EVALUATING THE IMPACT OF THE FRENCH TAX CREDIT PROGRAMME, "LA PRIME POUR L'EMPLOI" : A DIFFERENCE IN DIFFERENCE MODEL♣

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Abstract

This paper seeks to estimate the impact of the French tax credit,"la Prime Pour l'Emploi", on the employment probability of women that are either head of the household or spouses of the head. A difference in difference approach is adopted. The data for the analysis are drawn from the French labour force surveys, "les enquêtes emploi". The rotating structure of this survey enables us to apply panel data methods to the estimation of the model. We find that the programme has a significantly negative impact on the employment probability of married women and an insignificant one for unmarried women, though not always significant.

Keywords : policy evaluation; difference-in-difference estimator; labour supply.
Classification JEL : C34, I38, J21

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Introduction

The French tax credit programme, "la Prime Pour l'Emploi", was launched by the Jospin government in spring 2001. This programme aims at increasing income from work for the low-paid, with the twins objectives of redistributing income to the less-skilled and increasing the incentives to work for those with low potential earnings. The purpose being to reduce unemployment traps, due to potential earnings being low relative to unemployment income. Similar programmes exist in many other OECD countries, such as, for example, in the United States, where the Earned Income Tax Credit is targeted at low income families with children or in the United Kingdom, where the Working Family Tax Credit has similar objectives.

The French tax credit measure differentiates itself from most anglo-saxon programmes in a number of ways. First of all, it is paid to the individual rather than to the household, in spite of being means-tested on total household income (see Cahuc, 2001, and Perivier, 2003, for a comparison). On the other hand, the amount of the tax credit is very low relative to similar anglo-saxon programmes (see, for example, Dupont and Sterdyniak, 2001, for a careful description). Child additions are very low and the redistributive scope of the measure is rather limited (see Stancanelli and Sterdyniak, 2004, for a discussion of the literature on this and other issues).

Given the novelty of the measure, only few simulation studies of its impact on the distribution of income and on the incentives to work are available to date, all based on survey data collected prior to the introduction of the tax credit. The papers by Legendre et al. (2001) and Bargain (2004) use data drawn from the survey of tax declarations ("enquête revenus fiscaux") of 1997, matched to data drawn from the labour force surveys. Salanié and Laroque (2002) use data from the 1999 French labour force survey. The authors of these studies conclude for limited employment effects of the policy measure. Laroque and Salanié (2002) conclude for small positive employment effects on French women's labour supply, which would amount to about 3000 new jobs. Choné (2002), looking at couples labour market supply, concludes that the programme would increase female employment by roughly 0.4%.

There is some evidence that there are negative employment effects for married women. Bargain (2004) focuses on the employment incentives of the tax credit for women married or living together. To evaluate them the paper compares the tax credit to other alternative measures imposing stricter means-testing conditions. It concludes that the disincentive effects of the tax credit are inferior to those that might come about from alternative programmes.

Our paper is the first one to use post-programme data to evaluate the employment effects

of the French tax credit programme. It is also the only one that applies non-experimental evaluation methods. An additional novelty of our paper relative to the earlier French studies is that it exploits the longitudinal structure of the data by estimating panel data regressions of a difference in difference model, on matched years of the French labour force surveys.

We focus on the employment effects of the measure on a sample of women head of the household or spouses of the head. The tax credit is expected to increase the incentives to work for non-employed persons. However, it may decrease incentives to work for (married) individuals with a working partner entitled to the tax credit, because of the means-testing on total household resources. It may also reduce working hours for those recipients with earnings between 1 and 1,4 the minimum wage, who would receive higher tax credit payments if they were earning less.

The announcement of the policy measure may in itself have an impact on individual behaviour in spite of the relative small amounts of money paid by the programme. On the other hand, it has been argued that the delay with which the tax credit is paid may make it less effective on individual work incentives. Moreover, the possibility of stimulating labour supply depends largely on whether non-employment is voluntary or non-voluntary. There may however be indirect employment effects, due to employers increasing the supply of jobs addressed to potential recipients of the measure, possibly by reducing the wages offered.

The vast anglo-saxon literature points to the negative effects of tax credit programmes on the labour supply of women married to a beneficiary of the measure, because of means-testing on total family income (see, for example, Eissa and Williamson Hoynes, 1999).

We evaluate the employment effects of the programme on women's employment probability and estimate the model separately for women with different marital statuses. We use data from three consecutive years of the French labour force surveys, years 2000 to 2002, to estimate the model. The year 2000 serves as the reference year, as the policy measure was not announced then. Year 2002 is the treatment year, when the measure was implemented. The treatment and the control groups are defined using information on programme entitlement. As an alternative, to test for the impact of means-testing on labour supply, we define "married" women as the treatment group and women "unmarried but living together" as the control group.

The structure of the paper is the following. The next section describes the tax credit programme. The following one, the estimation model. In Section 3, the data and the selection of the sample for analysis are described. The construction of the treatment and control groups

are explained in Section 4, together with the prediction of wages. The results of estimation of the difference-in-difference models are presented in Section 6. The last section concludes the paper.

1. The French "Prime Pour l'Emploi"

The French tax credit programme, "Prime Pour l'Emploi", was introduced by the Jospin government in Spring 2001. A number of features distinguish this measure from other well-known tax credits policies like the Earned Income Tax Credit, in the United States or the Working Family Tax Credit, in the United Kingdom.

1. In France, individuals rather than households are eligible for the programme. This implies that both partners may claim the tax credit.
2. The programme is targeted at full-time workers and long-hours part-time workers. Small hours part-time workers are not eligible : individuals earning a (full-time equivalent[1]) salary of less than approximately 0,3 times the minimum wage are excluded from the policy measure.
3. The amount of the tax credit is very low. It varies, as a summary indication, between 25 and few hundred euros per year[2].
4. Children and dependent spouse additions are very small. They amount to a lump-sum of 31 euros per annum per dependent person[3].
5. Means-testing on total household income applies only to formally married people, as the tax credit is administered by the taxation offices. In France, individuals living together cannot file joint tax forms and therefore do not benefit from any tax reduction due to asymmetric participation and earnings.

As in other countries, the amount of the tax credit varies with the level of earnings and household income. It is equal to 4,4% of the earnings for salaries between 0,3 times the minimum wage and the minimum wage. It decreases for earnings between the minimum wage and approximately 1,4 times the minimum wage.

[1] This is computed by annualizing working hours and comparing them to 1820 (equal to 35 hours a week times 52 weeks a year).

[2] Payments cannot be inferior to 25 euros per year.

[3] This can be increased to 62 euros for the first child under certains conditions. There is a lump-sum addition of 78 euros when both partners are entitled to the tax credit.

The maximum earnings threshold for eligibility is increased for married individuals when one of the partners is out of work or earns less than the lowest earnings threshold (equal to approximately 0,3 times the minimum wage).

An income ceiling prevents workers with total family income above a certain threshold to benefit from the measure. The income ceiling increases with each dependent child and for married couples (see Table 1).

The programme was reformed in 2003 to diminish the bias in favour of full-time workers, by increasing the amount of the tax credit paid to workers with (full-time equivalent) earnings between 0,3 times the minimum wage and the minimum wage.

2. The evaluation model

We apply a difference in difference approach to estimate the employment effects of the French tax credit programme. This methodology is particularly adapted to evaluate the effects of programme participation using non experimental data. The effect of the programme is measured by the difference between the employment probabilities of individuals belonging respectively to the "treatment" and the "control" group, before and after the policy change.

There is a vast literature that applies this counterfactual method to the evaluation of labour market programmes. Eissa and Williamson Hoynes (1999), for example, use a difference in difference model to evaluate the impact of the American Earned Income Tax Credit (EITC) on labour market participation rates of married men and women. Households with children are defined as the treatment group, while childless households are the control group for the policy evaluation exercize. A similar approach is followed by Stewart (2002) who evaluates the impact of the introduction of the minimum wage in the United Kingdom on the employment probability, by estimating a difference in difference model where the control group are individuals paid just below or at the minimum wage before the policy was implemented and the control group are those just above in the wage distribution.

The validity of this non-experimental evaluation method rests on a number of hypotheses. The first being that the employment probability of the control group is not affected by the policy change. In our case, we assume that individuals with earnings and income above the programme eligibility thresholds do not or cannot modify their labour market behaviour to participate in the programme.

The second important assumption is that the difference between the employment probabilities of the two groups is time invariant, i.e; that the employment probabilities of the

two groups are not affected differently by the business cycle or other institutional changes that may have taken place during the same period. In this respect, in France at about the same time when the tax credit was introduced, some other policies changes were made to increase the rewards from work for the low-skilled. These included the possibility of continuining to receive housing benefits as well as social security benefits while taking up work for the previously unemployed. Also, the switch to a "35 hours" working week for some small and medium size entreprises and some employers'contributions reductions for hiring low-skilled people were implemented in the 2000s. However, none of these programmes are administered by the tax administration. They treat married and cohabiting women alike. Eligibility to the "Prime Pour l'Emploi" tax credit programme is conditional for formally married women on husband's earnings and income, while the same condition does not apply to cohabiting women. Moreover, the earnings and income conditions determining eligibility to the tax credit programme are very specific to this programme and they apply to all workers and not just to the segment of the labour market which were previously unemployed and receiving welfare (social security assistance) benefits. Also the "35 hours" working week and the employers' contributions reductions were timed somewhat differently than the tax credit measure. Therefore, our approach should enable us to disentangle the impact of the introduction of the tax credit from that of other policy changes.

Finally, for the difference-in-difference approach to be meaningful, the assigned control group should be as close as possible to the treatment group, without however being eligible for the programme. The procedure adopted here for the construction of the comparison group aims at ensuring that this condition is satisfied.

We look here at the impact of the tax credit programme on the employment rate. Let us define E as a binary variable taking value one if individuals are employed, and zero if they are not[4]. Our estimating model is a dichotomous probability model of the employment probability:

$$1)\ \Pr(E_{it}=1\,|\,x_{it}) = G(z_{it}'\beta + \alpha PPE_{it} + \delta y2001_{it} + \psi y2002_{it} + \gamma PPE_{it}y2002_{it})$$
$$t=1,...,T$$

where z are individual characteristics, *PPE* is a dichotomus variable taking value one for individuals eligible to the policy programme, *y2001* and *y2002* are, respectively, year

[4] Here we have chosen to look at the "unconditional" employment probability. Alternatively, one could have focused on the participation probability like Eissa and Williamson Hoynes (1999) do.

dummies for year 2001 and year 2002, the interaction variable *PPE* times year 2002 measures the policy impact, and ϑ summarizes the vector of parameters to be estimated. The additional repressors included in the vector z control for individual characteristics, family composition, and local labour market conditions (see the data section for more details). For the purposes of our difference-in-difference model, the year 2000 is used as the base year, as at that time the tax credit policy was not announced yet. The year 2001 serves also a reference year as the survey is carried out in March and the policy measure was voted in May 2001. The year 2002 is the treatment year. The underlying model is:

$$E_{it}^{*} = x_{it}'\beta + \alpha PPE_{it} + \delta y2001_{it} + \psi y2002_{it}\gamma + PPE_{it}y2002_{it} + \varepsilon_{it}$$

and if the error term is normally distributed G(·) in equation (1) is equal to a standard cumulative normal distribution under a probit specification:

$$G(x) = \Phi(x) = \int_{-\infty}^{x} \phi(v)dv, \qquad \phi(x) = (2\pi)^{-1/2}\exp(-x^2/2),$$

If the error term follows a logit specification, G(·) in equation (1) is a standard cumulative logit distribution: $G(x) = \Lambda(x) = \exp(x)/[1+\exp(x)]$.

The corresponding log-likelihood is:

$$l_i(\vartheta) = E_i \log\left[G(\cdot)\right] + (1-E_i)\log\left[1-G(\cdot)\right]$$

If we assume additionally unobserved individual effects, c_i, the panel data models are specified as follows:

$$2)\ \Pr(E_{it}=1|x_i,c_i) = \Pr(E_{it}=1|x_{it},c_i) = G(z_{it}'\beta + \alpha PPE_{it} + \delta y2001_{it} + \psi y2002_{it} + \gamma PPE_{it}y2002_{it}, c_i)$$
$$t = 1,...,T$$

Under a fixed effects logit model, the model is estimated only for observations for which we observe a change in employment status, i.e. a transition, and the c_i are not estimated.

Under a population averaged model with a logit specification, the c_i are unobserved cluster effects, to allow for correlation of the observations over time and :

$$3)\ \Pr(E_{ig}=1|x_i,c_i) = \Lambda(z_{ig}'\beta + \alpha PPE_{ig} + \delta y2001_{ig} + \psi y2002_{ig} + \gamma PPE_{ig}y2002_{ig}, c_i)$$
$$g = 1,...,G$$

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Models (1) and (3) are estimated by using robust standard errors, to account for the possibility of serial dependence. Some authors have highlighted the importance of accounting for possible serial correlation in the context of difference-in-difference models (see, for example, Beblo et al., 2001). Serial correlation may seriously bias the standard errors of the model, though it appears to be more of a problem in the case of long-time series data (see also Kezdi, 2002). In our model, serial correlation may arise due to correlation of the explanatory variables through time. This may especially be the case for the binary treatment variable determining eligibility to the programme. Serial correlation may also come about from highly positively correlated values of the dependent variable over time. To control for possible serial correlation, robust standard errors are estimated using the Huber/White/sandwich estimator.

Now, we have to complete the difference-in-difference model by allowing for the fact that the treatment "PPE" depends on observed earnings and hours of work, which are potentially endogenous to a model of the employment probability. The tax credit law establishes that earnings of part-timers should be transformed into equivalent full-time earnings to determine eligibility to the tax credit[5]. It turns out that actual hours of work cancel out and one does not have to worry about working hours of part-time workers[6]. For eligibility purposes, yearly earnings (W) are set equal to hourly earnings (w) time annualized working hours (52*h) scaled by the equivalent full-time earnings factor, which is equal to 1820 (35*52) over annualized hours, for part-time workers:

$$W_i = \exp(w_i) * (h * 52) * 1820 / (h * 52) = \exp(w_i) * 1820 = \exp(w_i) * 35 * 52$$

This means that for part-time workers hours cancel out. It suffices to set hours of full-time workers equal to 35 hours per week and we do not have to worry any longer about hours. Assuming that full-time workers work 35 hours per week does not seem a too strong assumption in the current French framework. Moreover, full-time workers are not usually paid by the hour but rather on a lump-sum monthly basis, so that setting hours equal to 35 is as good as any other approximation.

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[5] According to the law, this is done by multiplying annualized earnings by the ratio of annualized weekly working hours to 1820 hours (35 weekly hours times 52 weeks).

[6] In an earlier version of this paper, we had estimated hours of work. This turns out to be rather cumbersome and it is actually redundant, if one is ready to assume that full-time workers work 35 hours per week.

There is also a question concerning those earning less than 0.3 times the minimum wage who are excluded from the tax credit programme. However, in our dataset, where we replace observed earnings by predicted ones, there are no observations that follow in this category.

To predict eligibility to the tax credit, we predicted hourly earnings for women for whom earnings are not observed. Further to this, as employment may not be independent from the policy measure, we replace observed earnings with predicted ones[7] also for women that do report earnings. We estimate predicted hourly earnings for year 2000. To this end, we estimate a regression of hourly wage, w_i, conditional on participation, p_i, using an Heckman selection model, where:

$$\ln w_i = x_i\beta + u_{1i}$$
$$p_i = m_i\delta + u_{2i}$$
$$u_1 \sim N(0,\sigma), u_2 \sim N(0,1), corr(u_1, u_2) = \rho$$

Under this set up, the log-likelihood for observation i is:

$$l_i = \begin{cases} \ln\Phi\left(\frac{m_i\delta + \ln w_i - x_i\beta)\rho/\sigma}{\sqrt{1-\rho^2}}\right) - \frac{1}{2}\left(\frac{\ln w_i - x_i\beta}{\sigma}\right)^2 - \ln(\sqrt{2\pi\sigma}) & w_i observed \\ \ln\Phi(-m_i\delta) & w_i notobserved \end{cases}$$

and $\lambda=\rho\sigma$.

To define the treatment *PPE* we apply the programme earnings and income thresholds as defined by the PPE programme announced in year 2001 (see Table 1), to our estimation sample. The employment status (and earnings) of the partner, if any, are assumed to be unaffected by the policy measure.

3. The data and the sample selection

The sample for analysis is drawn from the French Labor Force Surveys of years 2000, 2001 and 2002. This survey has a rotating sample structure which enables one to construct a longitudinal sample. Around 60,000 households are interviewed each year in March, with a quarter of the sample being replaced each year[8].

[7] We apply the parameters from the model estimated for year 2000 to the values of the explanatory variables as measured in year 2001 and 2002, respectively. This should ensure that predicted hourly earnings are independent from the policy change. Here the selection is based on the wages, which is potentially endogenous. Replacing the wage by the predicted wage to achieve exogeneity, may introduce a classical errors-in-variables problem, which is, however, reduced by allowing for individual unobserved heterogeneity in the panel data specification.

[8] The structure of the survey was radically changed in 2003, with interviews taking place every quarter and the survey questionnaire being heavily revised.

For our analysis, we select from each survey year the sample of women that are either household heads ("personne de reference du ménage") or spouse of the head. Additionally, we select only observations that were aged between 17 and 52 in year 2000 (53 in year 2001 and 54 in year 2002). Until age 16, school is compulsory in France. Special labour market programmes apply to individuals aged 55 and over, who are, for example, exempted from searching for a job while receiving unemployment benefits, and protected from dismissal, if in-work (by the so called "Delalande" law which obliges employers to pay extra-compensation money for the dismissal of older workers). Women that were self-employed were also dropped from the sample as their yearly earnings and hours of work are more difficult to evaluate for the purposes of determining eligibility to the tax credit. Moreover, self-employed income is typically more likely to be affected by reporting errors than dependent income. Finally, all observations relating to full-time students and trainees or to retired persons were discarded from the sample.

Other comparable French studies (Laroque and Salanié, 2002, Bargain, 2004) eliminate from the sample for analysis also women that are public employees ("fonctionnaires", in French), as they have a special social security status - for example, they have special pension and retirement arrangements- and their employment contract is permanent, so that they enjoy a lower probability of leaving or loosing their job than other comparable individuals. Here, we keep these women in the sample for a number of reasons. First of all, we cannot exclude that some transitions from non-participation, unemployment or other employment statuses to the status of public employee will take place. For this reason, we also want to include public workers in our sample and account for their wages in the wage regression to predict earnings for non-employed people. Secondly, reducing working hours (one of the possible induced effects of the tax credit programme) may actually be easier for public workers than for private sectors employees, which could compensate for the possibly lower quittal rates of this category of workers. Thirdly, women tend to be over-represented among public sector employees and them being the focus of our analysis, throwing public employees away we may end up with a non-representative selected sample of women.

Having selected according to the criteria above a sample of women that are either household heads or spouses of the head, we end up with a sample of roughly 35,000 observations for each year. We then match these women to their partners, if any, and we match these observations over the three years period considered, from year 2000 to year 2002.

Descriptive statistics of the employment rate[9] for different groups of women distinguished accordingly to their marital status are shown in Table 2. The following groupings were made:

- married women
- unmarried women, which can be further distinguished in:
    1. women living together but not formally married (cohabiting)
    2. single women

It is shown that the employment probabilities of women belonging to these different categories are fairly stable over time, at least for the period of time considered here. Married women have a lower employment probability than single women, as one might expect. Unmarried women living together with their partner have a higher employment probability than married women but a lower one than single women.

Descriptive statistics of these sample for the three years considered are given in Table 3. The wage information available in the survey relates to usual monthly wages, net of (after) employee payroll taxes but gross of (before) employee income taxes. Information on wage bonuses is collected in a separate question. We add wage bonuses to women's monthly wages to compute the total monthly wage. Information on usual weekly working hours is used to compute the hourly wage.

Some women in the sample report hourly earnings below the minimum wage. Cross-checking observations with unusually low earnings against an indicator of unreliable survey responses provided in the survey, we could not find any correlation between the two. Other cross-checkings, for example with the self-employed status or the education and training statuses, did not give any additional information either. Basically, we could not find any evidence that women reporting less than the hourly minimum wage were misreporting their wages. Moreover, in France, in jobs like babysitting workers may happen to earn less than the hourly minimum wage. The standard contract for these household employees distinguishes between "active" and "passive" hours of work, where "active" hours of work amount to 2/3 of the actual working time and they are the only ones actually paid for by the employers. For these reasons, we have resolved to keep these observations in our estimation sample. In any case, we replace actual earnings with predicted ones for all observations, including these ones.

Total income is constructed as the sum of the earnings of the two partners. To determine eligibility to the tax credit, total income is computed setting women's earnings equal either to

[9] The employment rate is set equal to one for individuals in work and to zero for non-employed persons.

predicted earnings. Other sources of income are not taken into consideration here, as they are not available in the survey. No information is available on non-wage income except for unemployment or social security benefits. We assume that income from property or interests on savings are on average negligible. This does not seem as a too strong an assumption given that we restrict attention to low-income workers.

Education level dummies are increasing in educational level, the basis being the highest education level, equivalent to a university degree. A dummy variable was constructed for women without any formal education. This variable happens to be highly correlated with non-French nationality, which is therefore not included among the explanatory variables of the model. Experience is computed by subtracting age at the end of formal schooling from current age. The experience variable is further corrected for career breaks due to children by subtracting one year for each child. Maternity leave in France is equal to sixteen weeks, but parental leave of up to three years is also available to parents of small children. This is paid as a flat rate and can also be taken on a part-time basis. There is no information in the survey on whether women with young children do take any parental leave or not, but other studies show that the majority of parental leave takers are low-paid women, who are the focus of our study.

To account for local labour market conditions, we have constructed a series of dummies for the region of residence, with base "Ile-de-France", the region of Paris. The other regional areas are as defined by the survey: Bourgogne ; Champagne Ardenne ; Haute Normandie ; Basse Normandie ; Picardie ; Centre ; Calais ; Lorraine ; Alsace ; Franche Comte ; Loire ; Bretagne ; Poitou Charentes ; Aquitanie ; Midi-Pyrenées ; Limousin ; Rhones Alpes ; Auvergnes ; Languedoc Roussillon ; Provence, Cote d'Azur et Corse.

The area of residence dummies account additionally for the size of the agglomeration where individual reside:

b) small cities include rural neighbourhoods or urban neighbourhoods with less than 20,000 inhabitants;
c) large cities are those with more than 200,000 inhabitants;
d) Paris stands on its own as the largest urban agglomeration in France;
e) the base for these dummies are medium size cities with a population of 20,0000 to 200,000 inhabitants.

4. The construction of the treatment and control groups

To define the treatment and the control group, we apply first of all the earnings and income thresholds as established by the law that implemented the programme in Spring 2001 (see Table 1). These vary with:

a) the presence and the number of dependent children;

b) the employment status and the earnings and other income of the partner, for married women.

For these purposes, earnings and income variables are constructed using information on predicted earnings. The number of dependent children is taken into account to determine the level of the income threshold which applies in each case. We use information on husband's observed employment status and earnings at the various points in time to determine eligibility to the programme for married women. The assumption is made that husbands' labour market participation is not affected by the policy measure. This is a standard though conservative assumption.

A Heckman selection model was estimated for earnings. The dependent variable in the wage equation is the logarithm of the hourly wage. All variables are measured in year 2000. Women that reported working on more than one job are excluded from the wage model, as well as those with missing working hours. The regressors of the wage equation include a quadratic in age[10], a quadratic in experience[11], education level dummies, a dummy for no formal education and a dummy for residing in Paris, as Parisian salaries may be higher. The explanatory variables of the employment participation equation are the same as those included in the wage equation plus variables relating to family composition and area and region of residence dummies. The family composition variables include controls for the presence of young children aged less than three years; the number of children; whether the person is married or she is living together. The area and region of residence dummies are meant to proxy the impact of local labour market conditions on the employment probability.

The results of estimation, reported in Table A in the Appendix to the paper, indicate that hourly earnings increase with higher education levels. The absence of any formal schooling is found to affect negatively earnings. Hourly earnings increase significantly with experience

[10] We also experimented with using a polynomial in age. The age cube coefficient turns out statistically significant and negative, though it is very small in size. To make our results comparable to other French studies on the same data, we do restrain our specification to a quadratic in age. The estimation results are not much affected from this exclusion.

[11] Age and experience are not much correlated as experience varies with schooling completion age and with the number of children (see the data section for more details).

but at a decreasing rate and they are non-linear in age. Parisian salaries appear to be significantly higher on average than salaries in other livelihoods. The estimated lambda is statistically significant and positive suggesting that selection is an issue here.

To check the robustness of our estimates, descriptive statistics of the prediction error of hourly wages for women for whom wages are observed are shown in Table 4. It is shown that the distributions of predicted and observed hours are quite close. On the average predicted hourly earnings underestimate observed wages by 4 francs, with a standard deviation of 28 francs.

The treatment group is made up of women that satisfy the earnings and income eligibility conditions. The control group includes women that earn at most half the minimum wage more than those eligible for the tax credit and married women that fail to meet the income conditions for eligibility because of their husbands' earnings level.

About 63% of the women in our sample would be eligible to the programme in each of the years considered, i.e. belong to the treatment group. The control group makes up for about 20% of the sample. According to preliminary data on actual number of programme recipients, drawn from fiscal data for the year 2002, which have become available only very recently (DARES, unpublished 2004), a fairly substantial proportion of working women is indeed entitled to the tax credit.

Concerning variation in eligibility over time, we find that over 90% of those that would be eligible for the programme in 2000 (2001), according to our estimates, would also eligible for the programme in 2001 (2002). Going from 2000, to 2002, 87% of the eligible sample are the same individuals. It appears, therefore, that there is a considerable overlapping of the samples eligible to the tax credit over time. However, as we keep into the sample for analysis also new observations in each year (we have an unbalanced panel), only 50% of the eligible sample is the same going from one year to the next.

For information, we show in Table 5 the simulated amounts of the tax credit to which women in the treatment sample would be eligible for, on the basis of our hypotheses concerning earnings (and programme eligibility). The average tax credit amounts to about 200 euros per year. According to our estimates married women would be, on average, eligible for lower tax credits than unmarried women, suggesting therefore that means-testing on total household resources is binding for them. The table shows also what is the relative size of the simulated tax credit, computed as a proportion of individual monthly earnings. It appears that the tax credit that women would be eligible for is, on average, rather small

relative to potential or actual earnings. It would vary according to our estimates between 1.5 and 2 percentage points of potential or actual earnings.

Descriptive statistics of the treatment and control groups are shown in Table 6 for the year 2000. It appears that the two groups are fairly comparable in terms of age, experience, and marital status[12]. However, women in the control group tend to be more educated, to have less children and to be more likely to live in Paris and less likely to be foreigners. Their husbands are more often employed than those of women in the treatment group and they have on average higher earnings.

For information, about 17% (808 observations) of women non-employed in 2001, and belonging to either the treatment or the control group, transit from non-employment in 2001 to employment in 2002. The corresponding figure is 23% (496 observations) for transitions from non-employment in 2000 to employment in 2002. We do not look directly at transitions, though estimating fixed effects panel model only those observations that change labour market status are kept into the estimation sample.

Alternatively, to test for the impact of the means-testing condition on total family income for married women, we define the treatment group as including married women, irrespective of earnings and income eligibility conditions. The control group is then made up of cohabiting women, that live together with their partner but are not married. As discussed earlier on, the income and earnings of the partner are not taken into account to determine eligibility to the programme of women that are not married, as the tax credit is administered by the taxation authorities. This means that all things equal, an unmarried woman with a "high earner" partner would be entitled to the tax credit, but a married woman in the same situation would not. We follow here an approach similar to that of Eissa and Hoynes Williamson (1999), that defined individuals with children as the treatment group and those without as the control group, in order to evaluate the impact of the American Earnings Income Tax Credit programme on labour market participation.

Further to this, we define some new treatment and control groups by interacting these groups with those defined on the basis of the earnings and income conditions for eligibility. The resulting treatment group includes then married women eligible for the policy measure, while the control group contains married or cohabiting women not eligible to the policy measure. These are used to test for the impact of the tax credit on the employment rate of

[12] In year 2000, the percentage of cohabiting women is higher in the control group than in the treatment group, but this difference disappears in year 2001, for example (see Table 4a in the Appendix).

married women. Descriptive statistics of these treatment and control groups for year 2000 are given in Table 7. These two groups compare now fairly well.

5. Results of estimation of the difference in difference model

Results of estimation of probit and logit difference in difference models of the employment probability estimated on pooled data for the three years, without controlling for panel data effects, are shown in Table 8. Table 9 gives the results for the panel data models. Results of estimation of the model for married women are shown in Table 10. Results of estimation of the panel data model, showing all estimated coefficients, are given in Table A in the Appendix to the paper.

Overall, we can conclude in favour of a significantly negative effect of the programme on the employment probability of married women and positive one, though not always significant, for unmarried women.

In Table 8, the pooled logit and probit models for the three years considered, estimated specifying robust standard errors, and controlling for covariates, gives a significantly negative coefficient for married women and significantly positive one for unmarried women. According to these estimates, the employment rate would fall by 2-to-3% for married women and increase by 3% (probit model) for unmarried women. The estimates are insignificant if we split the unmarried women sample into single and cohabiting. This could be do to the small number of observations in the control group samples for these subsamples of women.

In Table 9, the "population averaged" or clustered observations panel data model, estimated specifying the robust standard error option, and controlling for covariates, gives a significantly negative coefficient for married women, suggesting that their employment rate falls by 3%. The estimate of the coefficient on the treatment dummy is insignificant for unmarried women. The fixed effects panel data model, which focuses on transitions, gives insignificant effects for all groups.

Results of estimation of the model for the treatment group "married women" are shown in Table 10. Here the control group are cohabiting women. According to the results of estimation of the population averaged panel data model, we find a significantly negative impact of the tax credit programme on the employment probability of married women. This turns out, however, insignificant if marital status is interacted with the eligibility dummy (model 2). The fixed effects model gives, on the other hand, insignificant effects under either

specification.

According to our estimates[13] the negative impact on the employment probability of married women can be quantified as varying roughly between 2 and 3 per cent. These estimates should, however, be taken with a pinch of salt, as given the large size of the sample eligible for the tax credit, our model may actually capture the impact of other more or less contemporaneous policy changes. Moreover, partly for the same reasons, our control group does not always match well the treatment group, as it includes women whose education level is on average higher.

A number of further checks of the robustness of our findings were carried out. These included:

a) running the model, adding a control for the interaction between the treatment and year 2001 (PPE*2001);
b) running the model adding controls for whether the partner, if present, were employed and, of so, for his earnings from work;
c) running the model dropping all observations with a partner other than a salaried worker. This is meant to account for the fact that we cannot control in the analysis for non-labour income of the spouse.

Our major findings concerning the impact of the tax credit on the employment probability of married or unmarried women were not substantially affected.

Conclusions

This paper provides an estimate of the impact of the French tax credit, "la Prime Pour l'Emploi", on the employment rate of low-earnings women. It represents the first evaluation study based on data posterior to the programme implementation.

Like similar in-work benefits programmes, this programme is expected to increase the incentives to work for non-employed persons. However, it may decrease incentives to work for (married) individuals with a working partner entitled to the tax credit, because of the means-testing on total household resources. It may also reduce working hours for those recipients with earnings between 1 and 1,4 the minimum wage, who would receive higher tax credit payments if they were earning less. The announcement of the policy measure may in itself have an impact on individual behaviour in spite of the relative small amounts of money

[13] According to the models that include all covariates.

paid by the programme. On the other hand, it has been argued that the delay with which the tax credit is paid may make it less effective on individual work incentives. Moreover, the possibility of stimulating labour supply depends largely on whether non-employment is voluntary or non-voluntary. There may however be indirect employment effects, due to employers increasing the supply of jobs addressed to potential recipients of the measure, possibly by reducing the wages offered.

We test in this paper for the employment effects of the policy, by applying a non-experimental evaluation method, a "difference-in-difference" approach. We focus on the employment effects for women, distinguishing them by their marital status. The survey data used for the empirical analysis are drawn from the French labour force surveys of years 2000 to 2002. The rotating structure of the survey enables us to apply panel data methods to estimate the employment impact of the policy.

A weakness of this study comes from the large number of workers that are eligible to the policy. This may render it difficult to single out the effect of the programme from that of other policy measures implemented at about the same time, like the extension of the 35 hours to small firms or the reform of the social assistance benefits (the French "Revenu Minimum d'Insertion").

In line with our theoretical a priori, we conclude that the policy has a negative impact on the employment probability of married women but a positive one, though not always significant, for unmarried women. We also find evidence of a negative employment effect of the means-testing condition for married women, by defining married women as the treatment group and cohabiting women as the control group.

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Table 1. The earnings and income thresholds for eligibility to the tax credit (euros)

	Earnings thresholds		*Income threshold*
	Lower	Upper	
Single women	3187	14872	11772
Married women	3187	14872	23544

These thresholds relate to annual taxable earnings and income. The income threshold is increased by 3253 euros for each dependent child. The upper earnings threshold is equal to 22654 euros for married women whose husband is out of work or earns less than the lower earnings threshold.

Table 2. Employment rates of women according to their marital status

	Year 2000	**Year 2001**	**Year 2002**
Total sample:	0.706	0.715	0.719
observations number	*35004*	*35031*	*35648*
Married women	0.676	0.688	0.691
observations number	*21509*	*21589*	*21689*
Unmarried women:	0.753	0.757	0.762
observations number	*13495*	*13442*	*13959*
Cohabiting women	0.732	0.740	0.755
observations number	*6470*	*6415*	*6778*
Single women	0.772	0.773	0.768
observations number	*7025*	*7025*	*7181*

Note: These are weighted probabilities, computed using the individual sample weights available for, respectively, year 2000, 2001 and 2002.

Table 3 ***Descriptive statistics of the samples for analysis***

	Year 2000		**Year 2001**		**Year 2002**	
Variable name	mean	SD	mean	SD	mean	SD
Age	38.28	8.41	38.76	8.67	39.22	8.98
age at the end of schooling	18.27	4.22	18.40	4.16	18.48	4.21
Experience	18.34	9.69	18.76	10.03	19.16	10.37
no formal education	0.01	0.10	0.01	0.10	0.01	0.10
education CEP	0.27	0.44	0.26	0.44	0.25	0.43
education BEPC	0.08	0.28	0.08	0.28	0.08	0.28
education BEP-CAP	0.26	0.44	0.26	0.44	0.25	0.44
education BAC	0.15	0.36	0.15	0.36	0.16	0.36
education BAC + 2	0.13	0.34	0.14	0.35	0.14	0.35
Married	0.61	0.49	0.62	0.49	0.61	0.49
Cohabitant	0.18	0.39	0.18	0.39	0.19	0.39
any child of age <3 years	0.13	0.33	0.13	0.34	0.13	0.34
child number	1.39	1.21	1.35	1.20	1.32	1.19
more than one job	0.03	0.17	0.03	0.17	0.03	0.17
house owner outright	0.19	0.40	0.21	0.41	0.23	0.42
h. owner with a mortgage	0.30	0.46	0.30	0.46	0.29	0.45
Paris	0.15	0.35	0.15	0.36	0.14	0.35
small city	0.44	0.50	0.44	0.50	0.46	0.50
large city	0.20	0.40	0.20	0.40	0.20	0.40
France	0.90	0.29	0.90	0.30	0.90	0.30
Ile de France	0.17	0.37	0.17	0.37	0.17	0.37
husband's employed*	0.88	0.32	0.88	0.32	0.87	0.34
husband's salary*, FF	10087.17	9955.97	10319.52	6340.46	10897.21	8558.66
Observations no.	*34976*		*35011*		*35641*	

(*) The mean of partner's employment status is computed only for married and cohabiting women. The salary of the husband is averaged over positive values only and computed on a monthly basis.

Table 4 *Distributions of the prediction error for predicted earnings*

	Prediction error
Quantiles	
5%	-28.67
10%	-28.67
25%	-13.91
50%	-6.73
75%	1.74
90%	13.15
95%	23.61
Mean	-4.21
St. Dev.	27.77

The observations number is here 19236.

Table 5. Amounts of tax credit one would be eligible for

	Raw amounts, euro per year			As a proportion of taxable earnings		
	Year 2000	**Year 2001**	**Year 2002**	**Year 2000**	**Year 2001**	**Year 2002**
Total sample						
Mean	221.1	217.0	212.4	1.7	1.7	1.7
St. Deviation	108.4	109.1	109.4	1.0	1.0	1.0
Observations	*21945*	*22197*	*22402*	*21945*	*22197*	*22402*
Married w.						
Mean	195.9	192.1	185.3	1.5	1.5	1.4
St. Deviation	99.5	100.5	98.6	0.9	0.9	0.9
Observations	*15596*	*15375*	*15145*	*15596*	*15375*	*15145*
Unmarried w.						
Mean	283.1	273.1	268.9	2.3	2.3	2.2
St. Deviation	104.5	107.0	109.4	1.1	1.1	1.1
Observations	*6349*	*6822*	*7257*	*6349*	*6822*	*7257*

Note: These figures are unweighted and computed on the basis of predicted earnings.

Table 6 ***Descriptives of the treatment and control samples***

	Treatment group		**Control group**	
Variable name	mean	SD	mean	SD
Age	38.25	8.22	38.61	8.44
Experience	19.37	9.61	17.25	9.82
no formal education	0.02	0.13	0.003	0.02
education CEP	0.38	0.48	0.09	0.28
education BEPC	0.10	0.30	0.06	0.24
education BEP-CAP	0.32	0.47	0.19	0.39
education BAC	0.12	0.33	0.20	0.40
education BAC + 2	0.06	0.24	0.26	0.43
Married	0.71	0.45	0.61	0.49
Cohabitant	0.09	0.28	0.23	0.42
any child of age <3 years	0.13	0.34	0.13	0.34
child number	1.53	1.25	1.20	1.13
more than one job	0.03	0.17	0.03	0.16
house owner outright	0.19	0.39	0.21	0.41
h. owner with a mortgage	0.29	0.45	0.34	0.47
Paris	0.09	0.29	0.22	0.41
small city	0.49	0.50	0.36	0.48
large city	0.20	0.40	0.22	0.41
France	0.89	0.32	0.94	0.24
Ile de France	0.11	0.32	0.24	0.43
husband's employed*	0.83	0.38	0.98	0.15
husband's salary*, FF	8090.13	2384.53	12060.45	15890.08
Observations no.	*21945*		*7681*	

Note: These statistics relate to year 2000.

(*) The mean of partner's employment status is computed only for married and cohabiting women. The salary of the husband is averaged over positive values only and computed on a monthly basis.

Table 7 ***Descriptive of the treatment and control samples, women married or cohabiting***

	Treatment group		Control group	
Variable name	mean	SD	mean	SD
Age	39.47	7.67	38.85	8.28
Experience	20.43	9.22	17.54	9.67
no formal education	0.02	0.14	0.0003	0.02
Education CEP	0.37	0.48	0.10	0.30
Education BEPC	0.10	0.30	0.07	0.26
Education BEP-CAP	0.32	0.47	0.21	0.41
Education BAC	0.12	0.33	0.21	0.41
Education BAC + 2	0.07	0.25	0.24	0.43
Married	1,00	0,00	0.72	0.45
Cohabitant	0,00	0,00	0.28	0.45
any child of age <3 years	0.14	0.35	0.16	0.36
child number	1.73	1.22	1.40	1.11
more than one job	0.03	0.17	0.02	0.15
house owner outright	0.23	0.42	0.22	0.41
h. owner with a mortgage	0.37	0.48	0.38	0.48
Paris	0.09	0.29	0.20	0.40
small city	0.53	0.50	0.40	0.49
large city	0.18	0.38	0.21	0.41
France	0.87	0.34	0.93	0.25
Ile de France	0.12	0.32	0.22	0.42
husband's employed*	0.85	0.36	0.98	0.15
husband's salary*, FF	8263.53	2332.68	12060.45	15890.08
Observations no.	*15596*		*6454*	

Note: These statistics relate to year 2000. The treatment group includes married women entitled to the tax credit; the control group married and cohabiting women in the control group, as defined for our main model. *(*)* The mean of partner's employment status is computed only for married and cohabiting women. The salary of the husband is averaged over positive values only and computed on a monthly basis.

Table 8 ***Results of estimation of logit and probit models***

	Estimates of the impact of the tax credit				
	full sample	***married w.***	***unmarried w.***	***single w.***	***cohabiting w.***
logit/probit no covariates					
coefficient logit	-0.100	-0.097	-0.249	0.073	-0.159
standard error logit	0.040	0.046	0.080	0.120	0.113
marginal effect logit	-0.045	-0.036	-0.065	-0.072	-0.056
coefficient probit	-0.057	-0.056	-0.132	0.033	-0.074
standard error probit	0.023	0.027	0.044	0.063	0.064
marginal effect probit	-0.020	-0.020	-0.046	0.010	-0.027
logit/probit all covariates					
coefficient logit	-0.037	-0.129	0.215	-0.119	0.366
standard error logit	0.043	0.049	0.091	0.128	0.130
marginal effect logit	-0.045	-0.036	-0.065	-0.070	-0.056
coefficient probit	-0.022	-0.073	0.106	-0.081	0.216
standard error probit	0.024	0.029	0.049	0.068	0.072
marginal effect probit	-0.007	-0.026	0.034	-0.024	0.064

Note: All models are estimated specifying robust standard errors.

Marginal effects are computed as the difference between the predicted probability of employment with the interaction dummy for the programme and year 2002 set equal to zero and the predicted probability where the same is set equal to one.

Table 9 ***Results of estimation of the panel data models***

Estimates of the impact of the tax credit

	full sample	*married w.*	*unmarried w.*	*single w.*	*cohabiting w.*
Pop. Av. logit (1)					
Coefficient	-0.536	-0.028	-0.126	0.056	-0.112
standard error	0.034	0.028	0.060	0.092	0.087
marginal effect	-0.030	0.020	0.059	0.063	0.059
Pop. Av. logit (2)					
Coefficient	-0.031	-0.065	0.059	-0.104	0.157
standard error	0.030	0.032	0.075	0.103	0.108
marginal effect	-0.042	-0.031	-0.067	-0.068	-0.060
FE logit (2)					
Coefficient	-0.084	-0,128	-0.078	-0.013	0.051
standard error	0.129	0.158	0.233	0.334	0.359
marginal effect					

Note: Models 1) do not control for other covariates; models 2 control for covariates, which include a quadratic in age, education level dummies, dummies for the presence of young children aged less than 3 years, number of children, area and region of residen

Marginal effects are computed as the difference between the predicted probability of employment with the interaction dummy for the programme and year 2002 set equal to zero and the predicted probability where the same is set equal to one.

Table 10 ***Results of estimation of the married women models***

	Estimates of the impact of the tax credit	
	Model (1)	**Model (2)**
logit/probit all covariates		
coefficient logit	-0.091	-0.056
standard error logit	0.041	0.037
marginal effect logit	-0.006	-0.029
coefficient probit	-0.053	-0.033
standard error probit	0.024	0.022
marginal effect probit	-0.013	-0.012
population averaged logit, all covariates		
coefficient logit	-0.077	-0.041
standard error logit	0.032	0.026
marginal effect logit	-0.004	-0.029
fixed effects logit, all covariates		
coefficient logit	0.048	-0.081
standard error logit	0.126	0.119

Note: In model (1) married women are the treatment group and cohabiting ones, the control group. In model (2) married women eligible to the tax credit are the treatment group and married and cohabiting women not eligible constitute the control group. In Model (2) the treatment group is obtained interacting the married dummy with the treatment group of the general model and the control group includes married and cohabiting women that were part of the control group in the general model, i.e. whose earnings exceed eligibility by half the minimum wage, etc.

Table A ***Results of estimation of the full panel data model of Table 9***
The model is a population averaged panel logit (see equation 3)

	Married Women		**Unmarried women**	
Variable name	coefficient	SE	Coefficient	SE
PPE	0.010	0.028	0.008	0.055
PPE*2002	**-0.065**	**0.032**	**0.059**	**0.075**
2001	0.039	0.014	0.011	0.027
2002	0.117	0.030	-0.033	0.072
age	0.301	0.015	0.163	0.016
age squared	-0.004	0.000	-0.002	0.000
no formal education	-1.001	0.110	-0.633	0.192
education CEP	-1.432	0.064	-2.014	0.102
education BEPC	-0.920	0.070	-1.341	0.107
education BEP-CAP	-0.748	0.063	-1.169	0.099
education BAC	-0.533	0.065	-0.651	0.103
education BAC + 2	-0.092	0.067	0.087	0.114
any child of age <3 years	-0.628	0.030	-0.809	0.043
child number	-0.363	0.011	-0.403	0.018
house owner	0.440	0.031	0.417	0.062
Lhouse owner mortgage	0.583	0.027	0.676	0.053
Bourgogne	-0.280	0.069	-0.412	0.102
Champagne Ardenne	-0.305	0.066	-0.553	0.099
Haute Normandie	-0.213	0.067	-0.241	0.099
Basse Normandie	-0.029	0.076	-0.219	0.112
Picardie	-0.371	0.065	-0.536	0.096
Centre	-0.058	0.069	-0.022	0.103
Calais	-0.701	0.055	-0.880	0.082
Lorraine	-0.426	0.064	-0.438	0.097
Alsace	-0.121	0.069	-0.152	0.109
Franche Comte	-0.180	0.064	-0.347	0.097
Loire	-0.043	0.065	-0.295	0.093
Bretagne	-0.082	0.064	-0.336	0.099
Poitou Charentes	-0.168	0.073	-0.404	0.102
Aquitanie	-0.395	0.066	-0.490	0.098
Limousin	0.011	0.079	-0.220	0.111
Rhones Alpes	-0.221	0.054	-0.080	0.085
Auvergne	-0.291	0.073	-0.439	0.108
Languedoc Roussillon	-0.822	0.065	-0.912	0.094
Provence Cote d'Azur Corse	-0.659	0.059	-0.662	0.085
Midi-Pyrenées	-0.355	0.073	-0.574	0.105
Constant	-3.700	0.286	-0.234	0.301
Observations no.	*60603*		*28040*	
Clusters no.	*38154*		*20083*	
Wald Test (chi squared(36))	*5103.09*		*3575.95*	

Table B ***Results of estimation of the hourly wage model***
The dependent variable is the logarithm of the hourly wage.
The dependent variable of the selection equation is the prob. of participation.

	Wage equation		**Probit of participation**	
Variable name	coefficient	SE	coefficient	SE
age	0.117	0.019	-0.066	0.054
age squared	-0.003	0.0005	0.002	0.001
age cube	0.00003	0.0000	-0.000	0.000
experience	0.0006	0.002	0.030	0.006
experience squared	-0.0006	0.002	-0.0005	0.0001
no formal education	0.100	0.049	-0.682	0.091
education CEP	-0.428	0.014	-1.043	0.044
education BEPC	-0.409	0.015	-0.674	0.046
education BEP-CAP	-0.408	0.012	-0.581	0.040
education BAC	-0.317	0.012	-0.388	0.039
education BAC + 2	-0.189	0.011	-0.074	0.039
Paris	0.118	0.007	-0.156	0.052
Constant	2.394	0.228	1.829	0.633
married			-0.165	0.017
any child of age <3 years			-0.336	0.023
child number			0.214	0.036
house owner			0.266	0.021
house owner with mortgage			0.407	0.018
Bourgogne			-0.342	0.061
Champagne Ardenne			-0.257	0.061
Haute Normandie			-0.180	0.059
Basse Normandie			-0.194	0.065
Picardie			-0.327	0.059
Centre			-0.179	0.060
Calais			-0.465	0.054
Lorraine			-0.416	0.059
Alsace			-0.087	0.059
Franche Comte			-0.176	0.060
Loire			-0.220	0.057
Bretagne			-0.236	0.058
Poitou Charentes			-0.247	0.061
Aquitanie			-0.339	0.058
Limousin			-0.218	0.064
Rhones Alpes			-0.265	0.054
Auvergne			-0.371	0.062
Languedoc Roussillon			-0.631	0.059
Provence Cote d'Azur Corse			-0.436	0.054
Midi-Pyrenées			-0.414	0.061
Lambda	-0.297	0.006		
Observations no.	28819			