



Groupe de Recherche en Économie et Développement International

Cahier de recherche / Working Paper
08-01

Taxation and marriage: Evidence from a natural experiment in France

Sophie Buffeteau

Damien Échevin

Taxation and marriage: Evidence from a natural experiment in France

Sophie Buffeteau*, and Damien Échevin†

April 30, 2008

Abstract

This paper uses the French family quotient reform of 1995 to analyze the impact of the individual income tax on marriage behavior. An important feature of this reform was the cancelation of fiscal subsidies aimed at cohabiting 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. To assess the impact of the reform, we use the difference-in-differences estimation approach. Using the panel structure of the French employment survey during the 1990's we find high and heterogeneous effect of the reform on the probability of marriage. In particular, the probability of marriage has increased by about 5 points for young cohabitant couples with children, and by about 12 to 14 points when focusing on those with more than one kid or on those with less educated woman and higher educated man.

Keywords: Marriage, Income Taxation, Labor Supply, Natural Experiment.

JEL Numbers: J12; J13; D13.

* INSEE; email: sophie.buffeteau@insee.fr

† Université de Sherbrooke; correspondance: Damien Échevin, Département d'économie, Faculté d'administration, Université de Sherbrooke, 2500 boulevard de l'Université (Québec), J1K 2R1, Canada; e-mail: damien.echevin@usherbrooke.ca

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 wealth of literature on the impact of the individual income tax on labor supply decisions¹. But less work has been carried out concerning the impact of the individual income tax on marriage behavior.

If we consider the income tax, the combination of progressive tax rates with a structure in which families with both an 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. In France, as in some other European countries (including Portugal and Luxembourg), the tax imposed on a married couple is calculated in relation to the household's aggregate income. In other countries, each person is taxed separately. Where tax is family-based and progressive, the effect of marriage is to reduce the income tax. Such is the case in the United States, for example, 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 distribution of income between the individuals. In the case of the United States, marriage penalties and benefits as a proportion of disposable income range between a 4% penalty for a couple with one wage-earner and a 3% benefit for a couple with two people working (see Alm, Dickert-Conlin, and Whittington (1999)). Theoretically, marriage penalties are still virtually non-existent in France (though not in practice).

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), Alm and Whittington (1999), Ellwood (2000)). 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

¹See Fortin and Lacroix (2002) for a survey.

that the individual would face if single.

In that perspective, it is logical that marriage rates should be higher for taxed households (and all the more so for couples with unequal earnings), when in fact the causal effect between taxation and marriage is difficult to interpret for several reasons. In the French tax system, tax rates generally decrease when individuals get married, and the greater the gender earnings gap within married couples, the lower the tax rate. Moreover, it is a widespread result that earnings are higher for married men but not necessarily for married women. Consequently, a greater gender earnings gap is observed for married couples (even when controlling for age effect). Considering this, it is not straightforward to know which way the relationship of cause and effect works, since the inequality gap within the couple between married couples on the one hand and cohabiting couples on the other hand can be interpreted either as a cause or as a consequence of marriage².

In this paper, we concentrate on the impact of the taxation on the marriage of previously cohabiting couples. Of course, economists do not have the full story about the decision to get married or not. All they can do is highlight the aspect of people's behavior that is meaningful for economists (that is, in particular, how financial incentives do impact on behaviors). In fact, changing social norms are good candidates to explain the changes in the marriage rate as well. For instance, a good indicator of the weight of the social pressure to get married is certainly the annual rate of children born out of wedlock (see Figure 1). In France, it appears that this rate was quite stable -from 10% to 6%- over the first two thirds of the century with peaks during the two world wars. At the end of the 1960's (probably around 1968), the annual rate of children born out of wedlock begins to rise and reaches over 40% at the end of the century³. Thus, though during the major part of the 20th century, being married to have children seemed to be a norm, nay an obligation, it is no longer the case at the end of the century: the great number of children who were born out of wedlock shows evidence that the link between fertility and marriage tends to crumble away. Being born out of wedlock does not even imply that children were born in a single parent family.

²See, among others, Nakosteen and Zimmer (1987), Becker (1991), Korenman and Neumark (1991), Daniel (1992), Jacobsen and Rayack (1996), Loh (1996), Cornwell and Ruppert (1997), Gray (1997), Nakosteen and Zimmer (1997), Hersh and Stratton (2000), Chun and Lee (2001), Nakosteen and Zimmer (2001).

³See Daguet (2002).

Since, nowadays, the social pressure to get married, even when the couple has children, is probably not so strong, our intuition is that a tax reform that treats differently cohabiting couples with children and cohabiting couples without children could prove to be a valuable "natural experiment" in order to evaluate the impact of taxation and financial incentives on marriage. Our empirical strategy thus consists in using the 1995 French family quotient (*Quotient Familial*) reform as a natural experiment. An important feature of this reform was that fiscal subsidies aimed at cohabiting couples with children were canceled.

The fundamental assumption of this natural experiment approach is that both the treatment group (i.e. cohabiting couples with children, especially those who were concerned by the income tax) and the control group (other cohabiting couples) are similarly affected by factors not considered explicitly in the analysis. In other words, the validity of our natural experiment depends on the assumption that temporal fixed effects are the same for both the control and the treatment groups. This can be simply checked on a graph, since this assumption only requires the trends of the variable of interest for the two groups to be the same before the reform. However, without panel data on the period considered, it is hardly possible to control for a hypothetical exogenous change after the reform. We thus try to correct for structural changes (mostly for age and education) and take into account the possibility that other reforms during that period may have impacted on marriage decisions as well. Such is the case of the APE (*Allocation Parentale d'Éducation*) program.

An other important issue concerns the heterogeneity of the effect of the tax reform on marriage incentives among households: it depends on the number of children, on the level of the household income, but also on the allocation of income between the spouses. The effect of the reform on marriage incentives is therefore strongly different among households, according to those dimensions. For several reasons, the fact that those dimensions may be correlated with some unobservable heterogeneity influencing marriage decisions leads to some endogeneity problems. In particular, we have to address the endogeneity bias due to the supposed impact of the 1995 tax reform on employment. On the one hand, increasing marginal tax rates for cohabitants due to the reform may have impacted on their labor supply. On the other hand, if such was the case, it then led to a change in the financial incentives to

marry (since, in the French tax law, the higher the gender earnings gap within married couples the lower average tax rate). Taking seriously that selectivity bias into account will thus require to estimate a joint model of marriage and employment.

What is more, the 1995 reform may have impacted on fertility. Thus control group and treatment group membership may be modified in response to the reform. Although recent studies on fertility in France that rest on different methodological approaches (namely structural models and natural experiments) share the view that financial incentives have not impacted that much on fertility behaviors in France in the last few decades⁴, it is not clear that the reform we study didn't impact on fertility. For that reason, suitable strategy will be proposed to try to circumvent this identification problem.

Finally, the 1995 tax reform may have also some tax evasion implications since the tax department may not have perfectly tracked cohabiting couples with children on whom the reform is focused. To check for potential tax evasion behaviors we first look whether the number of single taxpayers with children has declined after 1995, using tax returns annual tabulations edited by the tax administration⁵ as well as tax returns micro files based on a sample of income tax payers. On the other hand, from 1996 onward, French employment surveys have been matched with tax returns, so one can for instance see whether some cohabiting couples keep benefiting from the full unit for their first kid.

The paper is organized as follows. Section 2 discusses the main features of the French tax system and the 1995 family quotient reform. Section 3 presents a simple framework to analyze income taxation and marriage decision in France. Section 4 provides a description of the data used in the empirical analysis as well as preliminary evidence on the impact of the 1995 reform. Section 5 introduces the statistical model and discusses potential endogeneity biases. Main findings are reported in section 6. Finally, the paper points up conclusions in section 7.

⁴See among others Landais (2003) and Piketty (2005). Note however that Laroque and Salanié (2005) did find an important impact of financial incentives on fertility in France while Laroque and Salanié (2003) –with a simpler model– did not.

⁵These annual tabulations were first used for economic studies purposes in France by Piketty (1999) (see also Piketty (1998) for a more extended version of this work) in order to exploit a number of changes in the family quotient system that were implemented during the 1980's–1990's. Piketty (1999) produced some tax returns data showing that the number of single taxpayers benefiting from one full unit for their first child has declined sharply after the 1995 reform. This *per se* does not show anything about marriage behavior, this just shows that tax authorities managed to track down cohabiting couples, to tell them apart from truly single parents; but this suggests that this data source must be used to analyze the 1995 reform.

2 The income tax system in France and the 1995 family quotient reform

In France, the family-based income tax system relies on the family quotient (*Quotient Familial*) which was established in 1945. The family quotient principle consists in dividing the household total taxable income by a certain number of fiscal units determined so as to evaluate the extent of family outgoings. In a given household as defined for tax purposes, each spouse counts for one fiscal unit. The first and second children (or dependent persons) count for one half fiscal unit each and the third and following ones count for one unit each. Some particularities of the individuals living in the households can entitle tax payers to extra units (handicap, widowhood, etc.). Then the family quotient ratio enters the tax progressive schedule in order to determine the marginal tax rate per fiscal unit. That rate of taxation is multiplied by the total number of fiscal units in order to obtain the amount of the household's income tax. Finally, the family quotient is restricted, which means that the advantage ensuing from its calculation can't exceed a certain amount.

The family quotient meets a number of objectives. It first aims to ensure horizontal equity, that is tax neutrality among households having a globally equivalent income, whatever its composition. It then meets family policy purposes, providing tax incentives in connection with marriage and birth rate. Actually, there are two different aspects to the family quotient: it involves both the issues of treating children and that of treating the couple. We are focusing here on that second side which is thus more to do with a "conjugal quotient".

Married couples benefit more by the conjugal quotient system, all the more so when the earnings' gap is wide between the members of the couple. For instance, consider a couple without children: getting married involves a maximum benefit when one of them is not working, while they have a zero benefit when their earnings are equal. Now, when there are children involved, tax calculation changes. For a couple with one child, the family quotient no longer favors the gender earnings discrepancy within the couple as the benefit in case of marriage is null when the first earner's income is 50% higher than that of the secondary earner. For a couple with two children, marriage entails no financial

gain when the first earner's income is twice as big as that of the secondary earner, etc.

Table 1 presents some figures. For instance, a couple with two children with an annual income of 30,000€ is penalized by the marriage status when the first earner earns twice as much as the secondary earner. The penalty makes up 2% of the total income. On the other hand, the fiscal benefit of marriage for a one earner couple without children with an annual income of 30,000€ amounts to 7% of total income; this gain would nullify when the two earners earn the same⁶. By comparison with the previous figures, Alm, Dickert-Conlin, and Whittington (1999) ranged marriage penalties and benefits for American citizens as a proportion of their disposable income between a 4% penalty for a couple with one wage-earner and a 3% benefit for a two earners' family.

The 1995 reform 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. A couple with two children could thus be granted 4 family quotient units if cohabiting, but only 3 if married (see Table 2). Since the tax gain in connection with the family quotient increases with the number of units, the situation before the reform could entail substantial penalties for couples with children if they were married. 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. This measure thus makes up for the married status penalty that existed for couples with children but it does not change anything for couples without children.

Whatever the number of children, this reform entails a rise of the income tax for cohabiting couples and a higher benefit in connection with the married status. For example, consider a couple with two children whose annual income amounts to 40,000€, the penalties resulting from the married status (evaluated at 3% of the total income before the reform) have been nullified by the reform. The income tax rises by about 1,000€ when this couple is not married, that is a near 50% rise⁷.

These theoretical results are slightly altered when taking into account some distinctive features of the French tax system. Using a micro-simulation model, Echevin (2003) has estimated the proportion

⁶See Buffeteau and Echevin (2003) for more figures.

⁷We assume for these calculations that cohabiting couples assign their children to one or the other of the parents' tax declaration so as to lessen the household's global taxation, which appears to be an acceptable proxy.

of married couples in France who enjoy a tax benefit because of their marital status (averaging 1,080€ per year) at roughly 46%, while 22% of married couples are found to be penalized by marriage by an average 185€ penalty per year (because of the "*décote*" rebate mechanism⁸, the tax collection threshold, and other special allowances). These figures can be compared to the ones obtained for the United States. Rosen (1987) estimated that in 1988 40% of American couples paid a marriage tax of some \$1,100, and that 53% enjoyed an average marriage benefit of \$600. Feenberg and Rosen (1994) estimated that, in 1994, 52% of American couples paid an average marriage tax of \$1,244; 38% had an average marriage benefit of \$1,399⁹. These figures show how low the marriage tax is in France (the marriage tax in absolute value being one-sixth as great as the average marriage benefit in France, whereas in the United States, at the end of the 1980's, the marriage tax was roughly twice as great in absolute value as the marriage benefit and then became approximately equal in the 1990's). The proportion of couples who lose out because of their married status is thus twice as high in the United States as in France.

3 Income taxation and marriage decision

Let's consider a simple framework where the couple tries to minimize income tax. We suppose that the schedule of the income tax is a simple progressive schedule by brackets. In other words, we have an increasing and convex function T of total taxable income per fiscal unit so that the income tax is $I = NT\{Y/N\}$ where N is the number of fiscal units and Y is the family taxable income. Note E the number of units given for the children in the family. The current income tax of the married couple is $I^M = (2 + E)T\{(Y_h + Y_w)/(2 + E)\}$ where Y_h is the husband's earnings and Y_w is the wife's earnings. When electing a separate taxation process for cohabiting couples and assigning children to the husband's tax declaration, the household pays $I^C = (1 + E)T\{Y_h/(1 + E)\} + T\{Y_w\}$. The

⁸This mechanism was set up so that a minimum wage earner who is single may not be liable to the income tax. The rebate favors cohabiting couples since it is calculated in relation to the global household's income: hence, a minimum wage earner who is single can enjoy it, but not a married couple made up of two minimum wage earners.

⁹Rosen (1987) assessed the consequences of the 1986 Tax Reform Act; that reform sharply reduced the overall income tax burden, but it also increased the marriage tax. In addition, Feenberg and Rosen (1994) simulated the tax measures taken by the Clinton administration raising the highest tax brackets and boosting the earned income tax credit (EITC).

term $(Y_h + Y_w)/(2 + E)$ is the combination of two terms, $Y_h/(1 + E)$ and Y_w , weighed by weights $1 - \mu$ and μ , with $\mu = 1/(2 + E)$. The convexity of T thus implies that $T\{(Y_h + Y_w)/(2 + E)\} \leq (1 - \mu)T\{Y_h/(1 + E)\} + \mu T\{Y_w\}$. Hence $I^M \leq I^C$ in any case: there is a positive fiscal gain for the couple to be married. This gain is null ($I^M = I^C$) when $Y_h = (1 + E)Y_w$, or, symmetrically, when $Y_w = (1 + E)Y_h$.

Consider now that cohabitants with children get an extra half fiscal unit, so that $I^C = (1.5 + E)T\{Y_h/(1.5 + E)\} + T\{Y_w\}$. Then, those couples are neutral to marriage when $Y_h = (3 + 2E)Y_w$. If that condition does not hold anymore –i.e. if the extra half unit is canceled– then couples previously in the condition of neutrality will choose to marry.

As a result, it illustrates that cohabitation subsidies will prevent people from getting married. However, it is an empirical question to know how important are those effects. Furthermore, there is some reason to believe that a reform in the opposite way (i.e. subsidizing marriage starting from neutrality instead of canceling marriage penalty) would have had the same effects. Indeed, to generalize the above result we simply have to consider that $Y_h = kY_w$, with k being the ratio of the husband's earnings to the wife's earnings. Then, adding some extra fiscal units when married (noted m) and when cohabiting (noted c), rewriting the neutrality condition and deriving according to k , we obtain a first-order condition $T'\{(1 + k)Y_w/(2 + E + m)\} - T'\{kY_w/(1 + E + c)\} = 0$. So that the neutrality condition holds when $k = (1 + E + c)/(1 + m - c)$; then increasing m will generate neutrality for couples' earnings corresponding to a lower ratio k and will increase marriage benefits for those above.

Finally, the neutrality condition can be restated with extra costs of marriage, noted λ , so that we can write $(2 + E + m)T\{(1 + k)Y_w/(2 + E + m)\} + \lambda - (1 + E + c)T\{kY_w/(1 + E + c)\} = 0$. Those extra costs of marriage are related to family composition, family history (divorce), age, etc., and could be lowered by other specificities of the tax system (concerning the inheritance tax for instance that is lower in France for married couples). This is in fact an empirical question to know how those various determinants could influence the decision to marry.

4 Data and preliminary evidences

In this section, we present data from various statistical sources which document the impact of the 1995 reform. In the perspective of section 2, we use, on the one hand, tax returns statistics to show how much is the increase of the percentage of households with a positive income tax among cohabiting couples just after the reform. We also find evidence that the number of new taxed households has been limited by marriage strategies. On the other hand, we use demographic statistics to describe the trends in marriage rate as well as in other demographic variables of interest. Finally, we use employment surveys in order to complement this first set of evidence concerning the impact of the 1995 reform on marriage.

4.1 Fiscal trends

In 2002, out of 32 million tax units, 20 million consisted of single persons and 12 million of married couples¹⁰. Among unmarried tax units, a third consisted in fact of unregistered domestic partners¹¹ living together but reporting their income separately.

Using cross section data from income tax returns statistics we draw the changes in the percentage of taxed households. As shown in Figure 2, half of the population is taxed in France and this figure is quite stable throughout the period considered. Splitting tax units into different groups, according to marital status and according to the presence of children, we show that the percentage of taxed households among unmarried tax units with children (either cohabitant or single¹²) sharply rose between 1994 and 1995 from 32.3% to 39.3%. Keeping in mind that taxes are collected within the year after income has been earned, these figures can be interpreted as the impact of the 1995/96 reform on income taxation. Other groups didn't register such an increase in the percentage of taxed households.

Another interesting result drawn from the tax returns statistics is the increase in the percentage

¹⁰Calculations performed on a representative sample of 500,000 income tax returns for 2002. Source: French National Revenue Service (DGI).

¹¹The proportion of tax units consisting of partners in registered civil unions (PACS), who are treated the same as married couples for income tax purposes, is not believed to exceed 0.1%.

¹²Note that the difference between both types of households as defined for tax purposes can't be made on the basis of tax returns statistics before 1995.

of married couples with children among married couples who are not taxed. According to Figure 3 this population had increased by about 4.5 percentage points two years after the reform. One possible explanation for this delay is that the reform had an immediate impact on marriage in 1996 but maybe not quickly enough for the couples to split their income in an optimal way. This is indeed a distinctive characteristic of the French income tax that marriage allows optimal declared income splitting when it is effective approximately in the middle of the year, so that the three tax declarations (one for each cohabitant during the first period of the year and one for the married couple over the other period of the year) could minimize taxes. Furthermore, income declarations that concern only one period of the year are recorded in tax returns statistics just like other declarations; so that could be another reason why no change can be observed in 1996 concerning tax returns statistics.

Nevertheless, looking on Figure 2 again, it is possible to track down a slight decrease of the percentage of unmarried and taxed tax units with children the year after the reform, though the gap between the percentage of taxed married couples with children and the common trend is perceptible only in 1997.

4.2 Demographic trends

The contours of family units in France have been globally evolving with continuity: the number of marriages per year has declined by roughly 25% over the last three decades, and the number of children conceived out of wedlock has been rising rapidly since the early 1970's, up to over 40% by the end of the 20th century.

The demographic data published by the French NSO (INSEE) and by Eurostat present a panorama of marriage and birth rates trends over the last few decades. With a view to give an account of the part played by tax incentives upon marriage-related behaviors, we first present the French trends of the marriage rate (or marriage indicator) in an international perspective (Figure 4).

The marriage rate has been decreasing dramatically for about three decades in France, in Europe and in the US. In 1999, 4.9 per 1,000 inhabitants got married in France, 5.3 per 1,000 in Spain, 5.1 per 1,000 in the United Kingdom and 8.4 per 1,000 in the United States.

The fall of the marriage rate over the past three decades appears to be particularly great in France. Moreover, the trend reversal also seems stronger in France in 1996 than in the other European countries (including Spain, whose rate also rises from the second half of the 1990's onward). From these data, it clearly appears that the rise of the marriage rate took place as soon as 1996.

Moreover, it is of note that the marriage rate in France is particularly low, in spite of a tax system that tends to favor married couples. From 1970 to 1995, the number of marriages decreased more in France than in all the other European countries. In this context, the trend reversal observed after 1995 thus appears all the more surprising and commands further commenting.

Nowadays, couples can be joined a long time before getting married. Cohabiting couples are thus younger than married couples; in 2000, three quarters of the former are between 21 and 30 years old, one third between 26 and 30, while they only make up 5% of couples after 40.

Furthermore, as pointed out in the introduction, one of the remarkable consequences of the changes in marriage-related behaviors has been the quick rise of out-of-wedlock births over the last three decades (Figure 1).

A central hypothesis in our study is that, with less social pressure to get married, the part played by financial incentives in the decision to get married is bigger. Hence, the impact of the 1995 family quotient reform on the marriage rate legitimating children¹³ should enable us to give a good illustration of the link between taxation and marriage (Figure 5).

The assessment based on the trends of marriage rate legitimating children appears to corroborate the first set of results yielded by the trends of marriage rates by country.

4.3 Heterogeneous effects of the 1995 reform

The data used in the analysis are drawn from the French employment survey (FES). During the 1990's, approximately 70,000 households were surveyed each year and over three consecutive years. Information on marital status, age, education, family composition as well as participation in the labor

¹³Note that children are automatically legitimated in wedlock, but not out of wedlock, although the proportion of children acknowledged by their father either automatically in the marriage or by registration at birth has been very stable over the century, around 95%.

market and earnings are available (see Table 3). Furthermore, the survey has a panel structure that can be used to study the dynamics of marriage. Indeed, one third of the households are replaced each year so that we can follow three years of the family's history. For our analysis, we first rule out households whose head or cohabitant is over 60 years old, a student or self-employed person. Secondly, we keep individuals that were cohabitant one year, and either unmarried or married the subsequent year.

As proposed previously, the family quotient reform of 1995 is considered as a natural experiment. One then compares the difference in behaviors after and before the reform for groups affected by it (cohabitants with children, especially those who were concerned by the income tax) to that difference among unaffected groups (other households). The difference-in-differences estimator results from that comparison. This estimator is further discussed in the next section as well as possible endogeneity biases.

Using data available in the employment survey on individuals' earnings as well as on the number of dependent children in the household, we construct a dummy variable whose value is 1 if the household is taxed and 0 otherwise. To do so, we suppose that unmarried individuals declare children in order to minimize the overall household income tax. Figure 7 then reports trends of the percentage of taxed unmarried people among cohabitant couples with or without children in the 1990's. It is clearly shown that the reform has increased the percentage of taxed individuals with children as previously noticed with income tax statistics, while the percentage of not taxed persons has practically not changed during that period.

Using matched employment survey-tax returns data sets available in France since 1996 enables us to check the accuracy of those figures. With these 1996-2000 data sets, our predictions for the fiscal status of cohabiting couples can be compared with their tax declarations. As a result, our predictions prove to be accurate for almost three quarters of the couples (75% among taxed cohabiting couples and 70% among untaxed cohabiting couples). Several explanations can account for such discrepancies. First, using the earnings to predict the fiscal status of couples may induce some errors since other income sources may have to be taken into account. However, when predicting the income tax from the household's taxable income as it is reported in the tax declarations, significant gaps still appear

between the predicted and the reported income tax for 20% of cohabiting couples with children. Secondly, optimization errors have to be considered as an alternative explanation for these errors: they may stem from various sources of inefficiency (non-cooperation, lack of information, etc.) or simply from the presence of ‘natural’ children in reconstituted families; in that case, children can not be allocated to one of their parents unless they are related to them biologically. Additional information provided by the French Family Survey matched with the French 1990 Census data show that almost 20% of cohabiting couples with children are find themselves faced with this dilemma.

According to our predictions, 58% of cohabiting couples should be taxed, while 62% actually are when checking their tax declarations. Non-optimization behaviors and other unobservable constraints for the couples may lead to such discrepancies. What is more, such cohabiting couples may not be as reactive to the 1995 tax reform. For instance, it may not be beneficial for couples with a child who is biologically linked to the secondary earner in the family and, in that case, no change in the fiscal status is observed, no matter if they benefit by an extra fiscal unit or not (the reason why such cohabiting couples are taxed is because the primary earner is taxed, while the secondary earner is not). For such couples, the reform doesn’t change the neutrality condition regarding marriage. In the context of a quasi-experimental design such as the one we describe subsequently, those couples should thus be classified in the control group –composed of the couples whose income tax does not change with the reform.

Employment survey data sets enable us to draw marriage rates –as defined as the percentage of cohabitant couples a given year who get married during the subsequent year– for different groups of individuals. We split the population between those who were "taxed" with children (treatment group), those who were taxed without children (control group 1), those who weren’t taxed with children (control group 2), and those who weren’t taxed without children (control group 3). People who would have been taxed if they hadn’t benefited from the one extra half fiscal unit to single parent with children belong to group T, so that individuals in this group are typically those concerned by the reform (i.e. the treatment group).

In practice, the use of those different control groups are problematic because they could be affected

by the 1995 reform. If we firstly consider cohabiting couples without children as a control group, they may plan to have children in the future. If they know that the marriage penalty for a couple with children is going to disappear, they might choose to get married now, and their fertility schedule is not going to be affected at all. That is why unmarried couples without children cannot be used as a reliable control group for a difference-in-difference estimation here. As their marriage behavior is positively affected by the reform, the estimates would be probably biased downward.

Secondly, we can consider as a control group the group of untaxed unmarried couples with children. This group is not directly affected by the 1995 reform, as long as one makes sure that the taxation status is stable (the household has a permanent income below taxation threshold). The problem is that the taxation status is not really stable in the middle-run: for instance, income grows with age, so that untaxed couples today are taxed couples of tomorrow. Since marriage is somewhat irreversible in the middle-run, it implies that couples compare the net present value of getting married to the net present value of not getting married. For an untaxed couple expecting its income to grow (and therefore expecting to get taxed in the future), incentives to get married immediately increase in 1995.

However, that incentive to marry for couples that are currently not taxed is questionable. On the one hand, it is difficult to substantiate the role of anticipations with the data¹⁴. On the other hand, people will gain from marriage even if they are taxed one year in their life; however, they won't marry now because the cost of marriage is not null. As they will actualize the costs and benefits from marriage, they will always find that marriage is less profitable now as it may be in the future.

For that reason, it is possible to use untaxed cohabiting couples with children as a reliable control group. What is more, comparing taxed individuals with children with untaxed individuals with children should also control for the potential impact of the reform on fertility –since individuals won't move from the control group to the treatment group even in presence of fertility response to the reform.

¹⁴The French employment survey is a rotating three-years panel. This survey is a residence based survey so that some individuals move during the survey period. Consequently, it is possible to estimate permanent income as the mean of earnings over only three years for couples that marry or stay cohabitant during the three years. Other couples who separate or divorce would not be considered so that it may be problematical.

Looking on Figures 7 and 8 give information on heterogenous effects of the reform. If we consider the difference of marriage rates between taxed cohabitant couples with children and not taxed cohabitant couples with children, then we can see that this difference increases for subsequent years after the reform, especially for lower age groups and for less educated groups. We find no difference between marriage rates of untaxed and taxed cohabitant couples concerning the more educated. Furthermore, the break in the marriage rate differential between treatment and control groups is more neat for couples with two kids: having more kids seems to enhance the effect of the reform. Finally, as expected, the reform has greater effect the higher the gap between spouses' earnings.

5 The statistical model

5.1 Difference-in-differences estimator

The difference-in-differences estimates of the impact of the 1995 fiscal reform on marriage-related behaviors as well as standard errors for these estimates are derived from using regressions on individuals in treatment and control groups over several years before and after the reform.

Formally, the population of unmarried individuals is divided into two groups: control group includes untaxed couples with children before they get married or not (they were unmarried in $t - 1$ and either unmarried or married in t), and treatment group includes those with children before they get married, either taxed or potentially taxed if they didn't benefit from the one extra half fiscal unit for single parents (group T). Assume that individual i experiences marriage at t if:

$$m_i^*(t) = \alpha + \alpha_{Tax} \mathbf{1}_{iTax} + \alpha_R \mathbf{1}_{iR} + \alpha_{TaxR} \mathbf{1}_{iTax} \mathbf{1}_{iR} \\ + z_i(t) \beta + \mathbf{1}_{iTax} z_i(t) \beta_{Tax} + \epsilon_i(t) > 0.$$

In this equation, $m_i^*(t)$ is a latent variable for the decision to get married and $\mathbf{1}_{iTax}$ is a dummy variable equal to one when the individual is taxed (or potentially taxed), that is when she/he belongs to the treatment group. $\mathbf{1}_{iR}$ is a dummy variable for the post-reform period. The parameters α and

α_{Tax} measure the control and treatment groups' invariant specific effects. The parameter α_R allows for a post-reform shift in the marriage rate that is common to both treatment and control groups. Furthermore, the impact of the reform on the marriage-related behavior of the treatment group, which is given by α_{TaxR} , is provided by the parameter associated to the interaction term between the post-reform and the treatment group dummy variables, $\mathbf{1}_{iTax}\mathbf{1}_{iR}$. We thus suppose that the reform has no effect on the control groups. This parameter can be interpreted as a change in the post-reform marriage rate of the treatment group –and controlling for the explanatory variables included in the vector $z_i(t)$. Since the individuals of the treatment group can differ from those of the control groups in terms of age or education, $z_i(t)$ 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 β and β_{Tax} allow for the specific effects of the independent variables on the control and treatment groups. Other factors not considered in the analysis are supposed to affect both groups similarly. The $\epsilon_i(t)$'s are i.i.d. random variables with zero mean reflecting individual unobserved heterogeneity.

Based on standard economic theory, one should expect the marriage rate to rise with an increase in marriage subsidies (or a decrease in cohabitation out of wedlock subsidies). Therefore, parameter α_{TaxR} in the previous equation should be positive. However, one consequence of the fiscal reform considered is that "true" single parents may have delayed their choice to cohabit with someone else and then to marry. That represents one possible negative effect of the reform on marriage. Incentives to evade or avoid taxes contribute to the ambiguity.

After providing a discussion of potential biases for the analysis in the next section, results on the assessment of the impact of the reform on marriage are finally presented in section 6 together with tax evasion issues.

5.2 Potential biases and estimation strategies

One fundamental assumption for the estimates of the previous marriage model to be valid is that the error term $\epsilon_i(t)$ is not correlated with unobservable variables (such as individual productivity and so on) that could also be impacted on by the reform. For instance, if substitution effect exceeded income

effect, an increase in marginal tax rates may have reduced cohabitants' labor supply incentives after the reform. As a consequence of changing employment behaviors, tax incentives to marry could have also decreased. In the border-line case, labor supply responses would have canceled incentives to marry, making people move from the treatment group to the control group. For that reason, estimations of the effects of the reform may lead to specification error biases.

Then an estimation of the marriage model should take care of these biases by providing simultaneous estimates for marriage and employment (taking into account the correlation between both variables explicitly). This will in principle allow consistent estimates of α_{TaxR} .

Formally, we estimate a joined model of marriage and employment that allows for correlation between residuals of the two equations. These equations are similar to the previous equation. That specification would not allow to identify the impact of the reform on employment, since the post-reform shift in the employment rate is supposed to vary according to group membership. Identifying the effect of the reform on employment is indeed a complex issue that is out of purpose of this paper.

To identify the impact of the reform on marriage-related behaviors, it is also important to check whether other reforms or external changes during the period considered have impacted on the treatment group without impacting on the control group. In other words, the validity of our natural experiment depends on the assumption that temporal fixed effects are the same for both the control and the treatment groups. However, as pointed out previously, without long panel data available on the period considered it is hardly possible to control for those shocks or for other changes in the composition of the treatment and control groups. Though we didn't find other covariates than age and education that clearly impacted on the marriage decision, it is possible to control for the effect of another reform that took place in the same period and which also concerned families with children (especially low income families). As mentioned at the beginning of this study, such is the "Allocation Parentale d'Education" (allowance to help raise children): this program was implemented in 1985 to allow one spouse in a family with three children or more and at least one child under three to stop working or to reduce his/her activity. In 1994, the APE was extended to families with two children with at least one less than three. It is now well documented that these subsidies have lowered women's labor supply though

only little evidence has been given as to the impact of this program on demographic trends. Insofar as single parent families were the main beneficiaries and the most reactive (several research studies have showed a sharp decrease in single mothers' employment rates, due to the reform), then the APE may also have impacted on the couple, its stability and, by extension, marriage. To control for the effects of that reform, we choose to reduce the size of our sample by cutting out individuals who were eligible to the APE program ¹⁵.

6 Results

6.1 Estimating heterogeneous effects of the reform on marriage

Following the main lines of our strategy described in the previous section, Tables 4 and 5 present estimates of the impact of the reform on marriage for different groups of couples. Our findings are as follows.

Results from bivariate probit models for both marriage and employment are presented. The treatment group includes taxed (or potentially taxed if tax subsidies to single parents were canceled) cohabitant couples with children who were unmarried in $t - 1$ and either unmarried or married in t . The control group includes cohabitant couples not taxed cohabitant couples. The coefficient for $Post95 \times taxed$ then represents DD estimate of the impact of the reform. Other variables (age, age squared, education, education squared, for both spouses, the number of children, and all those variables crossed with the post reform dummy) are added to the regressions but are not reported in the tables.

Various groups of couples are considered according to spouses' age, education or the number of children. Furthermore, results are presented for women and men, since employment is an individual variable and constraints for men and women on the labor market are different. As a result we show that, though the estimated correlation between the error terms is significant for women, it is not very

¹⁵All our estimates are presented without that population, though it does not change the results. Persons concerned by the APE program are mostly untaxed low skilled people and should thus rarely be concerned by the family quotient reform. Therefore, comparing the evolution of marriage rate of taxed people with children to that of, for instance, taxed people without children, could also control for the potential effect of low income families programs.

high (-.1), and it is significant and positive for men only in less educated couples. On the other hand, the post-reform shift in employment is rather stable for men, but is negative for women, especially in younger couples.

We then turn to the estimation of the impact of the reform on marriage for different groups. We find a negative and significant marginal effect (around 5 points) for younger couples (less than 40 years old) but no effect for older ones (40 years old and more). Among younger couples, we find a significant effect when woman's years of schooling is less than 12 years and man's years of schooling is 12 years or more (around 13 points for women and 14 points for men). Those marginal effects are high. Furthermore, young cohabitant couples with 2 kids seem to have been the more reactive to the reform (marginal effect is around 12 points).

6.2 Tax evasion

As shown further up the percentage of taxed households among unmarried tax units with children sharply rose in the year of the reform. Though previous results corroborate the idea that tax authorities have managed to track down cohabiting couples, as opposed to true single parents, some may still have managed to avoid the tax.

Using matched employment survey-tax returns data sets, it is possible to check whether one part of the story has been overlooked, and how important it is. Figure 9 shows that the percentage of 'falsely' isolated parents (those who were declared as isolated parents with children though actually cohabiting) amounts to 3% to 4% of overall cohabiting individuals with children after the reform. Those figures are lower than the percentage of cohabitants that were getting married because of the reform, though it can't be considered as totally marginal. Note also that those 'falsely' isolated parents were more numerous among divorced or widowed cohabitants with children (around 10%) since it is likely that those people were less enticed to marry 'again'. Moreover, the percentage of 'falsely' isolated parents among cohabitants with children increased until 1998 and then decreased slightly.

7 Conclusion

This paper aims to exploit the 1995 reform in the French tax code to estimate the impact of financial incentives on the probability of marriage. The 1995 reform basically raised the amount of taxes paid by cohabiting couples with children (and all the more so for couples with unequal earnings), without affecting the amount of taxes paid by cohabiting couples without children, nor the amount of taxes paid by married couples (with or without children). Therefore the prediction is simply that marriage rates should suddenly increase after 1995 for cohabiting couples with children (and all the more so for couples with unequal earnings), and not for cohabiting couples without children.

The identification strategy used is straightforward. Unmarried couples with children who were taxed (or potentially taxed if they didn't benefit from tax subsidies) are defined as the treatment group while unmarried couples with children who were not taxed are defined as the control group. First, using the panel structure of the French employment survey during the 1990's we find a neat break in the marriage rate differential between treatment and control groups especially for younger couples (under 40 years old) and less educated ones (under 12 years of schooling). Second, turning to bivariate probit estimates for marriage and employment and adding several controls we find that the probability of marriage has increased by about 5 points for young cohabitant couples with children, and by about 12 to 14 points when focusing on those with 2 kids or on those with less educated woman and higher educated man. The effect of the reform thus prove to be quite high for those couples.

Hence, this paper illustrates how tax policy can impact decisions within the household through measures targeted at specific groups of people –married or not. In particular, family-based and progressive tax system appears to be non neutral in terms of marriage behaviors.

Throughout the century, French households were indeed more and more indifferent to births in or out of wedlock, so that marriage is becoming a ritual without consequences and actually quite sensitive to immediate economic interest. Beside, though the social meaning of marriage has changed, some politicians and even some economists still consider that marriage should be encouraged through tax subsidies. In this line, the 1995 reform has globally increased marriage subsidies. That lecturing attitudes toward marriage did contribute to the sudden break in the statistics of marriage, and yet it

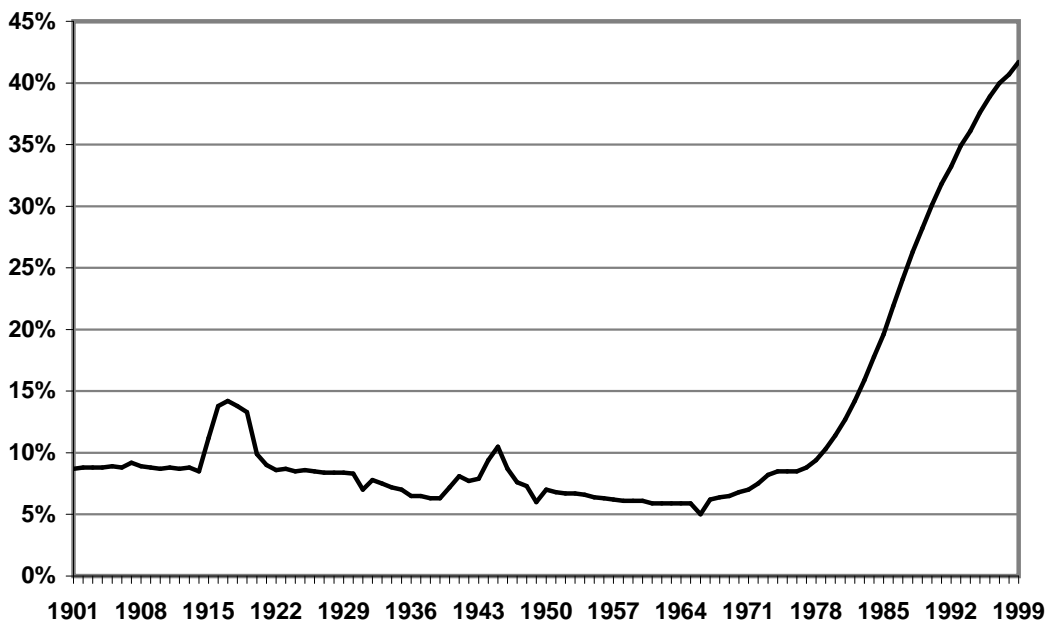
also paradoxically marked the end of the predominance of Christian marriages (at church) over non Christian marriages as shown in Figure 10.

Marriage was indeed a good mean for the French tax payers to lower income taxation. Tax evasion should not be underestimated either. As a consequence, the impact on labor supply of a change in marginal tax rates were probably lowered. Fertility impact of the reform should also be considered as of second order, though it may be impacted in the longer run. However, as only few studies ever found any impact of financial incentives on fertility in France, further works should concentrate on this other important dimension of family formation.

References

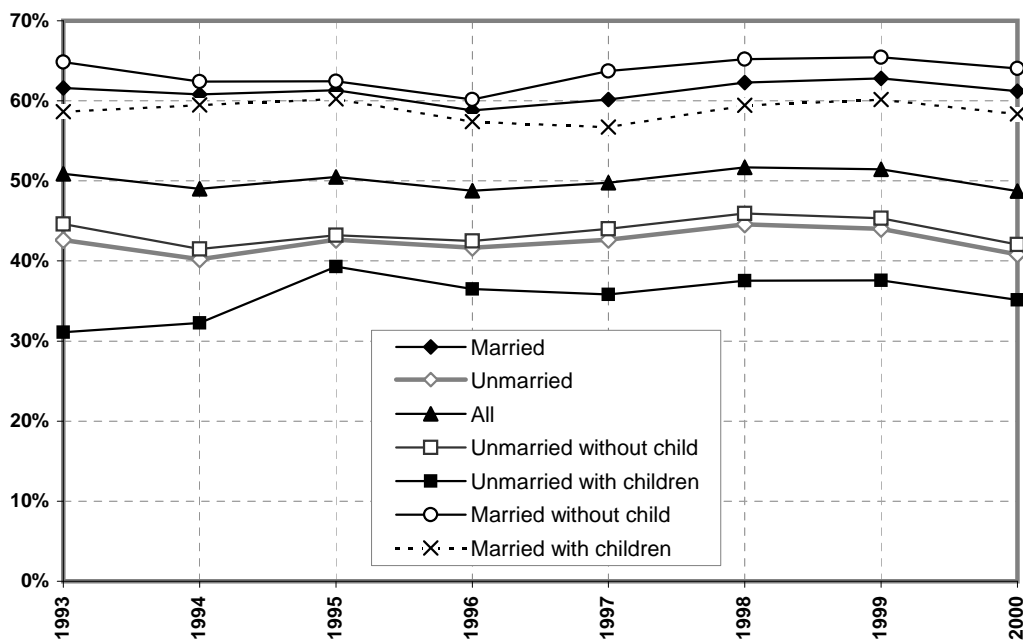
- Alm, J., S. Dickert-Conlin, and L. Whittington (1999). Policy watch: The marriage penalty. *Journal of Economic Perspectives* 13(3), 193–204.
- Alm, J. and L. Whittington (1996). Income taxes and the timing of marital decisions. *Journal of Public Economics* 64(2), 219–240.
- Alm, J. and L. Whittington (1999). For love or money? The impact of income taxes on marriage. *Economica* 66(261), 1–24.
- Becker, G. (1991). *A Treatise on the Family*. Cambridge, MA: Harvard University Press.
- Buffeteau, S. and D. Echevin (2003). Fiscalité et mariage. *Economie Publique* 13(2), 125–150.
- Chun, H. and I. Lee (2001). Why do married men earn more: productivity or marriage selection? *Economic Inquiry* 39(2), 307–319.
- Cornwell, C. and P. Ruppert (1997). Unobservable individual effect, marriage and the earnings of young men. *Economic Inquiry* 35(2), 285–294.
- Daguet, F. (2002). Un siècle de fécondité française : caractéristiques et évolution de la fécondité de 1901 à 1999. INSEE résultats, INSEE, Paris.
- Daniel, K. (1992). Does marriage make men more productive? NORC Discussion paper, 92-2, University of Chicago.
- Echevin, D. (2003). L'individualisation de l'impôt sur le revenu: équitable ou pas ? *Économie et Prévision* 160-161(4-5), 149–165.
- Ellwood, D. (2000). The Impact of the Earned Income Tax Credit and Social Policy Reforms on Work, Marriage, and Living Arrangements. *National Tax Journal* 53(4), 1063–1106.
- Fortin, B. and G. Lacroix (2002). Assessing the impact of tax and transfer policies on labour supply: a survey. Project report Cirano.
- Gray, J. (1997). The fall in men's return to marriage: declining productivity effects or changing selection? *Journal of Human Resources* 32(3), 481–504.

- Hersh, J. and L. Stratton (2000). Household specialization and the male marriage wage premium. *Industrial and Labor Relations Review* 54(1), 78–94.
- Jacobsen, J. and W. Rayack (1996). Do men whose wives work really earn less. *American Economic Review* 86(2), 268–273.
- Korenman, S. and D. Neumark (1991). Does marriage really make men more productive? *Journal of Human Resources* 26(2), 282–307.
- Landais, C. (2003). Le quotient familial a-t-il stimulé la natalité française ? *Economie Publique* 13(2), 95–123.
- Laroque, G. and B. Salanié (2003). Fécondité et offre de travail des femmes. *Economie Publique* 13(2), 61–94.
- Laroque, G. and B. Salanié (2005). Does fertility respond to financial incentives? CEPR Discussion Paper.
- Loh, E. (1996). Productivity differences and the marriage wage premium for white males. *Journal of Human Resources* 31(3), 566–589.
- Nakosteen, R. and M. Zimmer (1987). Marital status and earnings of young men: a model of endogenous selection. *Journal of Human Resources* 22(2), 248–268.
- Nakosteen, R. and M. Zimmer (1997). Men, money, and marriage: are higher earners more prone than low earners to marry? *Social Science Quarterly* 78(1), 66–82.
- Nakosteen, R. and M. Zimmer (2001). Spouse selection and earnings: evidence of marital sorting. *Journal of Human Resources* 39(2), 201–213.
- Piketty, T. (1998). Les hauts revenus face aux modifications des taux marginaux supérieurs de l'impôt sur le revenu en France, 1970-1996. CEPREMAP Working Paper, 98-12.
- Piketty, T. (1999). Les hauts revenus face aux modifications des taux marginaux supérieurs de l'impôt sur le revenu en France, 1970-1996. *Économie et Prévision* 138-139, 25–60.
- Piketty, T. (2005). L'impact de l'allocation parentale d'éducation sur l'activité féminine et la fécondité en France, 1982-2002 in C. Lefevre, ed. *Histoires de familles, histoires familiales*, Les Cahiers de l'INED, 156, INED, Paris.



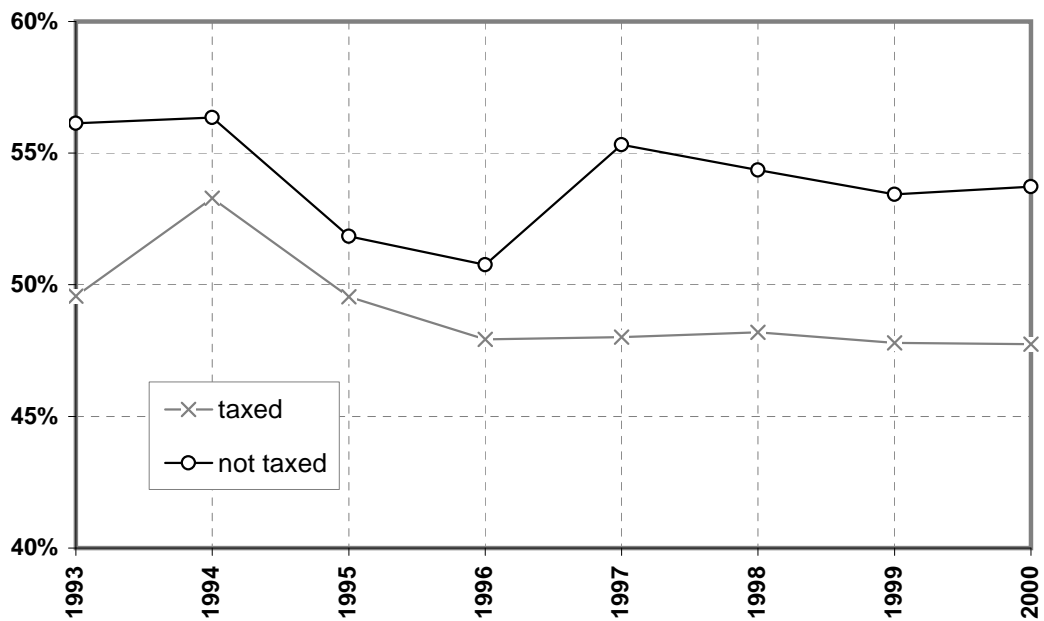
Source: Demographic database, INSEE. **Notes:** The percentage of out-of-wedlock births is the number of births occurring out the wedlock divided by the total number of births during the year. This ratio has increased sharply since the end of the 1960's.

Figure 1: Percentage of out-of-wedlock births



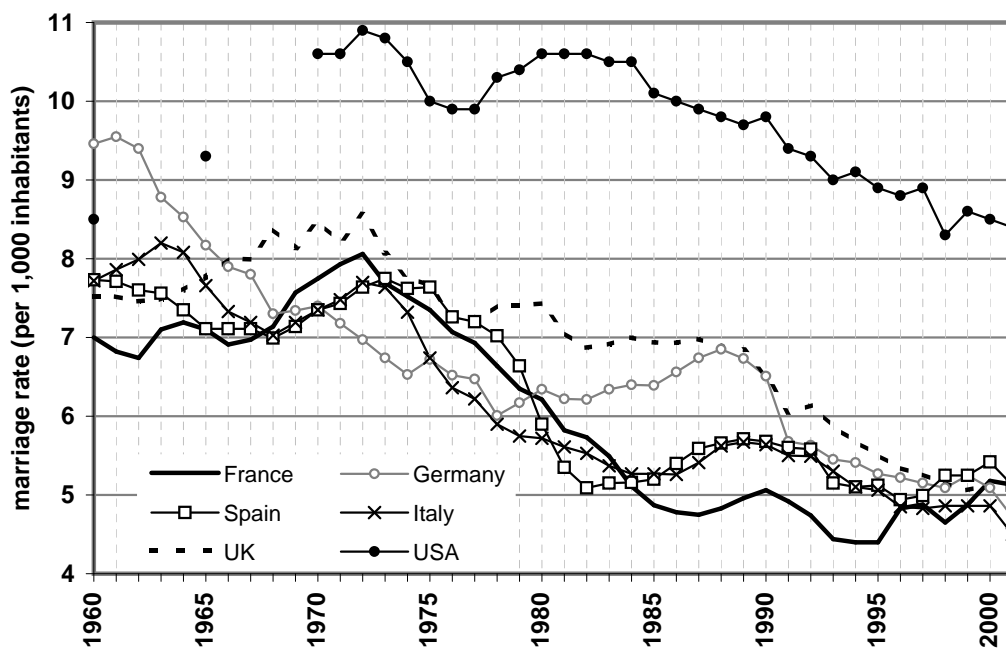
Source: DGI sample. **Notes:** The percentage of taxed households has been computed for different groups of people using French Revenue Service (DGI) micro-data files (so called DGI sample) that have been extracted from the exhaustive population of income tax returns from 1993 to 2000. Tax returns data show that the percentage of taxed unmarried individuals (either cohabitants or singles) with children has increased sharply between 1994 and 1995 by about 7 points.

Figure 2: Percentage of taxed households



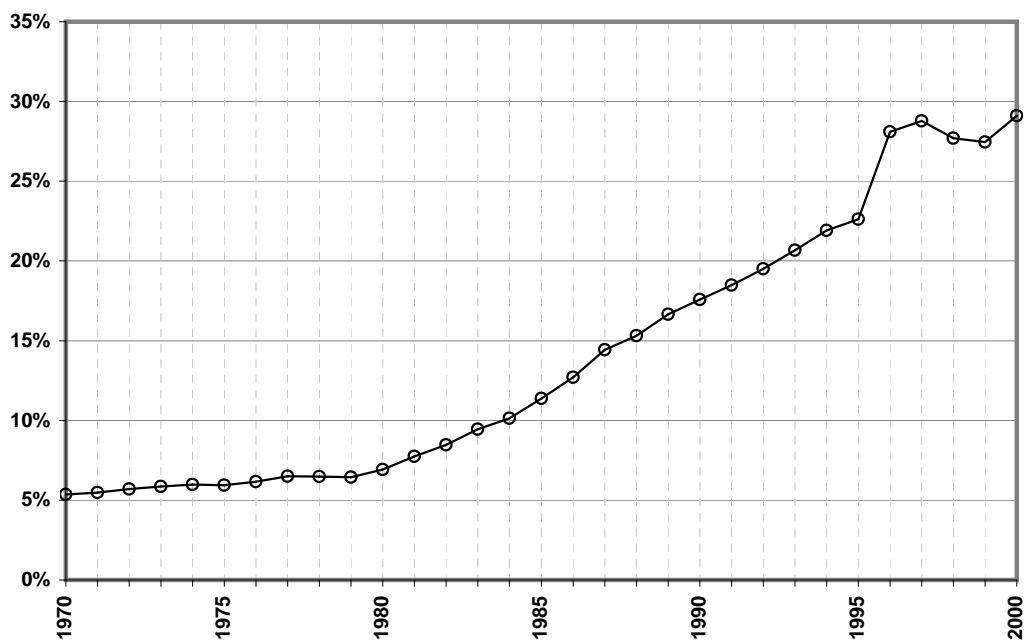
Source: DGI sample. **Notes:** Tax returns statistics show that the percentage of untaxed married couples with children among the untaxed married couples increased between 1996 and 1997 from 50.8% to 55.3%, whereas the percentage of taxed married couples with children among the taxed married couples did not. This illustrates how those people have possibly escaped taxation by marrying.

Figure 3: Percentage of households with children among married couples



Source: Demographic database, Eurostat. **Notes:** The marriage rate is the number of marriages occurring among the population during a given year, per 1,000 mid-year total population during the same year. Whereas the marriage rate in France was decreasing since the beginning of the 1970's as in most of other countries considered on the figure, this trend was reversed since 1995, though not in other countries (except in Spain).

Figure 4: International marriage rates



Source: Demographic database, INSEE. **Notes:** The marriage rate legitimating children is the ratio of the number of marriages legitimating children on the total number of marriages. Between 1995 and 1996, that rate passed from 22.6% to 28.1% that can be explained by an increase of more than 35% of the number of marriages legitimating children, that were around 21,000 marriages more.

Figure 5: Marriage rate legitimating children

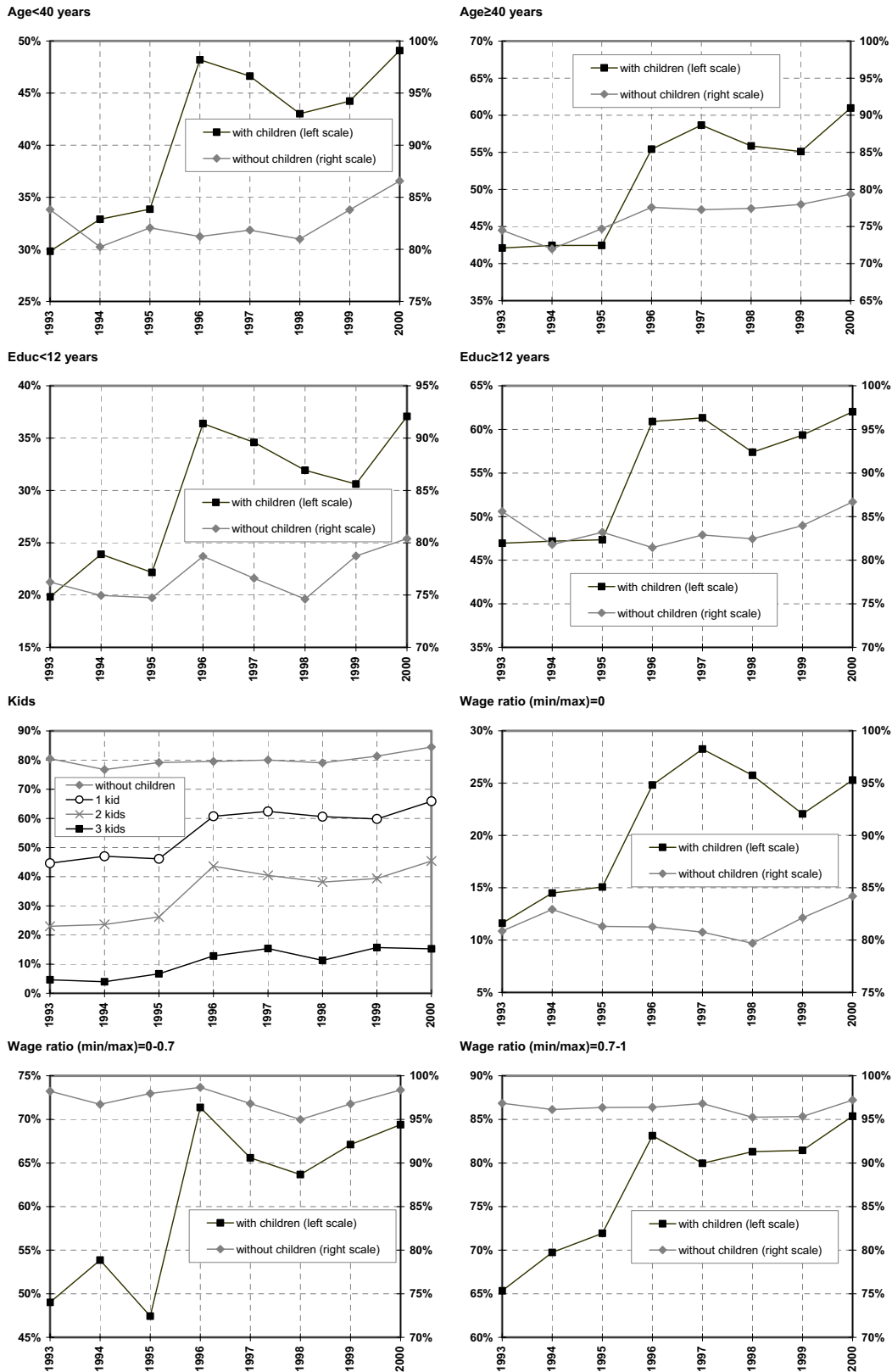
Total income (in €)	Ratio of spouses' minimum earning to total income	Couple with no kid	Couple with one kid	Couple with two kids
10000	0%	0.0%		
	20%			
	40%			
	50%			
20000	0%	7.5%	4.2%	0.0%
	20%	4.7%		
	40%	0.0%		
	50%			
30000	0%	6.7%	4.5%	3.4%
	20%	2.5%	1.6%	-0.8%
	40%	-1.2%	-2.9%	-1.9%
	50%	0.0%	-0.4%	-1.9%
40000	0%	8.0%	5.0%	3.4%
	20%	2.5%	0.8%	0.5%
	40%	0.7%	0.0%	-1.0%
	50%	0.0%	0.0%	-0.4%
50000	0%	7.8%	6.3%	4.0%
	20%	2.2%	1.2%	-0.2%
	40%	0.0%	0.0%	0.0%
	50%	0.0%	0.7%	0.0%

Lecture: The fiscal gain of marriage for a couple with one child where one spouse earns 30,000€ per year and the other doesn't work represents 6.7% of the couple's total income; this gain nullifies when both spouses have no child and earn the same; a couple with two children with a total income of 30,000€ where one spouse earns 40% of total income has a marriage penalty of -1.9%. **Notes:** We suppose that children are declared by one of the two spouses in order to minimize the income tax.

Table 1: Fiscal gains of marriage in France

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

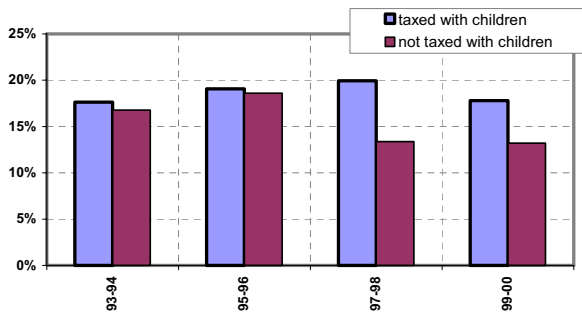
Table 2: Family quotient units before and after the 1995 reform



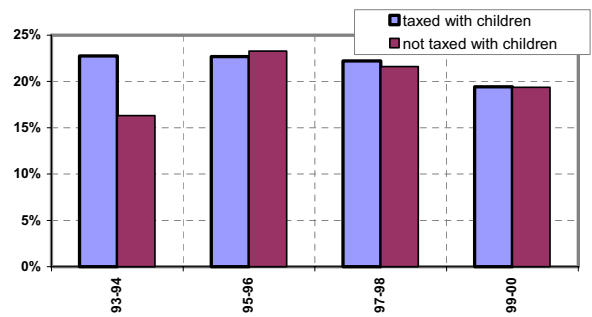
Source: FES, INSEE. **Notes:** Dummy variable whose value is 1 if taxed and 0 otherwise is constructed using data available on household earnings and the number of dependent children in the household. Then we calculate the percentage of taxed couples as a proportion of taxed couples among each group.

Figure 6: Percentage of taxed unmarried people among cohabiting couples

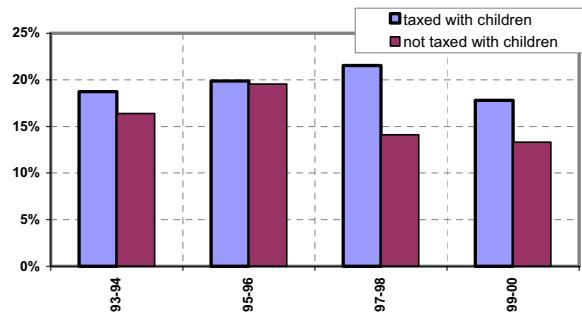
Women age<40 years & Men age<40 years



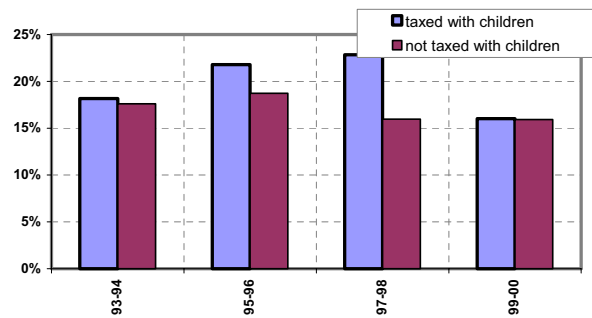
Women age≥40 years & Men age≥40 years



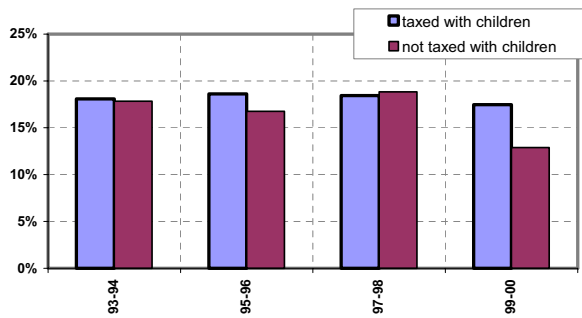
Women educ<12 years & Men educ<12 years



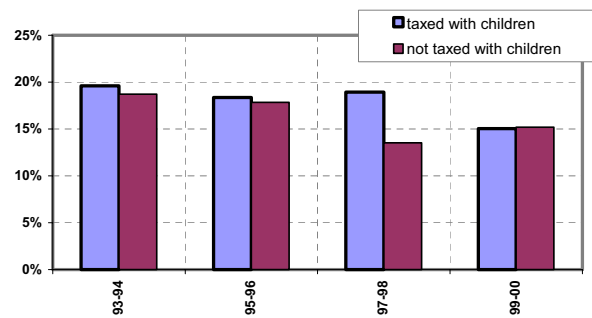
Women educ<12 years & Men educ≥12 years



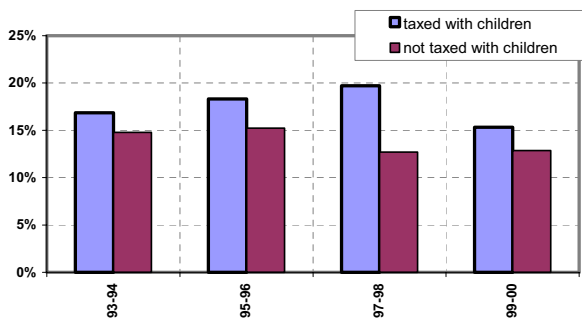
Women educ>12 years & Men educ≥12 years



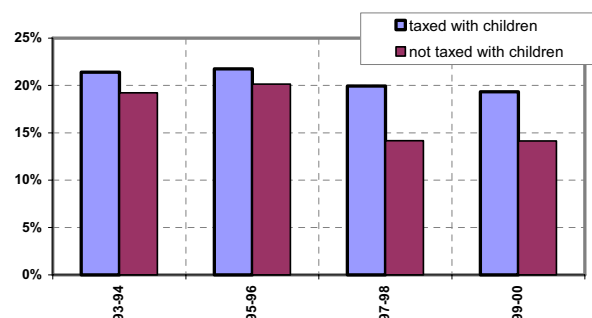
Women educ≥12 years & Men educ<12 years



1 kid



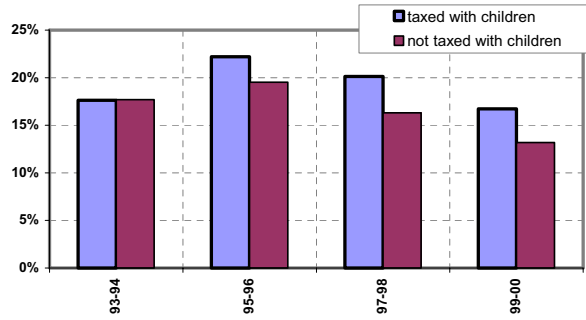
2 kids



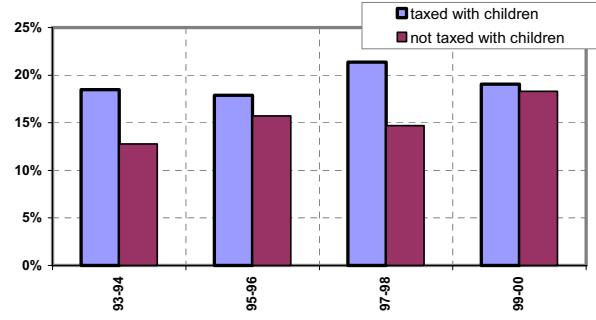
Source: FES, INSEE. Notes: The Marriage rate is the proportion of individuals who get married during the year among people who were either single or cohabitant the previous year.

Figure 7: Marriage rate according to spouses' age, years of schooling and the number of kids

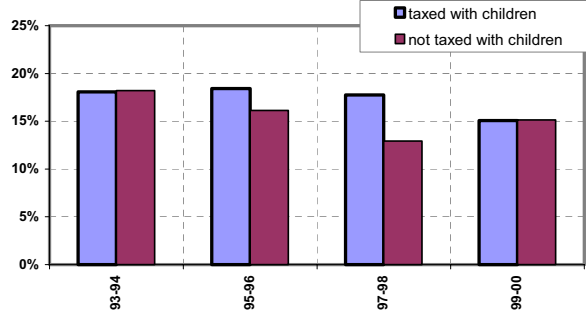
Wage ratio (min/max)=0



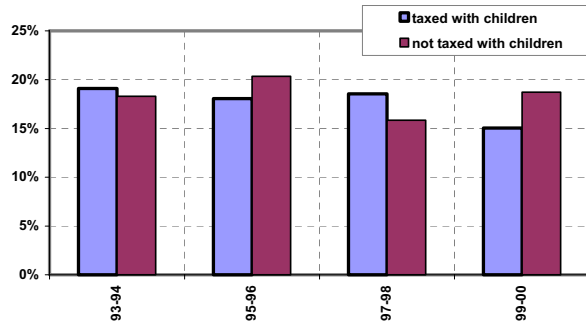
Wage ratio (min/max)=0-0.7



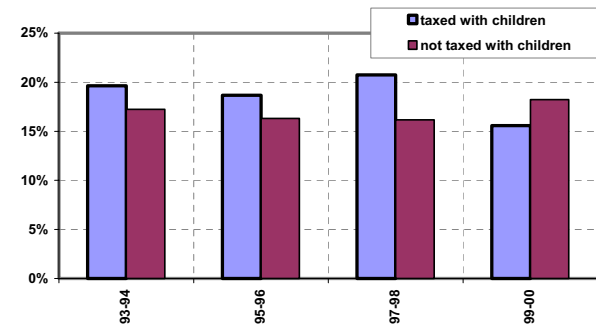
Wage ratio (min/max)=0.7-1



Quintile=3

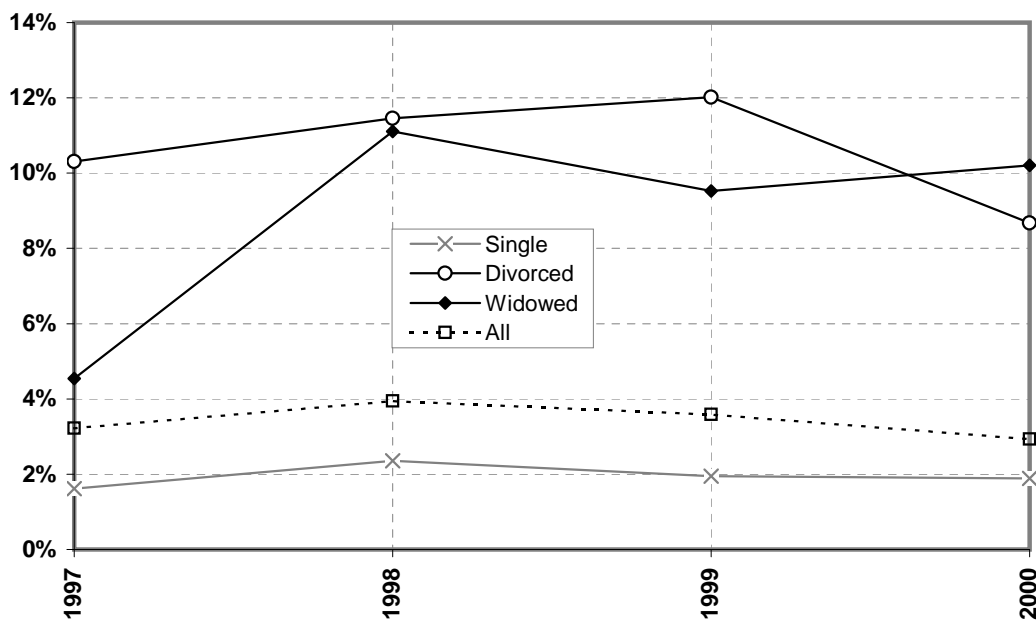


Quintile=4



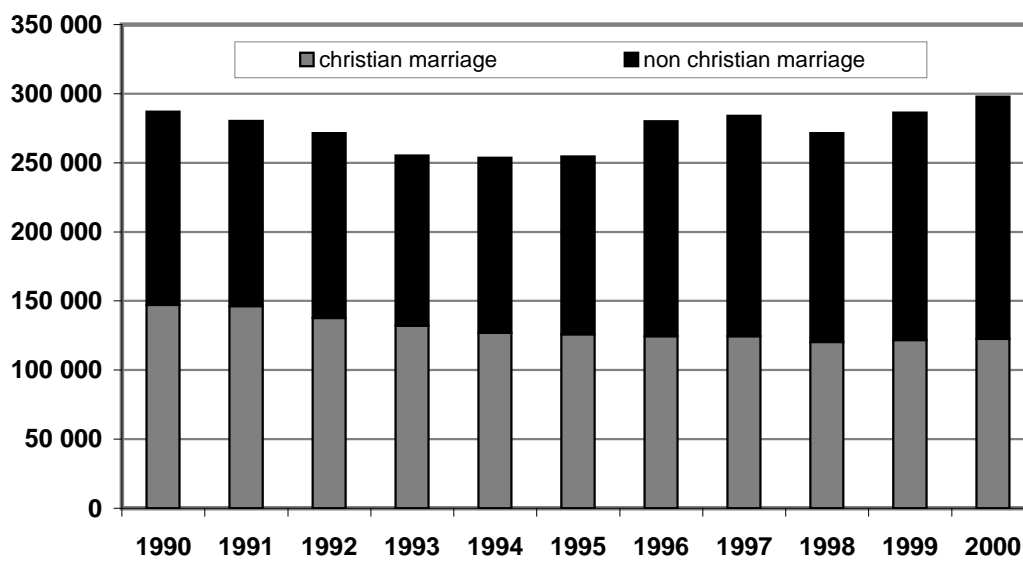
Source: FES, INSEE. **Notes:** The Marriage rate is the proportion of individuals who get married during the year among people who were either single or cohabitant the previous year.

Figure 8: Marriage rate according to the earnings ratio and by quintile



Source: Matched employment survey-tax returns micro-data files, INSEE-DGI. **Notes:** 'Falsely' isolated parents are individuals who were declared as isolated parents with children for tax purpose though actually cohabit with someone else. The percentage of 'falsely' isolated parents with children among cohabiting individuals with children is obtained from the comparison of the situation of the household as given in the employment survey and the situation of the household as defined for tax purpose.

Figure 9: Percentage of 'falsely' isolated parents with children among cohabitants with children



Source: Demographic database, INSEE. **Notes:** The number of non Christian marriages was increasing between 1994 to 1996 from 126,827 to 155,710. At the same time, the number of Christian marriages (at church) was decreasing from 126,919 to 124,362.

Figure 10: Number of Christian and non Christian marriages

	1993	1994	1995	1996	1997	1998	1999	2000
Age (women)	31.2	31.6	31.9	32.1	32.0	32.5	32.8	32.8
Age (men)	33.0	33.4	33.5	33.7	33.9	34.2	34.5	34.8
Years of schooling (women)	18.5	18.7	18.8	19.0	19.0	19.1	19.3	19.4
Years of schooling (men)	18.1	18.4	18.4	18.5	18.5	18.6	18.8	18.9
Employment rate (women)	0.655	0.659	0.654	0.658	0.659	0.648	0.672	0.698
Employment rate (men)	0.822	0.808	0.826	0.817	0.827	0.833	0.836	0.863
Monthly earnings (women)*	5719.9	5458.5	6723.1	6908.2	6694.9	6470.9	6480.9	6404.5
Monthly earnings (men)*	8013.5	8438.4	8654.1	8567.8	9963.1	7964.0	8229.9	8337.4
Ratio min/max earnings	0.408	0.356	0.392	0.395	0.404	0.399	0.416	0.431
Total monthly earnings	10999.3	11767.1	11985.6	12065.3	14346.1	11479.8	11722.2	12261.2
Children before marriage	0.432	0.438	0.447	0.467	0.480	0.490	0.490	0.492
Number of children**	1.678	1.673	1.608	1.627	1.671	1.681	1.679	1.669
Get married	0.556	0.623	0.630	0.655	0.599	0.608	0.542	0.588
Taxed	0.652	0.627	0.654	0.653	0.649	0.628	0.643	0.685
N	3112	3532	3404	3451	3467	3644	3716	3760

Sources: French Employment survey. **Notes:** *Employed persons only. In euros. **Among couples with children.

Table 3: Descriptive statistics (mean values) – cohabitant couples

Variable	Women's age < 40 years		Women's age ≥ 40 years	
	Men's age < 40 years		Men's age ≥ 40 years	
	Marriage	Employment	Marriage	Employment
Post 95	-.0434**	-.0578**	.0056	.0021
	<i>.0127</i>	<i>.0156</i>	<i>.0381</i>	<i>.0389</i>
Taxed	.0418	-.1412	.4138	.0515
	<i>.2125</i>	<i>.2736</i>	<i>.2725</i>	<i>.4598</i>
Post 95 x taxed	.0481**	.0751**	-.0145	.0588
	<i>.0188</i>	<i>.0243</i>	<i>.0484</i>	<i>.0524</i>
Rho	-.0977		-.1462	
Wald test for rho=0	**		**	
Log-likelihood	-8615.9		-1529.6	
Sample size	8350		1533	

Variable	<i>Women's age < 40 years & Men's age < 40 years</i>							
	Women's educ < 12 years		Women's educ ≥ 12 years		Women's educ < 12 years		Women's educ ≥ 12 years	
	Men's educ < 12 years		Men's educ ≥ 12 years		Men's educ < 12 years		Men's educ ≥ 12 years	
	Marriage	Employment	Marriage	Employment	Marriage	Employment	Marriage	Employment
Post 95	-.0342*	-.0766	-.0877**	.0423	-.0285	-.0341	-.0398	-.1096**
	<i>.0189</i>	<i>.0266</i>	<i>.0336</i>	<i>.0428</i>	<i>.0258</i>	<i>.0320</i>	<i>.0268</i>	<i>.0267</i>
Taxed	-.2866	-.9877	-.0166	.2563	.9193**	.7459	-.7208	-.3147
	<i>.3646</i>	<i>.0287</i>	<i>.3893</i>	<i>.5269</i>	<i>.3851</i>	<i>.7465</i>	<i>.4567</i>	<i>.4797</i>
Post 95 x taxed	.0542	.0072	.1268**	-.0042	.0175	-.0242	.0350	.1706**
	<i>.0429</i>	<i>.0591</i>	<i>.0612</i>	<i>.0720</i>	<i>.0383</i>	<i>.0544</i>	<i>.0315</i>	<i>.0356</i>
Rho	-.0906		-.0215		-.1112		-.1160	
Wald test for rho=0	**		-		**		**	
Log-likelihood	-2178.2		-1172.4		-1924.8		-3243.7	
Sample size	2134		1104		1865		3247	

Variable	<i>Women's age < 40 years & Men's age < 40 years</i>			
	1 kid		2 kids and more	
	Marriage	Employment	Marriage	Employment
Post 95	-.0340*	-.0507**	-.0840**	-.0929**
	<i>.0189</i>	<i>.0216</i>	<i>.0226</i>	<i>.0266</i>
Taxed	-.0511	-.0518	.0255	.3874
	<i>.2690</i>	<i>.3274</i>	<i>.4319</i>	<i>.4759</i>
Post 95 x taxed	.0277	.0677**	.1181**	.1034**
	<i>.0238</i>	<i>.0297</i>	<i>.0395</i>	<i>.0477</i>
Rho	-.1125		-.0707	
Wald test for rho=0	**		*	
Log-likelihood	-4780.5		-2707.7	
Sample size	4696		2613	

Source: FES, INSEE. **Notes:** A bivariate probit model for both marriage and employment is estimated. Marginal effects are reported with standard errors in italic that are robust to heteroscedasticity. Two levels of signification are indicated: ** when significant at 5% level; * when significant at 10% level. Estimates concern cohabitant couples with children, under 60 years old, and neither students nor self-employed. Marriage variable is coded 1 if married, 0 otherwise. Women's employment variable is coded 1 if employed, 0 otherwise. Tax variable is coded 1 if taxed or would be taxed if the couple didn't benefit from the extra half unit for dependent children, 0 otherwise. Other added variables not reported in the tables are Age, Age squared, Years of schooling, Years of schooling squared for each spouse, the number of children and all those variables crossed with the tax dummy. Rho estimates measures the correlation between the residuals of the two equations.

Table 4: Bivariate probit estimates of the impact of the 1995 reform on marriage (using women's employment dummy)

Variable	Women's age < 40 years		Women's age ≥ 40 years	
	Men's age < 40 years		Men's age ≥ 40 years	
	Marriage	Employment	Marriage	Employment
Post 95	-.0453**	-.0085	.0069	-.0020
	<i>.0131</i>	<i>.0091</i>	<i>.0394</i>	<i>.0270</i>
Taxed	.0041	.0841	.4381*	.3875
	<i>.2146</i>	<i>.1591</i>	<i>.2727</i>	<i>.4654</i>
Post 95 x taxed	.0525**	.0217	-.0228	-.0152
	<i>.0194</i>	<i>.0157</i>	<i>.0498</i>	<i>.0416</i>
Rho	.0164		.1095	
Wald test for rho=0	-		*	
Log-likelihood	-6726.2		-1320.9	
Sample size	8079		1491	

Variable	<i>Women's age < 40 years & Men's age < 40 years</i>							
	Women's educ < 12 years		Women's educ ≥ 12 years		Women's educ ≥ 12 years		Women's educ ≥ 12 years	
	Men's educ < 12 years		Men's educ ≥ 12 years		Men's educ < 12 years		Men's educ ≥ 12 years	
	Marriage	Employment	Marriage	Employment	Marriage	Employment	Marriage	Employment
Post 95	-.0370*	-.0502**	-.0891**	.0061	-.0320	.0269	-.0376	.0039
	<i>.0198</i>	<i>.0180</i>	<i>.0347</i>	<i>.0228</i>	<i>.0263</i>	<i>.0211</i>	<i>.0276</i>	<i>.0159</i>
Taxed	-.2398	-.6605	-.0937	.0753	.8164	.5056	-.6719	-.1926
	<i>.4239</i>	<i>1.1763</i>	<i>3643</i>	<i>.3115</i>	<i>.6887</i>	<i>.8664</i>	<i>.5418</i>	<i>.2277</i>
Post 95 x taxed	.0664	.0583	.1448**	.0045	.0128	-.0173	.0364	.0096
	<i>.0458</i>	<i>.0393</i>	<i>.0640</i>	<i>.0480</i>	<i>.0387</i>	<i>.0377</i>	<i>.0325</i>	<i>.0211</i>
Rho	.1255		.0247		-.0226		-.0721	
Wald test for rho=0	**		-		-		-	
Log-likelihood	-1811.6		-874.1		-1555.2		-2405.7	
Sample size	2048		1055		1821		3155	

Variable	<i>Women's age < 40 years & Men's age < 40 years</i>			
	1 kid		2 kids	
	Marriage	Employment	Marriage	Employment
Post 95	-.0298	-.0139	-.0899**	-.0061
	<i>.0193</i>	<i>.0126</i>	<i>.0234</i>	<i>.0158</i>
Taxed	-.1134	-.2004	.0441	.4163*
	<i>.2849</i>	<i>.1702</i>	<i>.4559</i>	<i>.2543</i>
Post 95 x taxed	.0265	.0308	.1209**	.0001
	<i>.0245</i>	<i>.0188</i>	<i>.0405</i>	<i>.0328</i>
Rho	-.0196		-.0024	
Wald test for rho=0	-		-	
Log-likelihood	-3652.6		-2096.6	
Sample size	4565		2524	

Source: FES, INSEE. **Notes:** A bivariate probit model for both marriage and employment is estimated. Marginal effects are reported with standard errors in italic that are robust to heteroscedasticity. Two levels of signification are indicated: ** when significant at 5% level; * when significant at 10% level. Estimates concern cohabitant couples with children, under 60 years old, and neither students nor self-employed. Marriage variable is coded 1 if married, 0 otherwise. Men's employment variable is coded 1 if employed, 0 otherwise. Tax variable is coded 1 if taxed or would be taxed if the couple didn't benefit from the extra half unit for dependent children, 0 otherwise. Other added variables not reported in the tables are Age, Age squared, Years of schooling, Years of schooling squared for each spouse, the number of children and all those variables crossed with the tax dummy. Rho estimates measures the correlation between the residuals of the two equations.

Table 5: Bivariate probit estimates of the impact of the 1995 reform on marriage (using men's employment dummy)