# Taxation, marriage and labor supply: Evidence from a natural experiment in France *

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**Abstract**

This paper uses the French family quotient ("quotient familial") reform of 1995 to analyse the impact of the individual income tax on marriage behavior and labor supply decisions. An important feature of this reform was the cancellation of fiscal subsidies aimed at cohabitant couples with children. Before 1995, the system of the family quotient granted one extra half unit to each single parent with children as defined for tax purposes. The 1995 family quotient reform cancels the benefit for cohabitants with children by introducing the notion of isolated parents with children in the tax declaration. This measure thus compensates the marriage penalty for couples with children but does not change anything for couples without children. As a result, the tax for a one-earner cohabitant couple with one child that earns $35,000$ euros a year has increased by about $1,200$ euros after the reform. To assess the impact of the reform, we use the difference-in-differences estimation approach. Using the panel structure of the French employment survey (1990-2000) we find that the probability of marriage has increased for stable couples by about 4 points because of the reform. In a second stage, the response of married women with children is analyzed, using as a control group women who did not have children before they married. We therefore identify the tax effect as the difference between the change in the labor supply of women with children before they married and the change in the labor supply of women without children before they married. We find strong evidence that the labor supply of married women has decreased due to the 1995 family quotient reform. Nevertheless, although our results support the working hours response, they are inconclusive as to participation response.

**Keywords**: Labor supply, Marriage, Taxation, Natural experiment.
**JEL Numbers**: J12; J13; D13.

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# 1 Introduction

An important issue concerning the structure of the tax system is whether progressive marginal tax rates induce responsiveness in terms of individual behaviors. There is a large literature on the impact of the individual income tax on labor supply decisions (see Fortin and Lacroix, 2002, for a recent survey). But less work has been carried out concerning the impact of the individual income tax on marriage behavior. To our knowledge, no empirical study has tried to analyse the responsiveness in terms of both marriage and labor supply taken simultaneously. The reason is that existing theoretical models are not easily adaptable, since they concentrate either on the link between taxation and labor supply or on the link between taxation and marriage. Hence, no sound theoretical model has fully managed to establish the simultaneity of these links so far.

If we consider the income tax, the combination of progressive tax rates with a structure in which families with identical total income and family structure pay equal taxes (regardless of whether the income is earned by one worker or two) inevitably generates non-neutrality regarding marriage. This is the case for the USA where the federal income tax system has a progressive marginal tax rate structure with features that vary according to legal marital status. Of course, there are countless possibilities for tax penalties or subsidies, depending upon the level and the division of income among individuals. For example, in the USA case, the "marriage penalties" or "marriage benefits" range from about $-4\%$ of earnings for a one-earner couple to $+3\%$ for a two-earners couple (see Table 1 in Alm and al., 1999). This is also the case for France, though marriage penalties are very rare compared to marriage subsidies.

According to standard economic theory, marriage penalties may affect the probability of marriage and the timing of the marriage decision (Becker, 1991, Alm and Whittington, 1996, 1999). Marriage penalties and subsidies may also affect labor supply decisions for married individuals. For example, consider an individual who is not currently working (the "secondary earner" of the family) and whose spouse is working (the "primary earner"). If the secondary earner decides to work, then the additional income is taxed at the marginal tax rate faced by the family on their combined income, and this tax rate is likely to be much higher than the tax rate that the individual would face if single. On the other hand, marriage penalties or subsidies may affect labor supply in a non-direct way. Indeed, the variations in marriage penalties could affect the "reservation welfare" a spouse may be able to achieve if she/he were not married. As a consequence, marriage subsidies entailed by the difference in earnings between the two earners could move the "sharing rule" between the spouses to the advantage of the secondary earner. Though there exists an important theoretical literature on this effect (Chiappori, 1988, 1992, Chiappori and al., 2002, Donni, 2002, Donni and Moreau, 2002), there is little empirical evidence for the kind of "sharing rule" effect encapsulated by collective labor supply approaches, particularly in the case of taxation (exceptions are Laisney, 2002, Bargain and Moreau, 2002).

In this paper, we concentrate on the impact of the taxation on the marriage of cohabitant couples and on the labor supply of married women. We try to take into account the selectivity bias due to marriage selection in the study of the labor supply of married women. This kind of bias is often overlooked in labor supply studies.

Of course, economists do not have the full story about the decision to marry or not.

All they can do is to put some lights on the part of people's behavior that is meaningful for economists.

Changing social norms are good candidates to explain the evolution of the marriage rate as well. For instance, a good indicator of the weight of the social pressure to marry is certainly the annual rate of children born out of marriage (see Figure 1). In France, it appears that this rate is quite stable -from $10\%$ to $6\%$- during the two thirds of the century with pics during the two wars. At the end of the 60's (probably around 1968), the annual rate of children born out of marriage begins to raise and attains more than $40\%$ at the end of the century. Thus, though in the major part of the $20^{th}$ century, being married to have children seems to be a norm, nay an obligation, it is no more the case at the end of the century: the high number of children that are born out of marriage attests that the relationship between fecundity and marriage tends to crumble away. To be born out of marriage does not even signify that children are born out of a couple.

Since nowadays social pressure to marry, even in presence of children in the couple, is probably not so strong, our intuition is that a tax reform that treats differently cohabitant couples with children and cohabitant couples without children before marriage could prove to be a valuable "natural experiment" in order to evaluate the impact of taxation and financial incitatives on both marriage and labor supply.

Our empirical strategy thus consists in using the French family quotient ("quotient familial") reform of 1995 as a natural experiment. An important feature of this reform was the cancellation of fiscal subsidies aimed at cohabitant couples with children. The fundamental assumption of this natural experiment approach is that both the control (i.e. cohabitant couples without children) and the treatment (i.e. cohabitant couples with children) groups are similarly affected by factors not considered explicitly in the analysis.

One of the advantages of this approach is to get round the problems emerging from having no structural model to establish the simultaneity of the links between taxation, marriage and labor supply. Under plausible assumptions, the natural experiment approach allows one to estimate some structural parameters of the labor supply function. However, this approach is not well suited to infer potential impact of policy changes other than those considered in any particular analysis.

Therefore, our approach is quite different from more structural ones that often consider the demographic parameters as given and thus neglect the fact that the decision to marry can depend on tax schedules. One recent example of the structural approach is the Laroque and Salanié (2002)'s model that simulates the impact on employment of several reforms of the French taxation and social system. In particular, changing social or fiscal conditions for women -depending on the number of children for instance- have been identified as a major source of women's under-participation to the labor market in France. For that reason, our empirical investigation takes explicitly into account one important social program concerning employment : the APE (Allocation Parentale d'Education) program. This program was created in 1985 to allow one spouse of a family with three children with at least one child under 3 years old to stop working or reduce his/her activity. In 1994, the APE was extended to families with two children with one less than 3 years old. This reform has had important effects on the employment of women: these effects are well documented (see for example Piketty, 1998).

On the other hand, in a country where taxation is familialized, the selection bias due to marriage should be an important issue. Indeed, it could have important effects on

the previous evaluations. In particular, the reforms could have increased or decreased the marriage rate of more productive women, the ones who do not necessarily have prior preferences for marriage. Hence, the impact of taxation on labor supply of married women could have been over-evaluated or under-evaluated because of the specificities of the tax system.

The paper is organized as follows. Section 2 discusses the main features of the 1995 family quotient reform and provides a description of the data used in the empirical analysis. Section 3 shows how the labor supply model can be made equivalent to DD estimator and discusses the empirical variables used in the model. Main findings are reported in Section 4. Finally, the paper points up conclusions in Section 5.

# 2 Data

The data used in the analysis are drawn from the French employment survey and collected by the INSEE across the years 1990 to 2000. Prior to discussing the survey and its main features, we first describe the tax system in France and the 1995 reform.

## 2.1 The tax system in France and the family quotient reform of 1995

The French tax system is "familialized". The family quotient principle is as follows: the income is considered per fiscal unit (the reference person and his/her spouse count for one unit each, the first and the second persons in charge count for one half-unit each, and the third and followings ones count for one unit each) and the marginal tax rate is determined for each fiscal unit with this family quotient. Other particularities of the fiscal unit can be taken into account to calculate the family quotient : handicap, widowhood, etc..

The reform of 1995 has changed the definition of the family quotient. Before 1995, the system of the family quotient granted one extra half unit to each single parent with children as defined for tax purposes. The 1995 family quotient reform cancels this benefit for cohabitants with children by introducing the notion of isolated parents with children in the tax declaration (Table 1). This measure thus makes up the marriage penalty for couples with children but does not change anything for couples without children. Furthermore, marriage penalties decrease less for cohabitants with children that have a low wage differential than for those with a high wage differential (Table 2). For example, before the reform, a two-earners couple with identical earnings (of $17,500$ euros each) and one child has a marriage penalty of about $-397$ euros. After the reform, the marriage penalties canceled. In the subsequent sections, these main characteristics of the 1995 family quotient reform are used to identify the responsiveness to the reform in terms of marriage and labor supply.

## 2.2 The sample

The sample is issued from the French employment survey 1990-2000. Approximately $70,000$ households are surveyed each year and over three consecutive years. Information on matrimonial status, age, education, participation in the labor market, working hours per week, and earnings are available. For our analysis, we rule out households whose head is over 60 years old, student or self-employed.

## 2.3 Main evolutions during the 90's

Using the data for the years 1990 to 2000, on average, the ratio of minimum wage to maximum wage in the household is decreasing. It amounts to $80\%$ for married couples and $83\%$ for cohabitant couples (Figure 2). The gap between married couples and cohabitant couples is still significant when differentiating by age (Figure 3).

Another way of regarding the same phenomenon is to compare the marriage rates for various configurations of earnings within the couple (Figure 4). By grouping the couples into different categories, we notice that marriage rates are higher for couples whose earnings are particularly dissimilar. Hence, that could reflect the impact of taxation on marriage, since couples with low tax incentives seem to marry less.

The inequality gap within the couple between married couples on the one hand and cohabitants couples on the other hand can be interpreted either as a cause or as a consequence of marriage.

It can be regarded as a cause of marriage in the following cases:

- *spouse selection*: women tend to choose productive spouses so that the earnings of married men are higher than the earnings of unmarried men;

- *matching*: depending on individual preferences (positive or negative complementarities), the difference in earnings can be an explicative factor for couple formation, its stability and, by extension, for marriage;

- *assurance*: marriage can be seen as an assurance for the spouse that earns less;

- *taxation*: marriage subsidies are high when difference in earnings is big.

It can be regarded as a consequence of marriage in the following cases:

- *division of labor within the household*;

- *marriage may be valued in the professional environment*: with imperfect information, marriage can be seen by the employer as a sign of efficiency.

Because of these difficulties to identify the impact of marriage on earnings, our study concentrates on a sample of stable couples (i.e. together over three consecutive years), who had originally been cohabitants, and possibly cohabitant or married couples in subsequent years. The sample is finally composed of $7,850$ couples interviewed each year over three years during the period 1990-2000 (see Table 5).

## 2.4 Preliminary evidence on the impact of the 1995 reform

As proposed previously the family quotient reform of 1995 is considered as a natural experiment: one then compares the difference in behaviors (marriage and labor supply) after and before the reform for groups affected by it (cohabitant couples with children) to this difference for unaffected groups (cohabitant couples without children). The difference-in-differences (DD) estimator (further discussed in the next section) results from this comparison. Figures 5-9 report preliminary results from simple comparisons using our sample of $7,850$ couples.

Figure 5 clearly shows that the gap between the marriage rate of cohabitant couples with children, that are concerned by the reform, and the marriage rate of cohabitant couples without children has significantly risen after the 1995 reform. Indeed, before 1995, the marriage rate of about $15.5\%$ is not significantly different for both couples with children and couples without children. After the reform, the marriage rate is $13.1\%$ for cou-

ples without children and $15.7\%$ for couples with children: this difference is statistically significant at less than $5\%$.

Figure 6 shows the simple DD estimator by quintile of earnings. It is higher for low earnings' households. As shown in figure 7, this result could reflect the fact that difference in earnings is higher in low earnings' percentiles, so that the simple DD estimator for marriage is higher for couples with a great difference in earnings, as shown in figure 8.

Figure 9 shows the working hours for married women with or without children before they married. It seems that a simple DD estimator approach does not provide a clear result of what happens concerning the labor supply of married women. Indeed, although the amount of working hours decreases sharply the year after the reform, this effect could only be temporary.

In the next section, we propose an estimation strategy that enables us to estimate the impact of the reform on marriage and labor supply by taking into account other structural effects. In particular, our empirical approach tries to take into account the selectivity bias due to marriage selection in the study of the labor supply of married women. This way, we show that the reform has increased the marriage rate of more productive women, the ones who do not necessarily have prior preferences for marriage. That could explain why the simple DD estimator is only slightly significant for the working hours of married women at work.

# 3 The statistical model

## 3.1 Difference-in-differences estimator

DD estimates of the impact of the 1995 reform on labor supply and standard errors for these estimates are derived from using Ordinary Least Squares on individuals in treatment and control groups for several years before and after the reform.

Formally, the population of cohabitant couples is divided into two groups: Group $C$ (control group) includes couples without children before they choose to marry or not and Group $T$ (treatment group) includes those with children before they choose to marry or not. The working hours for a married woman $i$ at $t$ is assumed to be as follows:

$$h_i(t) = \alpha + \alpha_T D_{iT} + \alpha_R D_R + \alpha_{TR} D_{iT} D_R + z_i(t)\beta + D_{iT} z_i(t)\beta_T + \epsilon_{hi}(t), \quad (1)$$

In this equation, $D_{iT}$ is a dummy variable equal to one when the woman belongs to the treatment group, $D_R$ is a dummy variable for the post-reform period. The parameters $\alpha$ and $\alpha_T$ measure the control group and treatment group invariant specific effects. The parameter $\alpha_R$ allows for a post-reform shift in the working hours that is common to both treatment and control groups. Furthermore, the impact of the reform on the working hours of the treatment group, which is given by $\alpha_{TR}$, is provided by the parameter associated with the interaction term between the post-reform and the treatment group dummy variables, $D_{iT}D_R$. We thus suppose that the reform has no effect on the control group. This parameter can be interpreted as a change in the post-reform working hours of the treatment groups -and controlling for the explanatory variables included in the vector $z_i(t)$. Since the women with children before marriage group can differ in terms of age or education to the control group, $z_i(t)$ includes age and its square, and education and its square

as covariates. The education variable is the number of completed years of schooling. The parameters $\beta$ and $\beta_T$ allow for specific effects of the independent variable on the control and treatment groups. Other factors not considered in the analysis are supposed to affect both groups similarly. The $\epsilon_{hi}(t)$'s are i.i.d. random variables with zero mean reflecting individual unobserved heterogeneity.

## 3.2 Selection

The labor supply function for married women at work is estimated by first excluding unemployed and unmarried women from the sample and then adjusting the estimation method to avoid sample selection bias. Separate selection rules are estimated for both employment and marriage.

Indeed, as argued by Poirier (1980) and Ham (1982), combining two selection rules into one would produce inconsistent parameter estimates. Therefore, since the marriage decision and the participation in the labor market decision may be correlated, we use the extension of Heckman's approach proposed by Ham (1982) to the case where two correlated selection rules generate the sample.

Consider the general model of hours determination proposed in the preceding subsection. Assume that women experience employment if

$$e_i(t) = x_{ei}(t)\beta_e + \epsilon_{ei}(t) > 0, \tag{2}$$

while women experience marriage if

$$m_i(t) = x_{mi}(t)\beta_m + \epsilon_{mi}(t) > 0, \tag{3}$$

In equations (2) and (3), $\beta_e$ and $\beta_m$ are vectors of parameters, and $\epsilon_{ei}(t)$ and $\epsilon_{mi}(t)$ are error terms. The vectors $x_{ei}(t)$ and $x_{mi}(t)$ include independent variables like age or schooling, as well as post-reform and treatment dummies and their interactions. Furthermore, in the French tax system, marriage subsidies are increasing with the differences in spouses' earnings. This variable is thus introduced in the marriage equation and is computed as the ratio of minimum to maximum earnings within cohabitant couples, it is equal to zero for a one earner couple.

Then, the expectation of $h_i(t)$ conditional on $e_i(t) > 0$ and $m_i(t) > 0$ can be expressed as

$$E(h_i(t)|e_i(t) > 0, m_i(t) > 0) = \alpha + \alpha_T D_{iT} + \alpha_R D_R + \alpha_{TR} D_{iT} D_R$$

$$+ z_i(t)\beta + D_{iT} z_i(t)\beta_T + \sigma_e \lambda_{ei}(t) + \sigma_m \lambda_{mi}(t), \tag{4}$$

where

$$\lambda_e = \phi(Z_e)\Phi(Z_e^*)/F(Z_e, Z_m, \rho)$$
$$\lambda_m = \phi(Z_m)\Phi(Z_m^*)/F(Z_e, Z_m, \rho)$$
$$Z_e = (e - x_e\beta_e)/\sigma_e$$
$$Z_m = (m - x_m\beta_m)/\sigma_m$$
$$Z_e^* = (Z_m - \rho Z_e)/(1 - \rho^2)^{1/2}$$
$$Z_m^* = (Z_e - \rho Z_m)/(1 - \rho^2)^{1/2}$$
$$\rho = \rho_{em}$$

and $\phi(\cdot)$ and $\Phi(\cdot)$ are the univariate normal density and distribution functions respectively. $F(\cdot)$ is the bivariate standard normal distribution function, $\sigma_k$ is the standard deviation of $\epsilon_k$ (with $k = e, m$), and $\rho$ is the correlation between these error terms.

Based on standard economic theory, one should expect labor supply to decline with an increase in marriage benefits. Therefore, the parameter $\alpha_{TR}$ in equation (1) should be negative. According to Becker (1991), one should also expect the marriage rate to rise with an increase in the marriage subsidies. Thus, since the reform could have increased the marriage rate of more productive women -that is the ones who do not necessarily have prior preferences for marriage- least squares estimation of (1) on the censored sample will lead to specification error biases. Then least squares estimation of (4) can be used to obtain consistent estimates of $\alpha_{TR}$.

In the next section we will present results for marriage and labor supply of married women.

# 4 Results

In this section, we present natural experiment estimates of the impact of the French family quotient reform of 1995 on marriage and labor supply of married women.

Our empirical strategy first aims at evaluating the impact of the reform on marriage and employment. Secondly, we focus on the impact of the reform on the working hours of married women at work. We thus estimate the parameters of the selection rule equations by bivariate probit analysis and then use these parameters to form consistent estimates of Mills ratios in equation (4). Then least squares can be used to obtain consistent estimates of the impact of the reform on labor supply.

## 4.1 The impact of the 1995 reform on women's marriage and employment

Table 3 presents bivariate probit estimates of the impact of the reform on marriage and employment. Our findings are as follows:

1. Model 1 reports simple DD estimates without structural effects. We find that having a child before marriage has a negative and significant effect on employment and the impact of the reform on employment is not significant. The reform has a positive and significant impact on marriage.

2. Model 2 presents results obtained from a reduced sample that rules out couples who are eligible to the APE (Allocation Parentale d'Education) program. In 1994, the APE program was extended to families with two children with one less than 3 years old. To control for the important effect of the APE program on women's employment, 672 out of 7037 couples are thus ruled out of the sample, the ones who meet the new conditions to enter the APE program. The estimation results are quite the same: indeed, the impact of the reform on employment decreases toward zero and is still non significant; the impact on marriage is still positive and significant.

3. Model 3 adds explanatory variables to the analysis. Age and education have positive and significant effects on employment. As expected, difference in spouses' earnings has a positive though non significative impact on marriage. Moreover, introducing covariates in the analysis does not change the result for the post-reform employment shift that is still non significant. The impact on marriage is not changed either: the marginal effect of the reform on marriage is +0.044 (see table 3b).

4. Univariate probit estimates are reported in the last two columns of Table 3. No important differences are recorded between univariate and bivariate estimates. Indeed, though the estimated correlation between the error terms is significant, it is small (-0.1).

Table 3b sums up the estimation results.

Table 3b: *Marginal effects of independent variables on marriage behavior and married women's employment (Bivariate Probit - Model 3)*

| Variable X | Mean of X | dE[M\|E=1]/dX | dE[E\|M=1]/dX |
|---|---|---|---|
| Post 95 | .4909 | -.0374 | n.s. |
| Child before marriage | .4741 | n.s. | -.6113 |
| Post 95 x Child before marriage | .2480 | .0444 | n.s. |
| Ratio of min. to max. earnings | .4444 | n.s. | - |
| Child before marriage x ratio | .1943 | 1.0598 | - |
| Age | 33.66 | n.s. | .0444 |
| Education | 18.71 | n.s. | .0566 |

## 4.2 The impact of the 1995 reform on working hours

Since the marriage decision and the participation to the labor market decision are correlated, we use the extension of Heckman's approach proposed by Ham (1982) to the case where two correlated selection rules generate the sample.

Table 4 presents least squares estimates concerning the impact of the reform on working hours of married women at work. Our findings are as follows:

1. Model 1 shows non significant impact of the reform on labor supply when no structural effects nor selection biases are taken into account.

2. Model 2 takes into account APE program effects by dropping 43 out of 714 couples, but the impact of the reform is still non significant.

3. Adding covariates in Model 3 does not change the former results.

4. Taking into account selectivity biases in Model 4 by adding Mills ratios for employment and marriage sharply changes the conclusions. Having children before marriage seems to increase the amount of working hours when married women decide to work. Age has a positive and significant effect on working hours, though this effect is reduced, nay negative, in presence of children. Education has a negative and significant impact on working hours in presence of children. Indeed, in French

surveys 2/3 of women choosing part time jobs declare not to be constraint, and they probably are the more educated women.

Furthermore, we find evidence that the amount of working hours of married women has decreased by about 3 hours per week because of the reform. Because of the importance of this effect, we can conclude that overlooking the "marriage bias" in labor supply studies can induce serious evaluation errors. This is especially the case in countries where tax and benefits are familialized like in France or in the USA.

5. Correcting for heteroscedasticity in Model 5 doesn't change the preceding conclusions.

Table 4b sums up the estimation results.

Table 4b: *Effects of independent variables on working hours of married women at work*

| Variable X | Mean of X | dH/dX |
|---|---|---|
| Post 95 | .4739 | 2.4269 (1.2424) |
| Child before marriage | .4754 | 23.6068 (8.4512) |
| Post 95 x Child before marriage | .2578 | -2.8742 (1.7578) |
| Age | 33.81 | .1033 (.0559) |
| Education | 19.18 | -.1198 (.2228) |
| Mills ratio for employment | .4909 | -9.3468 (5.6719) |
| Mills ratio for marriage | 1.5720 | -23.6362 (8.9589) |
| Standard errors are in parenthesis. | | |
| F-test is significative at $1.7\%$ level. | | |

# 5 Conclusion

This paper uses the French family quotient reform of 1995 to analyse the impact of taxes on marriage and labor supply. This reform cancels the benefit for cohabitants with children by introducing the notion of isolated parents with children in the tax declaration. This measure thus offsets the marriage penalty for couples with children but does not change anything for couples without children.

Using the panel structure of the French employment survey (1990-2000) we find that the probability of marriage has increased for stable couples (i.e. together over three consecutive years) who had originally been cohabitants, by about 4 points because of the reform. Furthermore, we find strong evidence that the labor supply of married women has decreased due to the 1995 family quotient reform: in the selected sample, the working hours of married women at work have decreased by about 3 hours per week. Nevertheless, although our findings support the working hours response, they are inconclusive as to participation response.

Our conclusions are then as follows:

1. Our natural experiment approach succeeds in showing the impact of the 1995 tax reform on both marriage and labor supply considered simultaneously. However, from a theoretical point of view, the interpretation of these effects is twofold.

The impact of individual income tax on marriage behavior and labor supply decisions could be interpreted on the one hand as a non conventional one since the variations of the family quotient only affect the "reservation welfare" a spouse may be able to achieve if she/he were not married. Then, using up-to-date and quite novel micro-economic analyses of labor supply, our results provide empirical evidence for the kind of "sharing rule" effect encapsulated by collective labor supply approaches. On the other hand, our results are coherent with the univariate model as well since the reform has simply increased the cost of a divorce for married couples and thus decreased uncertainty concerning the future. Further researches should thus resolve this point.

Whatever the theory behind the empirical results, our analysis points out the difficulties due to marriage selection in the study of the labor supply of married women. This kind of bias is often overlooked in labor supply studies and thus could have induce evaluation errors, especially in countries where taxation is familialized like in France or in the USA. Further empirical studies should thus be conducted in these countries.

2. From a more practical point of view, this work leads us to conclude that tax policy can influence decisions within households through measures targeted at specific groups of people -married or cohabitants couples. In particular, a familialized tax system appears to be non neutral in terms of women's employment, as the actual social system does (through the APE for instance). Given the important policy implications of these findings, particular attention should thus be given to the sound structuring of both fiscal and social programs.

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Figure 1: *Annual rate of children born out of marriage*

*(Daguet, 2002)*

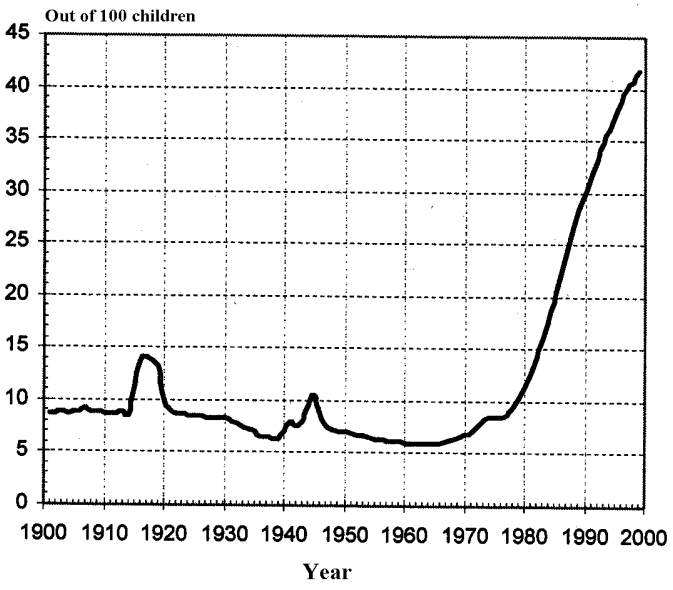

Table 1: *Family quotient units before and after the 1995 reform*

| Number of children in charge | Married couple | Single | | |
|---|---|---|---|---|
| | | Cohabitant single | | Isolated single |
| | | Before the reform | After the reform | |
| Without child | 2 | 1 | 1 | 1 |
| 1 child | 2,5 | 2 | 1,5 | 2 |
| 2 children | 3 | 2,5 | 2 | 2,5 |
| 3 children | 4 | 3,5 | 3 | 3,5 |
| 4 children | 5 | 4,5 | 4 | 4,5 |

Table 2: *Marriage subsidies before and after the 1995 reform for a couple that earns 35,000 euros a year*

| | **One earner couple without child** | **Two earners couple without child** | **One earner couple with one child** | **Two earners couple with one child** |
|---|---|---|---|---|
| **Before the reform** | +2905 € | 0 € | +733 € | -397 € |
| **After the reform** | +2905 € | 0 € | +1934 € | 0 € |

Note : Before the reform, a two-earners couple with identical earnings (of 17 500 € respectively) and one child has a marriage penalty of about -397 € ; after the reform, the penalty cancels.

Figure 2: *Evolution of the ratio of minimum to maximum earnings in the couple*

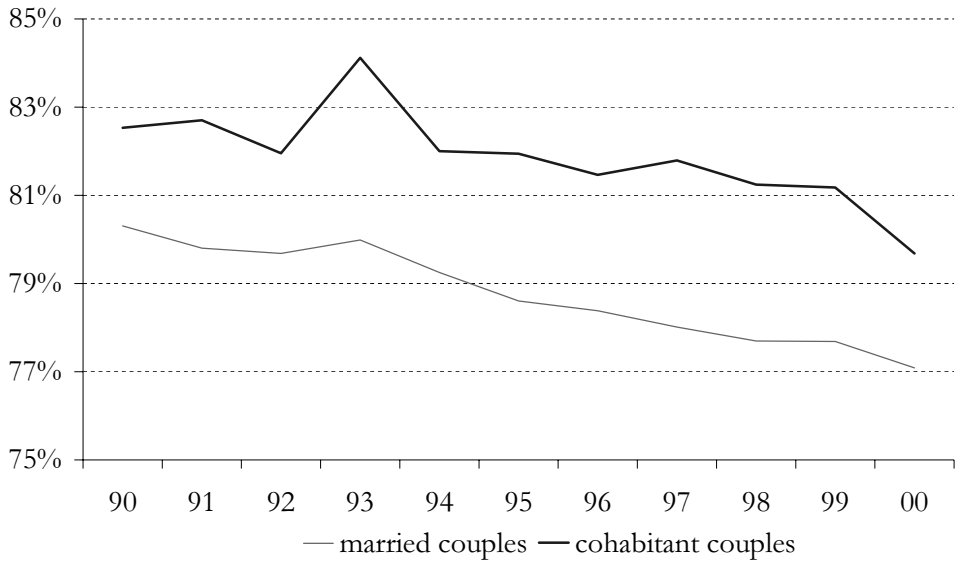

Figure 3: *Ratio of minimum to maximum earnings in the couple by age*

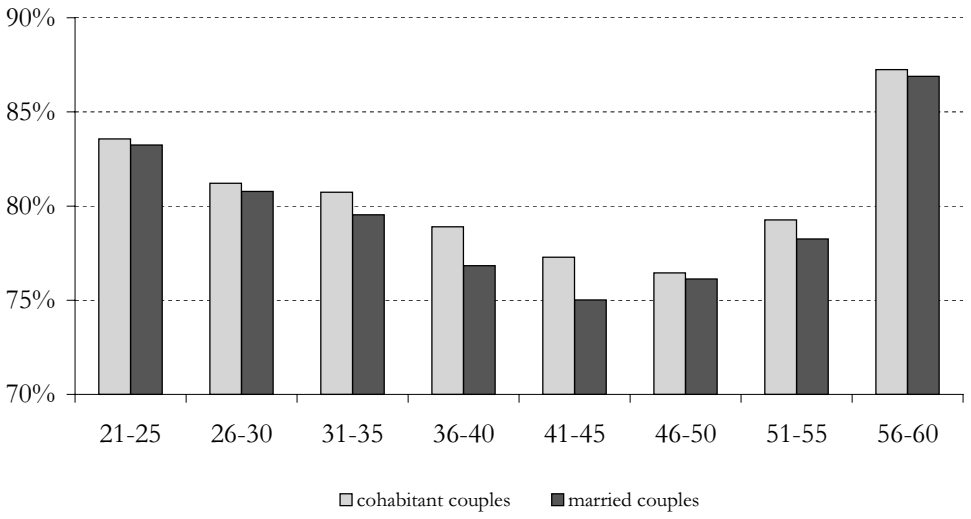

Figure 4: *Evolution of marriage rates*

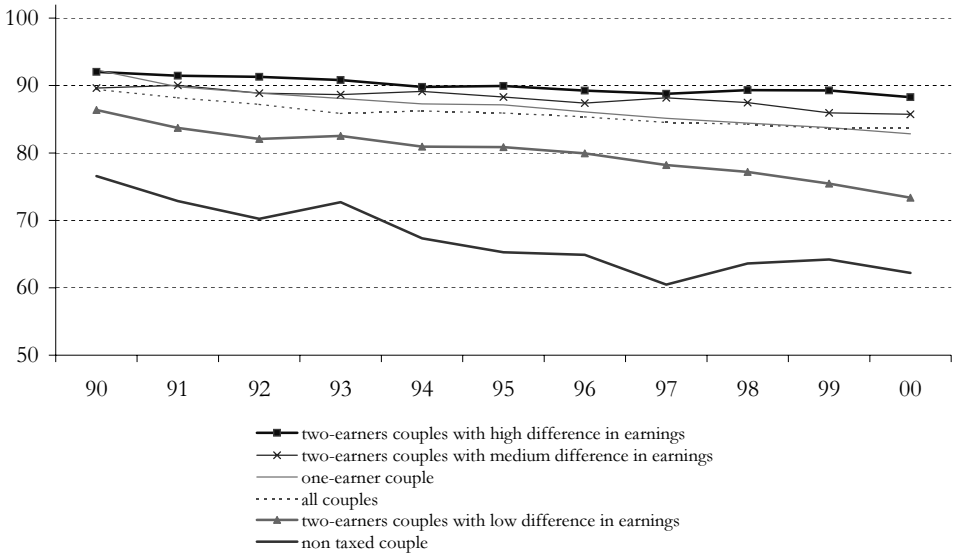

Figure 5: *Marriage rate at t for cohabitant couples with or without children at t-1*

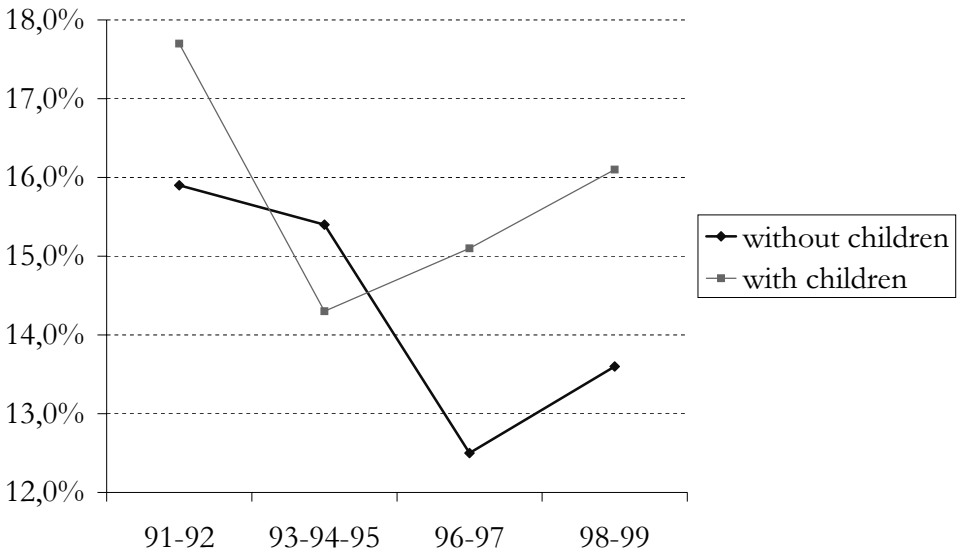

Figure 6: *Simple DD estimator for marriage by quintile of earnings*

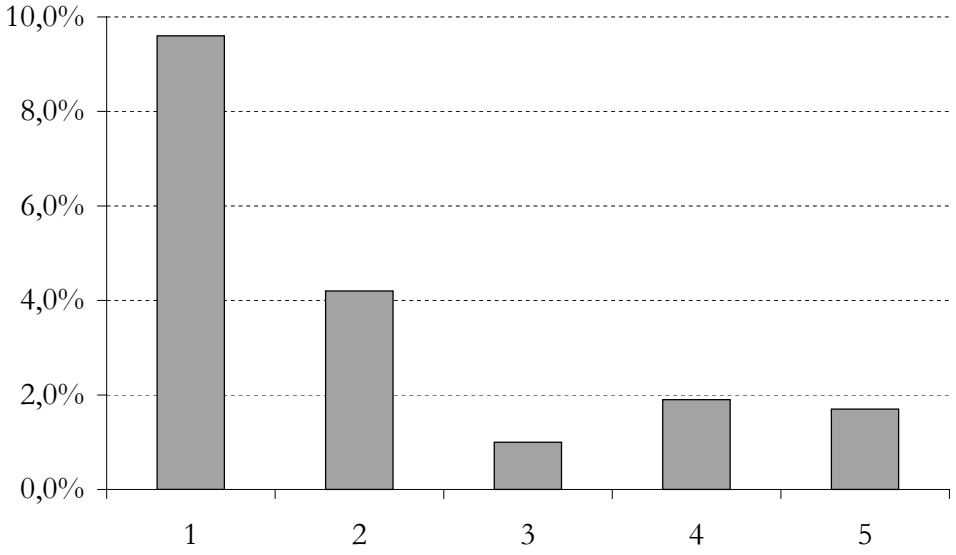

Figure 7: *Ratio of minimum to maximum earnings within the couple by quintile of earnings*

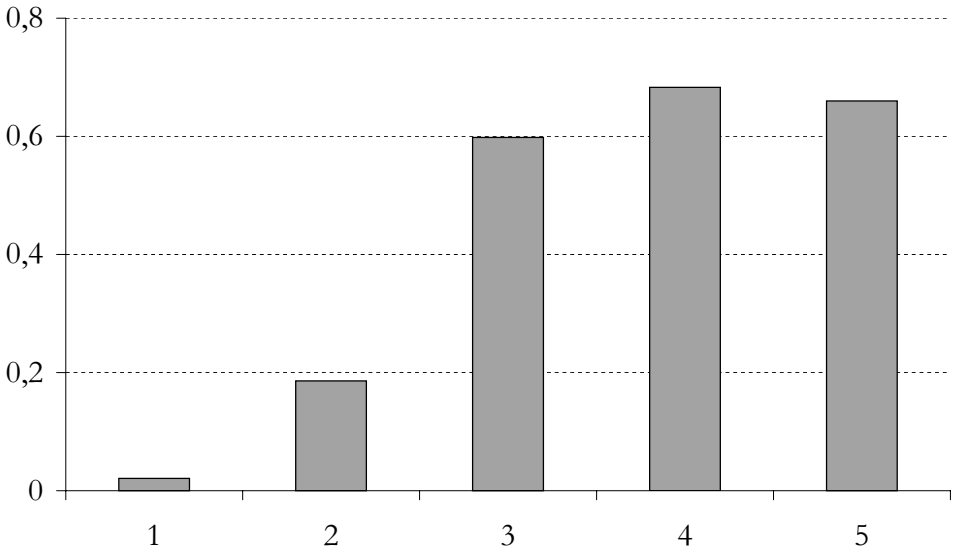

Figure 8: *Simple DD estimator for marriage by difference in earnings within the couple*

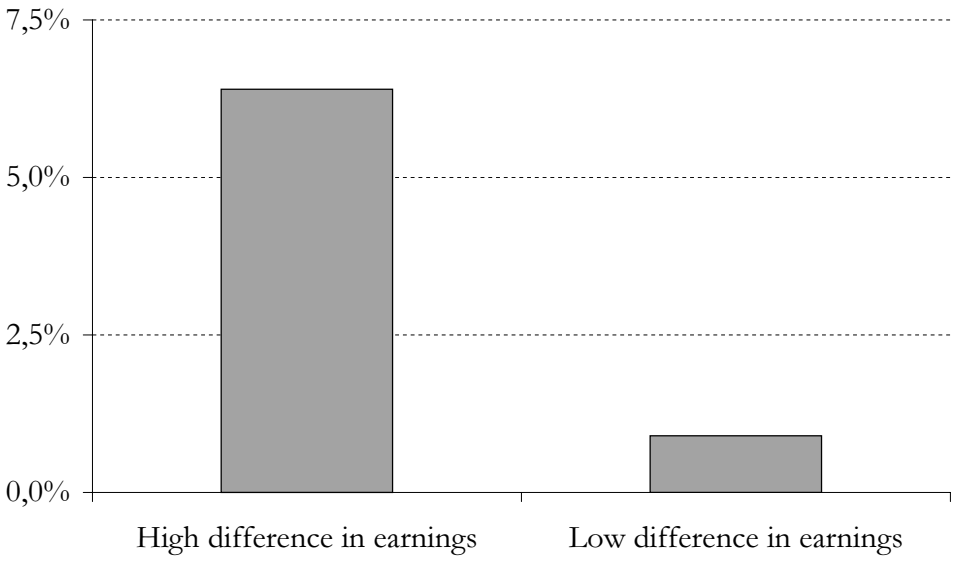

Figure 9: *Working hours for married women at work with or without children before they married*

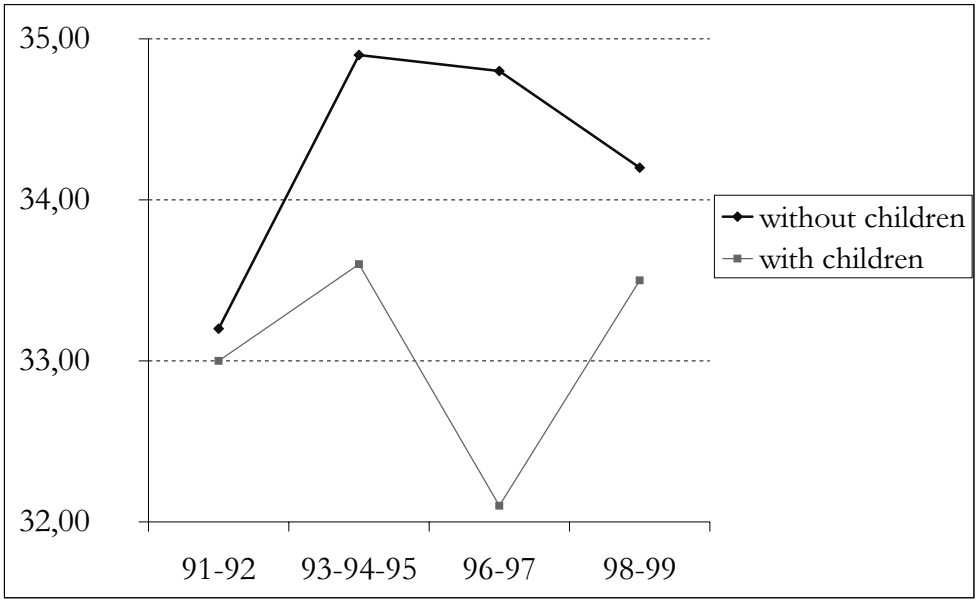

Table 3: *Estimating the probability of being employed or married*

| | Bivariate probit estimates | | | | | | Univariate probit estimates | |
|---|---|---|---|---|---|---|---|---|
| | 1 | | 2 | | 3 | | | |
| Variable | Employment | Marriage | Employment | Marriage | Employment | Marriage | Employment | Marriage |
| Constant | .7107<br>(.0323)** | -1.0040<br>(.0489)** | .7176<br>(.0324)** | -1.0137<br>(.0494)** | -3.5822<br>(.4815)** | .1722<br>(.8629) | -3.5658<br>(.5591)** | .1021<br>(.8198) |
| Post 95 | .0461<br>(.0478) | -.1219<br>(.0532)** | .0508<br>(.0481) | -.1277<br>(.0537)** | -.0023<br>(.0491) | -.1661<br>(.0891)* | -.0027<br>(.0492) | -.1664<br>(.0881)* |
| Children before marriage | -.3519<br>(.0447)** | -.0393<br>(.0658) | -.2819<br>(.0471)** | -.0182<br>(.0693) | -1.7287<br>(.7213)** | -.7701<br>(1.2637) | -1.7386<br>(.8223)** | -.8503<br>(1.1762) |
| Post 95 x children before marriage | -.4712<br>(.6398) | .1609<br>(.0730)** | .0409<br>(.0677) | .1554<br>(.0768)** | -.0143<br>(.0699) | .1972<br>(.1223)* | -.0144<br>(.0699) | .2000<br>(.1205)* |
| Ratio of min. to max. earnings | - | .0472<br>(.0728) | - | .0497<br>(.0738) | - | -2.8408<br>(1.9896) | - | -2.8524<br>(1.7585) |
| Child before marriage x ratio | - | .0127<br>(.0965) | - | .0086<br>(.1016) | - | 4.7055<br>(2.6876)* | - | 4.8792<br>(2.4484)** |
| **Controls** | | | | | | | | |
| Schooling, Age | NO | | NO | | YES | | YES | YES |
| Sch., Age x Child bef. marriage | NO | | NO | | YES | | YES | YES |
| Sch., Age x Child b. marr. x ratio | NO | | NO | | YES | | YES | YES |
| Rho | -.0919 (.0256)** | | -.0913 (.0273)** | | -.0986 (.0282)** | | - | - |
| Log-Likelihood | -7241.857 | | -6398.770 | | -6197.488 | | -3489.228 | -2714.446 |
| Sample size | 7037 | | 6365 | | 6365 | | 6365 | 6365 |

*Notes:*
(a) Standard errors are in parenthesis.
(b) Dependent variable coded 1 if employed, 0 otherwise.
(c) Dependent variable coded 1 if married, 0 otherwise.
(d) **Significant at 5% level *Significant at 10% level.

Table 4: *Alternative estimates of the working hours equation for married women at work*

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Variable | | | | | |
| Constant | 34.3702<br>(.6219)** | 34.4685<br>(.6182)** | 26.2513<br>(4.049)** | 74.3701<br>(14.0257)** | 74.3701<br>(14.9502)** |
| Post 95 | .3917<br>(.9665) | .3382<br>(.9631) | -.3579<br>(.9801) | 2.4268<br>(1.2226)** | 2.4268<br>(1.2424)** |
| Children before marriage | -1.0122<br>(.9399) | -.7973<br>(.9612) | 8.8259<br>(5.7847) | 23.6068<br>(7.6112)** | 23.6068<br>(8.4512)** |
| Post 95 x children before marriage | -.6329<br>(1.3561) | -.5991<br>(1.3881) | -.2452<br>(1.4281) | -2.8742<br>(1.6353)* | -2.8742<br>(1.7578)* |
| Age | - | - | .9047<br>(.5845) | .1033<br>(.0592)* | .1033<br>(.0559)* |
| Education (years) | - | - | .2815<br>(.1650)* | -.1198<br>(.2225) | -.1198<br>(.2228) |
| Age x Child bef. Marriage | - | - | -.7917<br>(.9435) | -.3881<br>(.1279)** | -.3881<br>(.1390)** |
| Education (years) x Child bef. Marriage | - | - | -.3770<br>(.2280)* | -.5268<br>(.2535)** | -.5268<br>(.3161)* |
| Mills ratio for employment | - | - | - | -9.3468<br>(4.893)* | -9.3468<br>(5.6719)* |
| Mills ratio for marriage | - | - | - | -23.6362<br>(7.1584)** | -23.6362<br>(8.9589)** |
| $R^2$ | .0056 | .0039 | .0110 | .0298 | .0298 |
| Sample Size | 714 | 671 | 671 | 671 | 671 |

*Notes:*

(a) Standard errors are in parenthesis.

(b) **Significant at 5% level *Significant at 10% level.

(c) Mills ratios are computed according to the Ham (1982) methodology.

(d) Correction of heteroscedasticity in model 5 requests computation of White's robust covariance matrix.

Table 5: *Descriptive statistics*

| Variable | Mean | Standard Deviation |
|---|---|---|
| Age (women) | 33.6 | 8.2 |
| Age (men) | 35.7 | 8.3 |
| Years of schooling (women) | 18.5 | 3.3 |
| Years of schooling (men) | 18.0 | 3.5 |
| Children before marriage | .526 | .499 |
| Married after one year | .150 | .358 |
| Employment rate (women) | .662 | .473 |
| Employment rate (men) | .844 | .363 |
| Monthly earnings (women)* | 1,027 | 782 |
| Monthly earnings (men)* | 1,313 | 1,762 |
| Ratio of min. to max. earnings within the couple | .809 | .232 |
| Total monthly earnings | 1,774 | 1,939 |
| *Employed persons only. In euros. | | |