained in section 3, this is very close to actual activity. The only error comes from very long-term unemployed still searching jobs. However, these active wives considered inactive for regressions only increase the standard errors and do not induce estimation bias but since this kind of women are not concentrated one side or the other of the thresholds. Indeed, it has been shown that the households cannot manipulate their position with regards to the thresholds. Even if they could – the proportion of such wives being discontinuous at the thresholds between marginal tax rates – it would mean that this status is not independent from the wives' will and is therefore actual inactivity.

The main explanatory variable, the position with regards to the discontinuities is given by the participation tax rate, as shown by figure 4. The participation tax rate is preferred to simple dummy of the position with regards to the threshold because it allows calculating elasticities of labor supply, and it is nonetheless

exogenous. This participation tax rate include the “*prime pour l’emploi*” (PPE, the French earned income tax credit) which can change due to the wives’ participation decision, and the other tax benefit, which do not changed. However, the loss of PPE due to wife’s participation is unlikely: it would necessitate that the husband is actually salaried around minimum wage (to take benefit of PPE) and the household as large non-wage income that place them just at the frontier of the ceiling of overall income to be eligible to PPE. Whatever, the potential loss of PPE is taken into account for calculating the participation tax rates.

Social benefits are not considered in the participation tax rate because the information lacks in the data base. However, due to the estimation strategy, they do not imply estimation bias since they are not discontinuous at the threshold between marginal tax rate brackets. The only threshold for whose there may be some issue is the first one, as some social benefits are conditional to be untaxed. The untaxed status does not depend on the amount of income tax actually paid, but on the tax due before imputation of any reduction of credit; it therefore correspond exactly to the first threshold. This problem is tackled by dropping households around this first threshold for all regression but the one specifically around this first threshold. This last estimation should be interpreted with caution because the estimate around the first threshold is overestimated. Indeed, discontinuity of the participation tax rate used for this regression – and this regression only – is underestimated because it does not take into account the loss of social benefit.

In addition to these main covariates, some controls are used. The first one is the taxable income per consumption unit. The second is the set

of dummies: the control is done by cluster (clustering is presented in table 2). The controls include the wife’s and husband’s ages, the number of dependent children in the tax household, the presence of children aged under 3, the real estate and financial asset returns and the position with regards to the tax thresholds. The interest of such way of controlling is that it allow for different impact of the controls for different kind of households. For example, the non-wage income impact on participation is not the same for young or older wives.

**Table 2: Categorization of households**

Determining parameters	Number of categories	Detail of the Categories
Wife’s age	3	30-40, 40-50, 50-60
Husband’s age	5	< 40, 40-50, > 50, retired
Dependent children	3	0, 1, 2, 3 and more
Child under 3	2	yes, no
Real estate income	2	yes, no
Financial asset income	4	0, < 0.5 SMIC, > 0.5 SMIC, > wages
Closest tax threshold	6	7 marginal rates and 6 thresholds

Note: SMIC is the minimum wage in France, its annual value for full-time work in 2005 is used as a unit of measurement for income.

However, it is not possible to control for the level of education, as this information is not declared to the tax service. Other characteristics of the household and endogamy give a kind of proxy for this, but imperfect. Nevertheless, this lack of control generates only noise (and increase of standard errors) but no estimation bias in regression discontinuity design, unless there is manipulation of the assignment variable: it would necessitate that among household with similar socio-economic characteristic and similar taxable income without the wife's wage, the taxable income without wife's wages of household with more educated wives be just below the threshold and those of less educated wives just above. Not only it is not plausible, but both empirical and theoretical arguments for non-manipulation of taxable income without wife's wage around tax thresholds are presented above.

Summarizing, the actual estimation consists in regressing the logit of the participation on the logarithm of the participation tax rate (one minus the participation tax rate), the logarithm of the taxable income per tax unit minus wife's wage, the logarithm of the taxable income per consumption units minus wife's wage and the set of control dummies. The estimates are evaluated at the maximum of likelihood. In addition, robustness test are implemented. The first one consists in adding another covariate. This added covariate is the product of the logarithm of the participation retention rate and the logarithm of the taxable income per consumption unit minus the wife's wage. In that case, the regression equation is given by equation 1.

$$\log \frac{\pi}{1-\pi} = \alpha + \beta \cdot \log R + \gamma \cdot \log R \cdot \log Y + \delta \cdot \log A + \mu \cdot \log Y + \rho_i D_i + u \quad (1)$$

where  $\pi$  is the wives' participation rate, R the participation retention rate, A the taxable income per tax unit minus wife's wage, Y the taxable income per consumption unit minus wife's wage and the Di the different dummies of the clustering control. Hence, the estimate of the elasticity of wife's participation to the retention rate is given by equation 2 and its standard error by equation 3.

$$\varepsilon = 1 - \pi \cdot (\beta + Y \cdot \gamma) \tag{2}$$

$$\sigma_\varepsilon = \frac{1 - \pi^2 \cdot \sigma_\beta^2 + Y^2 \cdot \sigma_\gamma^2 + \gamma^2 \cdot \sigma_Y^2 + \sigma_Y^2 \cdot \sigma_\gamma^2 + 2 \cdot Y \cdot \sigma_{\beta\gamma}}{\phantom{1 - \pi^2 \cdot \sigma_\beta^2 + Y^2 \cdot \sigma_\gamma^2 + \gamma^2 \cdot \sigma_Y^2 + \sigma_Y^2 \cdot \sigma_\gamma^2 + 2 \cdot Y \cdot \sigma_{\beta\gamma}}} \tag{3}$$

where  $Y$  is the mean of  $Y$ ,  $\sigma_Y$  its standard error, and  $\sigma_{ij}$  the coefficients of the variance/covariance matrix of the regression.

The second robustness test is done by changing the logarithm of the participation retention rate by its absolute value. In that case, the estimate is no more elasticity of wives' participation but the semi-elasticity of wives' participation with respect to the retention rate. The estimates out of each kind of regression are the same, which validates the strategy. Furthermore, a large number of regressions are run on different subsamples. This allows understanding the behavioral differences between different categories of households.

## 5. Results

First, the regressions on the full-sample (but observations around the first threshold) are run (table 3). The results are very close from one

specification to another, and all are very significant. This is also the case for the regressions on the different subsamples. This significance and coherence between different specifications reinforce the confidence in the results. Looking at the value of the results, the elasticity of wife's participation to the workforce with respect to their participation retention rate is actually very high, around seven. This estimate is sensibly larger than those previously found in the literature. However, it is mainly driven by behavior of household of the very bottom-end of the distribution, that is not fully accounted for in other estimations. The French tax system with discontinuities for very low income: first two thresholds stand at only 4,412 and 8,677 euros a year per tax unit. This would be discussed more extensively in the conclusion section.

**Table 3: Elasticities of wife's participation in the workforce, global average**

	Number of observations	Base estimates (1)	Crossed estimates (2)	Semi-elasticity (3)
<b>Overall sample</b>	82,821	7.082*** (0.010)	6.466*** (2.393)	7.846*** (0.011)
<b>Regression discontinuity design per threshold</b>				
Threshold 1	10,907	34.284*** (0.139)	34.365*** (0.752)	34.078*** (0.141)
Threshold 2	11,565	15.067*** (0.033)	17.363* (9.570)	15.172*** (0.034)
Threshold 3	21,685	7.634*** (0.015)	8.039** (3.151)	8.220*** (0.016)
Threshold 4	20,665	2.646*** (0.012)	2.618*** (0.287)	2.901*** (0.013)
Threshold 5	13,136	2.706*** (0.032)	2.709*** (0.071)	3.015*** (0.036)
Threshold 6	15,770	1.884*** (0.028)	1.820*** (0.198)	2.319*** (0.034)

Notes: ``Base estimates'', column (1), gives elasticity of wife's participation with respect to participation retention rate (one minus participation tax rate) from the logit regression – estimated at the maximum of likelihood – of the participation to the logarithm of the retention rate and the logarithm of the assignment variable (the taxable income per tax unit minus the wife's wage, with cluster controls plus the logarithm of the taxable income per consumption unit minus the wife's wage; ``crossed estimates'', column (2), gives result from the same regression with addition as regressor of the product of the logarithm of the participation retention rate and the logarithm of taxable income per consumption unit minus the wife's wage; ``Semi-elasticity'', column (3), gives semi-elasticity of wife's participation with respect to participation retention rate (it is the same regression as column (1) with the actual retention rate instead of its logarithm). Standard errors in parentheses. \*\*\*: significant at the threshold of 1%; \*\*: significant at the threshold of 5%; \*: significant at the threshold of 10%.

Source: DGFIP, sample of French tax returns for 2006 income tax

Table 3 also shows the results around each threshold, consisting of different regression discontinuity designs separately run around each discontinuity. The elasticity appears huge around the first threshold. However, as explained in the presentation of the identification strategy, it may be biased by the discontinuity of some social benefit around this first threshold. Still, it shows that the sum of joint taxation plus local social benefits conditioned by non-taxed status generates an important disincentive for women on the lower-end of the distribution to participate to the labor market.

Elasticities estimated around other thresholds are also large – even if substantially less. Furthermore, the elasticities are substantially lower for upper thresholds. This is not only due to the decrease of the retention rate (inducing larger relative change of the retention rate for the same absolute change of the retention rate) because the same decline with the rise in the tax schedule may be observed with semi-elasticities. This could be linked to the standard of living of the households, or more generally to the level of income and wealth.



**Table 4: Elasticities of wife's participation in the workforce, per income**

	Nb of Obs.	Base estimates (1)	Crossed estimates (2)	Semi-elasticity (3)
<b>Income per unit of consumption without wife's wages</b>				
< 10,000 euros	16,114	16.524*** (0.036)	18.228*** (4.285)	16.615*** (0.036)
< 25,000 euros	40,557	5.367*** (0.011)	4.983*** (0.882)	5.813*** (0.012)
< 50,000 euros	14,202	2.727*** (0.026)	2.835*** (0.493)	3.209*** (0.030)
< 100,000 euros	4,584	1.276*** (0.052)	1.277*** (0.108)	1.642*** (0.064)
< 250,000 euros	3,659	0.913*** (0.126)	0.949*** (0.187)	1.202*** (0.155)
< 500,000 euros	1,049	0.322 (0.328)	0.325 (0.345)	0.428 (0.395)
< 1,000,000 euros	458	0.914 (0.580)	0.908 (0.685)	1.193* (0.705)
> 1,000,000 euros	267	5.012*** (1.771)	5.246** (2.223)	6.629*** (2.375)
<b>Asset returns</b>				
No real estate income				
No financial income				
< ½ SMIC	40,856	7.822*** (0.012)	7.553*** (2.757)	8.477*** (0.013)
< ½ SMIC	19,277	4.585*** (0.018)	4.399*** (1.193)	5.168*** (0.019)
> ½ SMIC	2,368	1.141*** (0.236)	1.239 (1.388)	1.349*** (0.087)
> wages	1,488	2.397*** (0.172)	2.385*** (0.186)	2.841*** (0.201)

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Real estate income				
No financial income	6,328	6.731*** (0.046)	6.590** (2.424)	7.721*** (0.053)
< ½ SMIC	8,929	4.493*** (0.037)	4.213*** (0.905)	5.140*** (0.042)
> ½ SMIC	1,936	1.576*** (0.085)	1.504*** (0.246)	2.050*** (0.105)
> wages	1,638	1.700*** (0.134)	1.508 (1.261)	2.078*** (0.155)

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Notes: ``Base estimates'', column (1), gives elasticity of wife's participation with respect to participation retention rate (one minus participation tax rate) from the logit regression – estimated at the maximum of likelihood – of the participation to the logarithm of the retention rate and the logarithm of the assignment variable (the taxable income per tax unit minus the wife's wage, with cluster controls plus the logarithm of the taxable income per consumption unit minus the wife's wage; ``crossed estimates'', column (2), gives result from the same regression with addition as regressor of the product of the logarithm of the participation retention rate and the logarithm of taxable income per consumption unit minus the wife's wage; ``Semi-elasticity'', column (3), gives semi-elasticity of wife's participation with respect to participation retention rate (it is the same regression as column (1) with the actual retention rate instead of its logarithm). Standard errors in parentheses. \*\*\*: significant at the threshold of 1%; \*\*: significant at the threshold of 5%; \*: significant at the threshold of 10%.

Source: DGFIP, sample of French tax returns for 2006 income tax

This assumption is tested with estimations of elasticities per level of income per consumption unit (pre-woman wage) and per level of asset returns (table 4). Both confirm that the elasticity declines strongly with the standard of living. Furthermore, looking at very high level of income (both in general and in terms of asset returns), it appears that the elasticity increase at the very upper-end of the distribution, giving birth to a U-curve. The declining part of the U-curve may be explained by the interest of the jobs available if participating. Due to assortative mating, women at the bottom-end of the distribution can pretend to jobs bearing no intrinsic motivation. For them, the only reason to work is to earn money and they are therefore very sensitive to fiscal incentives. Women upper in the distribution can pretend to jobs interesting by themselves – and better paid – so their decision to work is less determined by taxation. For the very upper-end of the distribution, the budgetary constraints of the household are totally relaxed, so the wife's have more opportunity to decide not to work and may be more sensitive to fiscal incentive.

Following, it may be informative to look at difference of behavior depending on age (table 5). If considering only couples with similar ages (the majority of couples), it appears that the elasticity unambiguously increased with respect to age. This can be easily understood through two arguments. First, younger women decision has not only impact on its present income and well-being, but also modifies its perspective of career, mainly by the in-job accumulation of human capital. Hence, the decision to work depends less on present taxation and more future opportunities, lowering the elasticity of labor supply in the extensive margins with respect to the participation tax rate. Second, older women may be more tired to

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work, which may decrease the non-financial motivation to work, and therefore increasing the importance of taxation in the choice regarding participation.

**Table 5: Elasticities of wife's participation in the workforce, per family composition**

	Nb of Obs.	Base estimates (1)	Crossed estimates (2)	Semi-elasticity (3)
<b>Age categories</b>				
Wife: 30-40				
Husband < 40	16,259	5.659*** (0.018)	5.183** (2.463)	6.111*** (0.019)
Husband 40-50	7,605	8.011*** (0.035)	7.269* (4.230)	8.707*** (0.038)
Husband > 50	607	12.897*** (0.225)	11.683*** (4.317)	13.926*** (0.242)
Husband retired	354	11.085*** (0.238)	9.827 (8.993)	11.625*** (0.248)
Wife: 40-50				
Husband < 40	1,762	7.990*** (0.079)	7.096** (3.145)	8.639*** (0.085)
Husband 40-50	21,427	6.262*** (0.019)	5.905** (2.319)	6.967*** (0.021)
Husband > 50	7,221	7.598*** (0.033)	6.966** (2.676)	8.449*** (0.037)
Husband retired	1,788	10.893*** (0.080)	10.263*** (3.619)	11.563*** (0.085)
Wife: 50-60				
Husband < 40	66	18.708*** (0.778)	18.680*** (0.834)	20.308*** (0.849)
Husband 40-50	1,500	7.423*** (0.084)	7.412*** (0.111)	8.084*** (0.091)
Husband > 50	15,326	7.081*** (0.025)	6.521*** (1.242)	8.038*** (0.028)

Husband retired	8,906	9.827*** (0.036)	8.613** (3.725)	10.787*** (0.039)
<b>Number of children</b>				
No child under 3				
No child	20,778	7.875*** (0.020)	7.147*** (1.552)	8.770*** (0.022)
One child	12,381	7.277*** (0.024)	6.684*** (1.878)	8.065*** (0.026)
Two children	17,619	6.272*** (0.019)	5.826*** (1.787)	6.956*** (0.021)
Three or more	17,197	8.322*** (0.029)	8.575** (4.396)	9.096*** (0.031)
Child under 3				
One child	2,128	4.976*** (0.055)	4.827*** (1.713)	5.633*** (0.061)
Two children	5,349	5.344*** (0.095)	4.585** (2.198)	5.796*** (0.032)
Three or more	7,369	9.780*** (0.053)	9.623* (5.390)	10.451*** (0.056)

Notes: ``Base estimates'', column (1), gives elasticity of wife's participation with respect to participation retention rate (one minus participation tax rate) from the logit regression – estimated at the maximum of likelihood – of the participation to the logarithm of the retention rate and the logarithm of the assignment variable (the taxable income per tax unit minus the wife's wage, with cluster controls plus the logarithm of the taxable income per consumption unit minus the wife's wage; ``crossed estimates'', column (2), gives result from the same regression with addition as regressor of the product of the logarithm of the participation retention rate and the logarithm of taxable income per consumption unit minus the wife's wage; ``Semi-elasticity'', column (3), gives semi-elasticity of wife's participation with respect to participation retention rate (it is the same regression as column (1) with the actual retention rate instead of its logarithm). Standard errors in parentheses. \*\*\*: significant at the threshold of 1%; \*\*: significant at the threshold of 5%; \*: significant at the threshold of 10%.

Source: DGFIP, sample of French tax returns for 2006 income tax

In addition, the elasticity of participation increases with respect to the age difference within the couple – whatever the sign of this difference. This should cover intrinsic behavior differences between women choosing an husband of their age and choosing older or younger husband. However, it is difficult to link them to economic issues. In contrary, the very high sensitivity to tax incentive of women of retired husband may be more easily understood. The working status of their husband create a strong incentive to meet him in inactivity, that may only be counteracted if work is really remunerating.

Last, it is possible to look at the influence of children (table 5). Whatever, their age, the third and subsequent children not only increase the rate of inactivity but also increase the activity choice dependence on taxation. However, the first two children seem to have the opposite effect (lowering elasticity). However, this may come from composition effect, there are more older women among those without dependent children, and they are more sensitive to tax incentive more because of their age than because they have no children. Yet, this composition effect cannot explain why mother of less than two very young children (under three) are less sensitive to taxation than other women, even than the youngest wives. In that matter, the responsibility over very young children increases the need for income, lowering the possibility of inactivity. Indeed, those mothers of young children have very large rate of activity. The same explanation may be used to understand the high elasticity of older wives: the absence of children – and therefore of responsibility over other people – diminishes the need for income and relax the budgetary constraints. This has the consequences of freeing the choice over participation, which become more depending on taxes.

## 6. Conclusion and comments

The present article exploits the French joint income tax system and a large tax returns data base to implement a regression discontinuity design for estimating the elasticity of married women's participation in the workforce with respect to the rate of income tax. The negative impact of participation tax rate is found very strong in general, over unity. Only the upper middle class presents low sensitivity to the participation tax rate. Apart from the very bottom-end of the distribution of income, the order of magnitude is in line with previous results in the literature, above but around unity. The survey of Blundell and MaCurdy (1999) presents mean estimates slightly under unity, but estimations focusing on joint taxation in different countries found results above unity. With natural experiments estimations based on reforms of the joint taxation system, three studies found that the elasticity is substantially larger than one. On a 1948 US reform, LaLumia (2008) estimates a strong impact on women activity of the reforms. She has difficulty to estimate elasticity properly because she does not know the exact change in participation tax rate. Nevertheless, bounding hypothesis shows that it is clearly larger than two. On the 1971 Swedish reform Selin (2009) finds elasticities from 0.46 to 1.77 for the upper-end of the income distribution. On the 2005 Czech reform, Kalíšková (2013) finds elasticities between 1 and 4.

The results of the present estimation find that elasticity increases with age and difference in age within the couple. It is very high for wives of retired. From the family composition point of view, it appears that only the third and subsequent children strongly increase the elasticity. The first two do not, and even decrease it substantially



when young (under three). Concerning the impact of income, a U-curve is found. The upper part of this U-curve is consistent with the results of Gruber and Saez (2002) and Selin (2009), the bottom part is consistent with those of Kalíšková (2013).

Furthermore, the bottom of the distribution presents very large sensitivity to tax incentive. This result is original because other estimations fail to take into account the very bottom end of the income distribution. The French tax system allows such estimation thanks to discontinuities in the tax schedule for very low income: the first two thresholds stand at only 4,412 and 8,677 euros a year per tax unit. This result sheds light on the strong disincentive effect of the U-curve of marginal tax rates when the tax and transfers system is based on families. This is particularly problematic for France, where the income tax is family based with large discontinuities at the bottom and a large share of social benefit are conditioned to a non-taxed status. This induces a very low participation rate of wives with low socio-economic status. As non-participation increases, so does the difficulties to come back to work if necessary; it increases the dependency of married women to their husband, particularly in families at the bottom of income distribution.

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