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A Model with Endogenous Programme Participation

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A model with endogenous programme participation: evaluating the tax credit in France

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Abstract

This paper provides new estimates of the impact of the French tax credit on the employment outcomes of women. We model simultaneously the employment probability and the determinants of programme eligibility. We improve on earlier studies in this field that, using a single evaluation equation framework, predicted ex-ante programme eligibility. Within this framework, we also allow for hours responses. The data for the analysis are drawn from the French labour force surveys of years 1999 to 2002. We find no significant impact of the tax credit on either employment or hours of French women.

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1 Introduction

The French tax credit programme, “la Prime Pour l’Emploi”, was launched by the Jospin government in 2001. Like other “in-work benefits” measures, the French one aims at increasing income from work for the low-paid, with the objective of redistributing income to the less-skilled as well as increasing the incentives to work for those with low potential earnings. Since the introduction of the measure a number of ex-ante policy evaluation studies were carried out, all based on microsimulations or on structural labour supply models (see Stancanelli and Sterdyniak, 2004, for a review of the earlier literature). The main conclusions from the earlier literature were that the tax credit had little redistributive impact and very small employment effects, if any at all. Stancanelli (2004) was the first to estimate a difference-in-differences evaluation model of the employment effects of the policy. Distinguishing women by their marital status to allow for the differential impact of the policy for married and unmarried respondents, she finds some evidence of negative employment effects of the policy for married women. The overall employment impact is found to be insignificant. Significant work participation disincentives for married women were also found in the American literature by Eissa and Hoynes (2004a), who concluded that the American Earned Income Tax Credit reduces work incentives for secondary earners. Both studies do, however, rely on a single evaluation equation model, and predict ex-ante programme eligibility for non-employed people. Heim (2005) found a negative effect of the EITC on married women’s hours of work, using a structural model of labour supply behaviour of married couples. Eissa and Hoynes (2004b) find modest hours reductions for married women, using reduced form equations for married couples.

We provide new estimates of the employment effects of the tax credit by endogenizing programme participation. Eligibility to the tax credit depends on earnings. The employment decision depends in theory on potential earnings as well. As the tax credit measure is targeted at low-wage workers, a bias in the difference-in-differences estimates of employment effects of the tax credit will be introduced if unobserved heterogeneity in earnings affects the employment decision. We tackle this problem by jointly modelling the employment decision and programme eligibility. Our method of estimation also provides a solution for the fact that programme eligibility is not observed for the unemployed. We show that methods based on predicted wages introduce an errors-in-variables bias. This potential bias is not irrelevant since the unexplained part in wage regressions usually is sizeable, reflected by a low R-squared value. We also expand on Stancanelli (2004) by modelling hours responses to programme eligibility. To this end, we use a "naive" linear specification of working hours, which does, however, allow for endogenous programme participation.

We estimate the model for different groups of women, distinguishing between single, married, and cohabiting women. We do not allow the impact of the policy to vary (directly) with the presence of children given that entitlement to the French tax credit is not (directly) conditional on this variable. Moreover, children additions to the tax credit are not very tangible. Besides, Stancanelli (2004) finds that almost all of French lone mothers would be entitled to the tax credit if they took up work, so that there is no straightforward counterfactual for this group of programme participants. The Anglo-saxon literature finds positive work participation outcomes for lone mothers (see, for example, Blundell and Hoynes, 2003, for a review).

We use data from four consecutive years of the French labour force surveys, years 1999 to 2002, to estimate the model. Year 2002 is our policy year.[1] Given the 2003 break in the French LFS series of later years and the non-comparability of the labour market states across the two series, we cannot extend the analysis to later years.

The structure of the paper is the following. The next section describes the tax credit programme. The evaluation model for, respectively, employment outcomes and hours, is presented in Section 3, together with the construction of the treatment and control groups. The data used for the analysis are described in Section 4. The results of the estimation of the two models are discussed in Section 5. The last section concludes the

[1] In practise, this is actually the second year the policy was implemented. The tax credit was created in February-March 2001 and made payable as from 2001, on basis of tax declarations of year 2001, which related to income and earnings in year 2000. However, given the timing of the labour force surveys which were carried out in March of each year and collected earnings and income in the current year, 2001 cannot be possibly considered as a policy year. Therefore, for the purpose of our evaluation model, years 1999 to 2001 are defined as "control" years and 2002 is the treatment year.

paper.

2 The French tax credit measure

The French tax credit was designed to compensate the low-end of the distribution of tax payers for tax reductions granted to the wealthier households. Tax credit measures exist in many other OECD countries, such as 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. Within the "family" of OECD in-work benefits, the French programme stands out as a "hybrid" measure as it attempts to achieve a number of different objectives, such as discouraging small-hours part-time jobs and rewarding full-time "minimum wage" workers. Individuals with very little earnings over the year or working few hours in low-paid jobs are not eligible to the tax credit. The tapering off of benefits is such that benefits are the largest at about the minimum wage level and decrease thereafter.

Alike other in-work benefits schemes in OECD countries, the benefits paid increase with the number of dependent children for eligible workers and more so for lone parents in-work, but "children additions" are extremely small. An eligible lone parent is entitled to a 60 euros yearly addition for the first child and to 30 euros extra for each other child. The children addition for married parents is equal to 30 euros per dependent child, while the addition for a dependent spouse is 78 euros per year. Childless workers are also entitled to the tax-credit.

The credit is means-tested on total household income but payable to the individual, so that within each household both husband and wife may in principle get it.

Eligibility conditions to the French tax credit can be summarized as follows[2] (see

[2] The earnings and total income bounds have been slightly increased every tax year. For the purposes of our analysis, the bounds announced in year 2001 are relevant, and were, therefore given above. The policy year we consider is 2002. The relevant LFS survey was carried out in March 2002. At that time, individuals knew the eligibility bounds announced in 2001, but they did not yet know the bounds for 2002. In practice, given the time disconnection between the decision to work and the payment of the tax credit, the actual rules determining the payment of tax credits for the individuals in our sample, will be those fixed in 2003, as individuals file their tax declarations in March of each year. However, the relevant tax parameters for the purposes of our analysis are clearly those announced in 2001, as these were the only one known to individuals at the time of carrying out the 2002 LFS survey.

Table 1):

- Having worked at least part of the (fiscal) year and having earned more than roughly 0.3 of the full-time year-round minimum wage (about 3200 euros) and less than about 1.4 of the full-time year-round minimum wage (almost 15000 euro) on a yearly base. This upper earnings bound is larger and equal to almost twice the full-time year-round minimum wage (almost 23000 euros) for those with a dependent spouse or with a spouse earning less than 0.3 of the full-time year-round minimum wage (the lower earning bound).

- Reporting total taxable household income below roughly 12000 euros, for single people, and approximately 24000 euros, for married couples. These total income bounds are increased by over 3000 euros for each dependent child.

The reason for setting the lower earnings bound was to discourage small hours part-time jobs. However, few French workers fall below the lower earnings bound for eligibility, roughly less than 3 per cent of female workers, according to the LFS. But almost 60% of working women have earnings below the upper earnings bound, which is not surprising given the compressed shape of the earnings distribution at around the minimum wage in France and the fact that French women's earnings are still well below those of men.

Roughly half of French households filing a tax declaration fall below the income bound. One is then not surprised to find out from official tax statistics that over eight million French households were paid a tax credit in 2001, that is to say one out of every three workers.

The large coverage of the credit contrasts with its small importance. The amounts paid (see Table 2 and Figure 1) were equal in 2001 to 4.4% of reported (taxable) earnings for salaries between 0.3 times the full-time year-round minimum wage and the full-time year-round minimum wage[3] and decreased for earnings between the full-time year-round minimum wage and approximately 1.4 times the full-time year-round minimum wage (the phase out). Payments are, therefore, the largest for workers earning the minimum wage.

[3] These amounts were increased by later reforms, but remain small by international comparisons.

In 2001, the total public expenditure on tax credit payments amounted to over thousand millions of euros, corresponding to an average payment of 150 euros per year per eligible household. This profile contrasts with records of over one million recipients of the Working Family Tax Credit in the UK, for an average yearly expenditure of over 2500 euros per household, and nearly 20 millions recipients of the EITC in the USA, with an average expenditure of almost 700 euros per household.

However, the employment effects of tax credit programmes are not only a function of the amounts paid. For example, the UK measure has been found to be less effective than the USA one, in spite of the larger amounts paid by the British tax credit. In particular, the American Earned Income Tax Credit has been found to increase significantly work incentives of lone parents, while the overall employment effects are quite small. According to Blundell and Hoynes (2003), the differences in employment outcomes can be at least partly explained by the interactions with other tax benefits schemes (unemployment benefits for households with dependent children being much more generous in the UK than in the USA, for example) as well as by the general economic context (the booming economy in the USA in the mid nineties). When times are good, employment effects of in-work benefits may be larger as the larger number of jobs offered may allow individuals to really trade-off between working or not, on the basis of the expected gains from work. When (structural) unemployment is high, in-work benefits may play less of a role in this respect.

Since we are looking at the second year the policy was introduced, there may also be policy announcements effects, which make the impact of the policy larger than in later periods.

3 Evaluating the tax credit measure

3.1 The methodological framework

Most methods for the estimation of treatment effects[4] are based on the assumption of conditional independence. Applying conditional independence to the evaluation of

[4] See Wooldridge (2002) for an overview.

the tax credit implies that the employment probability is the same for an eligible and an ineligible worker with the same observed individual characteristics. Selection on unobservables is ruled out.

However, conditional independence is a priori unlikely to be satisfied in the evaluation of the impact of the French tax credit on employment. Wage rates and employment are potentially correlated,[5] whereas the tax credit eligibility is targeted to low-wage workers. Thus, there is a potential source of selection on unobervables between the treatment and control group: employment probabilities of the treatment and the control group can be different, even if observables are controlled for.

An additional problem is that for the non-employed eligibility to the tax credit is not observed since eligibility depends on wage rates. Our method of estimation allows both for selection on unobservables and for the unobservability of programme eligibility for the non-employed. We first estimate a wage equation, correcting for selectivity on employment. We assume that the wage equation is the same for the employed and the unemployed.[6] The estimates of the wage distribution can be used to obtain the probability distribution of programme eligibility. To estimate the impact of the tax credit measure on employment we specify a difference-in-differences model for the employment probability. We allow for correlation in unobservables between the employment probability and the probability of programme eligibility.[7]

This approach requires making possibly restrictive parametric assumptions. However, we can partly relax the parametric assumptions made. One of the main criticisms on a parametric specification is that the treatment effect parameter appearing in the single index of the employment probability does not vary with observables. If we can a priori distinguish different subgroups that are likely to have different treatment effects, either because they obtain different treatment or because they may be expected to have different outcomes in response to treatment, we stratify the sample. From the description of the tax credit measure in the previous section we know that the eligibility depends on marital

[5] In the labour supply literature, estimates of wage equations are usually corrected for selectivity on unobservables for this reason.

[6] This is the common approach followed in the labour supply literature. See Blundell and MaCurdy (1999) for an overview.

[7] Note that Wooldridge (2002) suggests this type of solution for comparable problems.

status since the husband's income enters the determination of a married woman's tax credit but not that of a cohabiting woman. Therefore in our empirical analysis we will estimate model variants with separate treatment effect by marital status.

Parametric estimation of a difference-in-differences model does not require to impose a common support between the treatment and the control group: the parametric assumption enables the extrapolation out of the sample of the observed characteristics. However, we also apply a common support for the treatment and control sample. In particular, common support makes it more likely that the common trends assumption for the treatment and control group is satisfied. Since our approach involves the estimation of the probability of programme eligibility, we can choose a control sample for which the range of the values of this probability is comparable to the range found in the treatment sample. We also restrict the treatment sample, taking out observations for which the probability of programme eligibility is not comparable to corresponding values in the control sample. We test for the sensitivity of the outcome to the use of common support.

3.2 The evaluation model: employment outcomes

To evaluate the impact of the tax credit on the employment probability, we use a difference-in-differences model. We define eligibility on the basis of the legal entitlement rules, that were spelled out in Section 2. According to these eligibility rules we can write the relation between (the logarithm of) earnings w^*_{it} and treatment PPE_{it} as

$$PPE_{it} = \iota(l_{it} < w^*_{it} < u_{it}) \tag{1}$$

where l_{it} and u_{it} in (1) are the lower and upperbounds for eligibility depend on the minimum wage, marital status, household composition, the labour market status of the spouse, and, for married people, on the earnings of the husband.

We specify the employment status E_{it} (with $E_{it} = 1$ indicating employment, 0 otherwise). It follows that:

$$\begin{aligned} &E^*_{it} = x'_{it}\beta + \alpha PPE_{it} + \psi y2002_{it} + \gamma PPE_{it} y2002_{it} + \epsilon_{it} \\ &\text{with } E_{it} = \iota(E^*_{it} > 0) \end{aligned} \tag{2}$$

We use data for the years 1999, 2000, 2001, and 2002 to estimate the model parameters. Accordingly, (2) contains a time dummy $y2002_{it}$ for the year 2002.[8] The year 2002 is the policy year in our model.[9] In (2) PPE_{it} indicates whether individual i's earnings in year t are such that she is eligible for the tax credit. To identify the treatment effect, we need to assume that (i) the employment probability of the control group is not affected by the policy change, and (ii) the trend effects are common for the treatment group and the control group. The latter assumption says that the difference between the employment probabilities of the treatment and control 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 continuing 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 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

[8] Time dummies for the years 2000 and 2001 are included in x_{it}.

[9] The tax credit was introduced in 2001 and started been paid on the basis of tax declarations made in 2001, and relating to incomes in 2000. However, the LFS surveys of 1999 to 2002 were all carried out in March and surveyed incomes in the year of the survey. At the time that the 2001 LFS survey was been carried out, the tax credit had just been created. This is why 2001 is a control year, while 2002 is the treatment year. At the time of carrying out the 2002 LFS surveys, in March 2002, tax credits had already been paid out, in September 2001, on the basis of the 2001 tax declarations. The 2002 LFS survey surveys individuals incomes in 2002. So it is seems right to consider 2002 as a policy year and 2001 as a control year.

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.

Under the assumptions (i) and (ii), the parameter ψ in (2) indicates a 'pure' time effect, that is common to the treatment and control group and refers to factors specific to the year 2002 that are other than the tax credit measure, and the parameter γ in (2) refers to the treatment effect, that is specific to individuals belonging to the treatment group of the eligible with $PPE = 1$.

However, earnings w_{it}^* are not observed for the non-employed, and therefore, by (1) eligibility is not directly observed. Further to this, unobservable factors that affect earnings may be correlated with unobservable factors affecting the employment probability. As eligibility (PPE) depends on earnings by (1), selection on unobservables may affect the comparison of the outcome variable for the treated with the outcome of the non-treated, even after conditioning on observables.

To address these issues, let us first write down the equation for log-earnings:

$$w_{it}^* = z_{it}'\eta + \nu_{it} \text{ with } E(\nu_{it}|z_{it}) = 0, Var(\nu_{it}) = \sigma_\nu^2 \tag{3}$$

In (3) w_{it}^* represents the (possibly latent) log-earnings.

Under normality of ν_{it} in the wage equation (3), the probability of programme eligibility reads

$$p(\tilde{z}_{it}) = P(PPE_{it} = 1|\tilde{z}_{it}) = P(l_{it} < w_{it}^* < u_{it}) = \Phi\left(\frac{u_{it} - \eta' z_{it}}{\sigma_\nu}\right) - \Phi\left(\frac{l_{it} - \eta' z_{it}}{\sigma_\nu}\right) \tag{4}$$

with $\tilde{z}_{it}$ including the variables in z_{it}, l_{it}, and u_{it}.

We employ a two-step method to estimate this model. In the first step, the parameters of the wage distribution are estimated. We use an auxiliary participation equation to correct for selectivity bias.[10] At this stage we assume that ν_{it} is normally distributed, and that participation follows a probit specification, which is estimated jointly by maximum likelihood with the parameters of the earnings equation in (3), allowing for correlation

[10] This auxiliary employment equation does not contain the treatment indicator PPE_{it}, so splitting up the sample in treated and controls does not play a role at this stage.

in the errors. Thus, we obtain parameter estimates of η and σ_ν, the standard deviation of ν_{it}, say $\hat{\eta}$ and $\hat{\sigma}_\nu$.

As an alternative 'shortcut' that may be taken to our approach, individuals may be assigned to the treatment or control group on the basis of 'predicted' wages $\hat{w}_{it} = z'_{it}\hat{\eta}$. Eligibility then is predicted by $\widehat{PPE}_{it} = \iota(l_{it} < \hat{w}_{it} < u_{it})$. But given that $\widehat{PPE}_{it} = \iota(l_{it} + \nu_{it} < w^*_{it} < u_{it} + \nu_{it})$ an errors-in-variables bias is introduced since $\widehat{PPE}_{it}$ depends on ν_{it}.[11] Our method also allows for the presence of measurement error in earnings and misclassification in programme eligibility

To allow for possible correlation of unobservables affecting eligibility PPE_{it} with the error term ϵ_{it} of the employment equation (2), we first specify the joint distribution of ϵ_{it} and ν_{it} (the errors, respectively, of the employment equation and the earnings equation) and next, derive the joint distribution of PPE_{it} and E_{it}, by using the relation between eligibility and earnings, spelled out in equations (1) and (4). To this end, we assume that ϵ_{it} and ν_{it} follow a bivariate normal distribution:

$$\begin{pmatrix} \epsilon_{it} \\ \nu_{it} \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \rho\sigma_\nu \\ \rho\sigma_\nu & \sigma^2_\nu \end{pmatrix} \right) \tag{5}$$

Now the joint probability of $E_{it} = 1$ and $PPE_{it} = 1$ reads:

$$P(E_{it} = 1, PPE_{it} = 1 | x_{it}, y2002_{it}, \tilde{z}_{it}) =$$
$$\int_A \Phi\left(\frac{x'_{it}\beta + \alpha + \psi y2002_{it} + \gamma y2002_{it} + \rho\nu}{\sqrt{1-\rho^2}} \right) \frac{1}{\sqrt{2\pi}} \exp\left\{ -\frac{1}{2}\nu^2 \right\} d\nu \tag{6}$$

with

$$A = \{\nu | L_{it} < \nu < U_{it}\}, L_{it} = \frac{l_{it} - \hat{\eta}' z_{it}}{\hat{\sigma}_\nu}, U_{it} = \frac{u_{it} - \hat{\eta}' z_{it}}{\hat{\sigma}_\nu} \tag{7}$$

The region A determines the range of wages for which programme eligibility applies. Therefore, (6) may be interpreted as the employment probability, restricted to and weighted by the region of unobservables for which eligibility applies.

Similarly, we can write the joint probability of $E_{it} = 1, PPE_{it} = 0$ as

[11] An additional problem that arises is that $\widehat{PPE}_{it}$ is discontinuous in $\hat{\eta}$. Therefore, it is nonstandard to correct the standard error of the eventual treatment effect obtained by this method for the standard errors of the first stage parameters.

$P(E_{it}=1, PPE_{it}=0|x_{it}, y2002_{it}, \tilde{z}_{it}) =$

$$\int_B \Phi\left(\frac{x_{it}'\beta + \psi y2002_{it} + \rho\nu}{\sqrt{1-\rho^2}}\right)\frac{1}{\sqrt{2\pi}}\exp\left\{-\frac{1}{2}\nu^2\right\}d\nu \tag{8}$$

with

$$B = \{\nu|\nu \leq L_{it}, \nu \geq U_{it}\} \tag{9}$$

and U_{it} and L_{it} as defined in (7).[12]

For someone nonemployed, we do not observe PPE_{it}, but we can define the probability of nonemployment, which typically will be a mixture of the events $PPE_{it} = 1$ and $PPE_{it} = 0$.[13]

If we denote $\phi(\nu)$ as the standard normal density function, we may write

$$P(E_{it}=0|x_{it}, y2002_{it}, \tilde{z}_{it}) = \int_A \left[1-\Phi\left(\frac{x_{it}'\beta + \alpha + \psi y2002_{it} + \gamma y2002_{it} + \rho\nu}{\sqrt{1-\rho^2}}\right)\right]\phi(\nu)dv +$$

$$+\int_B \left[1-\Phi\left(\frac{x_{it}'\beta + \psi y2002_{it} + \rho\nu}{\sqrt{1-\rho^2}}\right)\right]\phi(\nu)dv \tag{10}$$

with A and B as defined in (7) and (9), respectively. Here (10) is a weighted average of the probability of nonemployment for eligible and ineligible individuals. For someone with a large probability of being eligible, the integration region A is large and consequently a high weight is assigned to the probability for the eligible. So rather than an exact assigment of someone nonemployed to the treatment or control group we have this probabilistic assignment which accounts for the fact that PPE_{it} is not observed for the nonemployed.

The probabilities in (6), (8), and (10) are the likelihood contributions for the eligible employed, the ineligible employed, and the nonemployed, respectively, and they can be used to construct the likelihood function and estimate the model parameters, including the treatment parameter γ, by maximum likelihood.

We correct the standard errors of the estimates for the variance of the first stage estimates of the wage equation. Moreover, the standard errors are obtained by robust

[12] If there is no selection on unobservables, $\rho = 0$ and the expressions (6) and (8) become the product of the employment probability and the probability of programme eligibility.

[13] The underlying assumption is that the earnings equation in (3) is the same for the employed and the non-employed.

estimators, 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. In particular, the standard errors are also robust against possibly unobserved time-invariant random effects.

To evaluate the treatment effect for the treated on the employment probability, we compute the employment probability for someone who is eligible and is treated and the employment probability for someone who is eligible but not treated (i.e. does not get the tax credit). More specifically, we compute

$$P(E_{it}^j = 1 | PPE_{it} = 1, x_{it}, y2002_{it}, \tilde{z}_{it}) = \frac{P(E_{it}^j = 1, PPE_{it} = 1 | x_{it}, y2002_{it}, \tilde{z}_{it})}{P(PPE_{it} = 1 | x_{it}, y2002_{it}, \tilde{z}_{it})} \tag{11}$$

for $j = 0, 1$. For $j = 1$ (11) is computed directly using (6) with $\gamma y2002_{it}$ replaced by γ (treatment), whereas for $j = 0$ in (6) $\gamma y2002_{it}$ is replaced by zero (non-treatment). Taking differences and averaging over all time periods and individuals we obtain the treatment effect in terms of the employment probability.

3.3 Programme evaluation: working hours outcomes

Employed women may decide to work more or fewer hours, depending on the relative sizes of income and substitution effects induced by the tax credit. We analyse working hours responses as a straightforward extension of the analysis of employment effects.

Here, we adopt a “naive” approach to modelling working hours, by specifying a simple linear equation in hours. Zero working hours are included as a corner solution, to allow for selectivity. We use a difference-in-differences equation for working hours that is a direct extension of (2). If h_{it} denotes the observed level of working hours, we have the following equation

$$\begin{aligned} h^*_{it} &= x'_{it}\beta + \alpha PPE_{it} + \psi y2002_{it} + \gamma PPE_{it} y2002_{it} + \epsilon_{it} \\ \text{with } h_{it} &= \iota(h^*_{it} > 0)h^*_{it} \end{aligned} \tag{12}$$

We allow for endogeneity of eligibility by assuming that the errors ϵ_{it} of the hours equation and ν_{it} of the wage equation follow a bivariate normal distribution:

$$\begin{pmatrix} \epsilon_{it} \\ \nu_{it} \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma^2_\epsilon & \rho\sigma_\epsilon\sigma_\nu \\ \rho\sigma_\epsilon\sigma_\nu & \sigma^2_\nu \end{pmatrix} \right) \tag{13}$$

Using the assumption (13) we can construct the joint distribution of working hours h_{it} and programme eligibility PPE_{it}. For the nonworking individuals, we have $h_{it} = 0$ and the likelihood contribution is almost the same as before in (10)

$$\begin{aligned} P(h_{it} = 0|x_{it}, y2002_{it}, \tilde{z}_{it}) = \int_A \left[1 - \Phi\left(\frac{x'_{it}\beta + \alpha + \psi y2002_{it} + \gamma y2002_{it} + \rho\sigma_\epsilon\nu}{\sigma_\epsilon\sqrt{1-\rho^2}}\right)\right]\phi(\nu)dv + \\ + \int_B \left[1 - \Phi\left(\frac{x'_{it}\beta + \psi y2002_{it} + \rho\sigma_\epsilon\nu}{\sigma_\epsilon\sqrt{1-\rho^2}}\right)\right]\phi(\nu)dv \end{aligned} \tag{14}$$

To write down the likelihood contributions for positive working hours, we first introduce the notation $\bar{h}_{it}(PPE_{it})$ with

$$\bar{h}_{it}(PPE_{it}) = x'_{it}\beta + \alpha PPE_{it} + \psi y2002_{it} + \gamma PPE_{it} y2002_{it} \tag{15}$$

Then the likelihood function for positive working hours h_{it} and $PPE_{it} = 1$ is

$$\begin{aligned} &f(h_{it}, PPE_{it} = 1|x_{it}, y2002_{it}, \tilde{z}_{it}) = \\ &\frac{1}{\sigma_\epsilon}\phi\left(\frac{h_{it} - \bar{h}_{it}(1)}{\sigma_\epsilon}\right)\left[\Phi\left(\frac{U_{it} - \rho\left(\frac{h_{it} - \bar{h}_{it}(1)}{\sigma_\epsilon}\right)}{\sqrt{1-\rho^2}}\right) - \Phi\left(\frac{L_{it} - \rho\left(\frac{h_{it} - \bar{h}_{it}(1)}{\sigma_\epsilon}\right)}{\sqrt{1-\rho^2}}\right)\right] \end{aligned} \tag{16}$$

with $\phi(.)$ the standard normal density function, and U_{it} and L_{it} as defined in (7).

The likelihood contribution for observations with positive working hours and $PPE_{it} =$ reads

$$\begin{aligned} &f(h_{it}, PPE_{it} = 0|x_{it}, y2002_{it}, \tilde{z}_{it}) = \\ &\frac{1}{\sigma_\epsilon}\phi\left(\frac{h_{it} - \bar{h}_{it}(0)}{\sigma_\epsilon}\right)\left[1 - \Phi\left(\frac{U_{it} - \rho\left(\frac{h_{it} - \bar{h}_{it}(0)}{\sigma_\epsilon}\right)}{\sqrt{1-\rho^2}}\right) + \Phi\left(\frac{L_{it} - \rho\left(\frac{h_{it} - \bar{h}_{it}(0)}{\sigma_\epsilon}\right)}{\sqrt{1-\rho^2}}\right)\right] \end{aligned} \tag{17}$$

We compute the treatment effect for the treated as the sample average of the difference in expected hours, conditional on $PPE_{it} = 1$, for the cases $\gamma \neq 0$ (treatment) and $\gamma = 0$ (nontreatment).

4 The data and the selection of the sample for analysis

The sample for analysis is drawn from the French Labour Force Surveys of years 1999 to 2002. We cannot extend the analysis to later years as from 2003 onwards there was a break in the LFS series due to harmonization with other European datasets. The new data are not comparable to the earlier series. In particular, the concepts of employment and unemployment cannot be compared.

The LFS survey has a rotating panel structure which enables one to construct an (unbalanced) longitudinal panel sample. Around 60,000 households are interviewed each year in March. For our analysis, we select from each survey year a sample of women that are:

- either household heads or spouse of the head;

- aged over 16 years and less than 52 years at the time of each survey;

- employed in salaried work or unemployed or housewives.

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). Self-employed women were dropped from the sample as their earnings were not surveyed by the LFS of 1999-2002.[14]

In addition to this, only women reporting to be either employed or unemployed, on a broad range of criteria, or housewives were kept in the sample. Full-time students and trainees as well as retired women were discarded from the sample.

[14] As from year 2003 the design of the French labour force surveys was changed dramatically. Starting from 2003, the survey is run four times a year; a new questionnaire has been written; and half of the interviews (the second and the third) are done by telephone, rather than by person at the house of the respondent. According to the French national statistical offices, the new LFS surveys are not comparable to the earlier annual surveys. In particular, information on respondents' employment status cannot be compared, which makes it infeasible for us to extend the analysis to 2003 and later policy years (see also INSEE, 2003).

Along the same lines, women with a self-employed husband, or a retired husband or an employed husband that did not report earnings from work were also dropped from the sample, to enable us to apply the total household income conditions for eligibility to the tax credit.

Other studies of French labour supply eliminate from the sample for analysis also women that are public sector employees, as most of them have a special social security status - for example, they have special pension and retirement arrangements- which goes together with a long-term employment contract, so that they enjoy a lower probability of leaving or loosing their job than other comparable individuals in the private sector. 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.

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 ones actually paid for by the employers. For these reasons, we have resolved to draw the line at half the hourly minimum wage and drop those observations earning less than this from our sample.

Finally, we drop women that have more than one job, which represent about 2.5% of the (final) sample (about 600 observations), in each of the years considered. On the one hand, only earnings and hours of work in the "main job" are surveyed and, on the other hand, it would be difficult to predict (total) earnings for these women.

Having selected according to the criteria above the sample for analysis, we end up with roughly 24,000 through 25,000 women for each year considered. Women are next matched to their partners, if any, and all observations are pooled over the four-year period considered, from year 1999 to year 2002.

As far as variables construction goes, the following comments are in order. The wage information available in the survey relates to current monthly wages at the time of the survey, 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.

Total income is constructed as the sum of the income of the two partners. To determine eligibility to the tax credit, total income is computed setting it to women's earnings and adding the income of the husband to determine eligibility to the tax credit. Husbands' income includes earnings from work or unemployment benefits when available. Other sources of income are not taken into consideration here, as they were not collected by the survey. No information is available on non-wage income except for unemployment benefits. We assume that income from property or interests on savings are on average negligible. This does not seem as too strong an assumption given that we restrict attention to low-paid workers. Taxable income is computed by applying a standard approximation.

Education level dummies are increasing in educational level, the basis being the highest education level, equivalent to a university degree. Experience is computed by subtracting age at the end of formal schooling from current age.

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

- small cities include rural neighbourhoods or urban neighbourhoods with less than 20,000 inhabitants;
- large cities are those with more than 200,000 inhabitants;
- Paris stands on its own as the largest urban agglomeration in France;

The base for these dummies are medium size cities with a population of 20,000 to 200,000 inhabitants. Given that "Paris" accounts for a large share of the population of "Ile-de-France", we only enter "Ile-de-France" in our regressions.

Descriptive statistics of this sample for the four years considered are given in Table 3.

5 Results of estimation of the model

5.1 The probability of eligibility

In a first step we have estimated the parameters of the wage equation (3).[15] We use the estimated parameter values of the wage equation to compute the probability of eligibility (4) for the tax credit. The probability of eligibility provides a basis for comparing the treatment and the control group. Recall that we can only observe for employed individuals whether or not someone is eligible. For the nonemployed, however, we can observe the probability of eligibility. Figure 2 shows the sample distribution of the values that the probability of participation takes for the entire sample (89509 observations). It shows a peak at a value of the probability of eligibility of 0.80, indicating that a major part of the sample respondents has a reasonably large probability of eligibility, but we also see a small concentration of observations at probability values near zero. In the

[15] The estimation procedure is described in Appendix A. The estimates of the wage equation are given in table A.1.

figures 3 through 5 we have splitted the sample by labour market status and eligibility. Figure 3 shows the empirical distribution of the probability of eligibility for the eligible employed (41170 observations) and figure 4 shows the probability of eligibility for the ineligible employed (20663 observations). The distribution is quite different for these two groups. The distribution for the ineligible (figure 4) shows much higher sample frequencies at smaller probabilities of eligibility, whereas there are relatively few observations with a probability of eligibility that is larger than 0.80. The distribution of the eligible (figure 3) shows that there are not much eligible women with a probability of eligibility near zero, but a large part has a probability of eligibility of around 0.80. Thus, we see that the part of the subsample of the ineligible women with the low probability of eligible is not very useful as a comparison group for the eligible. For the part of the subsample of the eligible women with the highest probability of eligibility there are hardly any comparable observations in the subsample of the ineligible women. Figure 5 shows the empirical distribution of the probability of elibility for the nonemployed (27676 observations). We can see that the distribution looks more similar to the distribution of the eligible employed women than to the ineligible employed women, although we also spot a small peak near zero. Therefore the policy measure seems to reach the target group, in terms of programme eligibility.

Although the model we use is parametric so that we are able to estimate the employment probability also for observations in the treatment group that have no comparable counterparts in the control group, it seems wise to restrict the sample to improve the match between treatment and control group. First, it does not make much sense to include observations in the control group with a very small probability of eligibility. To make a selection, let us look at the 1% percentile of the empirical distribution of the probability. For the subsample of the eligible women this 1% quantile is 0.14, whereas for the subsample of the ineligible women the 1% percentile is 0.068, and for the subsample of nonemployed it is 0.10. Next, let us consider the 99% percentile: for the subsample of eligible employed women the probability is 0.97, and for the subsample of ineligible employed women and nonemployed women the values are 0.88 and 0.98, respectively.

We estimate the treatment effect excluding observations with a low probability of eligibility, and next to this also dropping observations with a very high probability of eligibility. The cutoff points for the sample are chosen to be the 1% percentile of the subsample of the eligible employed and the 99% percentile of the subsample of the ineligible employed. Table 4 shows the values of this selection criterion and its impact on the number of observations in the sample. We also estimate the treatment effect separately for married, cohabiting, and single women. For each subsample the sample selection criteria can be found in table 4.

5.2 Employment effects

We have computed the treatment effect for different samples, selected on the basis of the correspondence of the probability of eligibility for the treatment and the control group (see table 4).

To gain preliminary insights into the employment effects of the tax credit, we show pseudo-raw probabilities in Table 5. These were obtained by estimating the employment equation without covariates, except the intercept, PPE (parameter α), the time dummy for year 2002 (parameter ψ), and the treatment parameter γ, and using (11). If we use the full sample, the employment effect of the tax credit is found to be negative and significant at the 10% level. However, if we select the sample so that the range of the probability of eligibility coincides for the treatment and control group, we find that the 'raw' treatment effect is negative but not significant.

On the other hand, the treatment effect for married women is positive, but not significant and small in size, for any sample. For cohabiting women, the effect is also insignificant, though the sign of the effect varies for different samples. For single women, the treatment effect is negative and not significant.

Next, we have estimated the model including controls. We have estimated the model first, without correcting for possible endogeneity of programme eligibility ($\rho = 0$) and next, accounting for the possible endogeneity of eligibility. The treatment effect for the full sample is negative and insignificant. The effects for married, cohabiting, and single women, respectively, are also negative and insignificant.[16]

[16] Results of the estimation of all the parameters of the model for the main case (corresponding to

The results of estimation do not vary substantially when we correct for the endogeneity of programme eligibility, which is plausible if the treatment effect is not significant. However, for all variants we have estimated, we found that the parameter ρ is significantly different from zero, according to the likelihood ratio test.

From these results, we conclude that there is no evidence of any positive effect of the tax credit on employment.

5.3 Effects on working hours

To evaluate the impact of the tax credit on weekly working hours, we have estimated the model outlined in (12) for the several subsamples listed in table 4. We have computed the treatment effect on working hours as the difference in expected working hours in the case of treatment ($\gamma \neq 0$) and non-treatment ($\gamma = 0$), conditional on eligibility ($PPE_{it} = 1$). To compute expected working hours, we made use of the probability density function of working hours given in (14) through (16).

For each subsample we have estimated two variants of the model: (i) the model without covariates and $\rho = 0$ as an indication of the 'raw' treatment effect; (ii) the model with covariates and with ρ unrestricted. For reasons of conciseness, we did not estimate a model variant with covariates and with ρ restricted to zero. The resulting treatment effects are given in table 6.

The model without controls (see the 3rd column of Table 6) shows that for the entire sample (without selection on marital status) the 'raw' treatment effect on working hours is positive, but not significantly different from zero, and its size is smaller than 1. For the subsample of married women we find a somewhat larger effect on working hours of around 1. The effect is significant for the sample in which the range of the probability of eligibility is the intersection of the range for the eligible and the ineligible. Thus, the 'raw' treatment effect for married women suggests that there may be a positive impact of the tax credit on working hours. For cohabiting women, the sign of the treatment effect varies with the selection of the sample, but it remains not significantly different from

the variant on the first line of Table 5) are given in table B.1. We have excluded the dummy variable for Ile de France from the employment equation. The specific form of the eligibility rules provide a source of identification, irrespective of exclusion restrictions.

zero. For single women, the 'raw' treatment effects are negative but not significantly different from zero.

The final column of Table 6 shows the treatment effects based on the model variant that corrects for selection on both observables and unobservables. For the entire sample, the treatment effect is now negative, small in size, and not significantly different from zero, suggesting no effect of the tax credit on average working hours. For the subsample of married women, the treatment effect is still positive, but smaller in magnitude, and not significantly different from zero. For cohabiting women, the treatment effect has now become negative, and this for any sample selection, but is remains not significantly different from zero. Finally, for single women, the treatment effect after correction for selection on observables and unobservables, remains negative. The size of the negative coefficient is somewhat larger than for the 'raw' case, but it is not significantly different from zero.

We conclude, therefore, that the tax credit did not affect women's working hours.

6 Conclusions

This paper evaluates the impact of the French tax credit on the employment and working hours of women. 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.

Since the introduction of the measure a number of ex-ante policy evaluation studies were carried out, all based on microsimulations or on structural labour supply models, estimated on data collected before the policy was created. The main conclusions from these studies were that the tax credit had little redistributive impact and very small employment effects, if any at all. Stancanelli (2004) was the first to estimate a difference-in-differences evaluation model of the employment effects of the policy. She finds some evidence of negative employment effects of the policy for married women. The overall employment impact is found to be insignificant.

We extend here the study of Stancanelli (2004), by explicitly allowing for endogeneity of programme participation and by analyzing hours responses as well. We model employment simultaneously with programme eligibility. Programme eligibility is not directly observed for the unemployed, as wages are not observed for the unemployed. Programme eligibility is targeted at low-wage workers. We therefore allow for selection on unobservables as it is likely that unobserved variation in wages will be correlated with employment.

We analyse the impact of the tax credit measure on two outcome variables: employment and working hours. We analyse the treatment effect for subsamples of married women, cohabiting women, and single women. The treatment effect for each of these three groups is potentially different. We also analyse the sensitivity of the results with respect to different selections of the sample, on basis of the probability of eligibility.

For neither of the subsamples, we find a significant effect of the tax credit on the employment probability. The same holds for the analysis of hours decisions: the impact of the tax credit on average working hours is relatively small in size and it is statistically not significant.

We conclude therefore that, allowing for endogeneity of programme eligibility, for different cuts of the treatment and the control group, and for different sub-populations defined according to marital status, there is no significant impact of programme eligibility on employment nor on working hours.

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Table 1: Earnings and total income thresholds for eligibility to the tax credit

	Earnings thresholds (euros per year)		Income bound (euros per year)
Marital Status	lower bound	upper bound	
Single women	3187	14872	11772
Married women	3187	14872	23544

These threshold relates to the rules in force in 2001, which are relevant for the purposes of our analysis. They are defined in terms of taxable earnings and income. Notice that income is taxed at a much higher rate than earnings from work in France. The upper earnings threshold is equal to 22654 euros for married women with a non-employed husband or a husband earning less than the lower earnings threshold. The income bound is increased by 3253 euros per each dependent child.

Table 2. Amounts of tax credit payable, 2001 rules.

Earnings from work euros per year		Tax credit euros per year
Lower bound	Upper bound	
0	3187	0%
3187	10623*	4.4% * earnings
10623*	14872*	(14872-earnings)*5.5% (#)

(*)These are defined in terms of full-time equivalent earnings.
This percentage was changed to 11% as from 2002 and applied to the 2002 earnings but it is not obvious that respondents to the March 2002 LFS would be already aware of this and, moreover, they would not have had time to adapt their behaviour to this change.

Table 3: Sample descriptives

Variable	Full sample, $N = 89509$		nonemployed, $N = 27676$	
	mean	standard dev	mean	standard dev
Age	36.7	8.2	35.8	8.1
Education level 1 (lowest)	0.24	0.43	0.40	0.49
Education level 2	0.08	0.28	0.09	0.29
Education level 3	0.27	0.44	0.26	0.44
Edcuation level 4	0.16	0.37	0.12	0.33
Edcuation level 5	0.14	0.35	0.07	0.25
Married	0.51	0.50	0.56	0.50
Cohabiting	0.24	0.43	0.24	0.43
Single	0.25	0.43	0.20	0.40
# of children	1.34	1.18	1.81	1.33
Children,age < 3	0.15	0.36	0.25	0.43
Ile de France	0.17	0.38	0.13	0.34
Champagne Ardenne	0.032	0.18	0.037	0.19
Haute Normandie	0.038	0.19	0.042	0.20
Basse Normandie	0.026	0.16	0.024	0.15
Picardie	0.039	0.19	0.045	0.21
Centre	0.040	0.19	0.034	0.18
Bourgogne	0.031	0.17	0.032	0.18
Calais	0.071	0.26	0.110	0.31
Lorraine	0.037	0.19	0.040	0.20
Alsace	0.038	0.19	0.033	0.18
Franche Comte	0.038	0.19	0.035	0.18
Loire	0.053	0.22	0.049	0.22
Bretagne	0.047	0.21	0.037	0.19
Poitou Charente	0.035	0.18	0.032	0.18
Aquitanie	0.043	0.20	0.044	0.20
MidiPyrenes	0.032	0.18	0.031	0.17
Limousin	0.027	0.16	0.022	0.15
Rhones Alpes	0.072	0.26	0.066	0.25
Auvergne	0.028	0.17	0.029	0.17
Languedoc Roussillon	0.035	0.18	0.048	0.21
Provence	0.066	0.25	0.079	0.27
Paris	0.148	0.35	0.114	0.32
French nationality	0.92	0.27	0.86	0.34
y2001	0.25	0.43	0.24	0.43
y2002	0.25	0.43	0.23	0.42
y1999	0.26	0.44	0.27	0.45
$P(PPE = 1)$	0.65	0.26	0.75	0.23

Table 3 (continued): Sample descriptives

Variable	Eligible employed, $N = 41170$		Ineligible employed, $N = 20663$	
	mean	standard dev	mean	standard dev
Age	35.9	8.2	39.4	7.5
Education level 1 (lowest)	0.23	0.42	0.05	0.21
Education level 2	0.09	0.29	0.05	0.23
Education level 3	0.32	0.47	0.16	0.37
Education level 4	0.18	0.38	0.17	0.38
Education level 5	0.12	0.32	0.30	0.46
Married	0.47	0.50	0.55	0.50
Cohabiting	0.27	0.44	0.19	0.39
Single	0.27	0.44	0.27	0.44
# of children	1.11	1.04	1.17	1.03
Children,age < 3	0.10	0.31	0.11	0.31
Ile de France	0.14	0.35	0.28	0.45
Champagne Ardenne	0.032	0.18	0.024	0.15
Haute Normandie	0.038	0.19	0.033	0.18
Basse Normandie	0.029	0.17	0.025	0.16
Picardie	0.038	0.19	0.034	0.18
Centre	0.046	0.21	0.033	0.18
Bourgogne	0.033	0.18	0.027	0.16
Calais	0.056	0.23	0.050	0.22
Lorraine	0.036	0.19	0.035	0.18
Alsace	0.040	0.20	0.040	0.20
Franche Comte	0.041	0.20	0.035	0.18
Loire	0.062	0.24	0.041	0.20
Bretagne	0.055	0.23	0.047	0.21
Poitou Charente	0.041	0.20	0.027	0.16
Aquitanie	0.045	0.21	0.039	0.19
MidiPyrenes	0.035	0.18	0.027	0.16
Limousin	0.033	0.18	0.024	0.15
Rhones Alpes	0.075	0.26	0.075	0.26
Auvergne	0.030	0.17	0.024	0.15
Languedoc Roussillon	0.031	0.17	0.025	0.16
Provence	0.063	0.24	0.052	0.22
Paris	0.119	0.32	0.251	0.43
Weekly working hours	35.0	10.3	35.0	8.7
Hourly wage rate	39.35	7.49	75.03	43.82
French nationality	0.93	0.25	0.96	0.19
y2001	0.25	0.43	0.25	0.43
y2002	0.24	0.43	0.29	0.45
y1999	0.26	0.44	0.23	0.42
$P(PPE = 1)$	0.72	0.19	0.39	0.24

Table 4: Selection of the sample
on basis of the probability of eligibility

	Sample restricted from below		Range of probability of eligibility "matched"	
Family status	Range probability of eligibility	Number of observations	Range probability of eligibility	Number of observations
All	> 0.16	84134	(0.16, 0.89)	69160
Married	> 0.17	41783	(0.17, 0.87)	33897
Cohabitants	> 0.20	20751	(0.20, 0.93)	17335
Single	> 0.14	21282	(0.14, 0.88)	17692

Table 5: Treatment effects: impact of program eligibility on the employment probability

Selection family status	Selection on probability of eligibility	No controls	Controls, $\rho = 0$	Controls, endogeneity eligibility accounted for ($\rho \neq 0$)
All	none	-0.026*	-0.011	-0.010
		(0.015)	(0.0089)	(0.0087)
All	> 0.16	-0.0048	-0.0097	-0.0074
		(0.031)	(0.0091)	(0.012)
All	(0.16, 0.89)	-0.016	-0.0077	-0.0084
		(0.031)	(0.0097)	(0.021)
Married	> 0.17	0.0040	-0.013	-0.010
		(0.029)	(0.013)	(0.017)
Married	(0.17, 0.87)	0.00034	-0.0043	-0.0047
		(0.18)	(0.014)	(0.50)
Cohabitants	> 0.20	0.00032	-0.0054	-0.0027
		(0.038)	(0.016)	(0.019)
Cohabitants	(0.20, 0.93)	-0.035	-0.017	-0.016
		(0.034)	(0.016)	(0.019)
Single	> 0.14	-0.030	-0.020	-0.018
		(0.041)	(0.014)	(0.015)
Single	(0.14, 0.88)	-0.047	-0.016	-0.021
		(0.034)	(0.014)	(0.066)

Treatment effects are expressed in termsof the employment probability, conform (11). Standard errors in parentheses.

**: significant at 5% level; * significant at 10% level

Table 6: Treatment effects: impact of program eligibility on weekly working hours

Selection family status	Selection on probability of eligibility	No controls	Controls, endogeneity eligibility accounted for ($\rho \neq 0$)
All	none	0.24	-0.41
		(0.54)	(0.40)
All	> 0.16	0.82*	-0.18
		(0.48)	(0.58)
All	(0.16, 0.89)	0.38	-0.13
		(0.67)	(0.46)
Married	> 0.17	1.15	0.024
		(0.78)	(1.79)
Married	(0.17, 0.87)	1.08**	0.49
		(0.49)	(0.72)
Cohabitants	> 0.20	1.00	-0.40
		(1.02)	(1.38)
Cohabitants	(0.20, 0.93)	-0.48	-1.11
		(1.08)	(1.04)
Single	> 0.14	-0.23	-0.89
		(2.49)	(0.87)
Single	(0.14, 0.88)	-0.96	-0.89
		(0.95)	(0.87)

Treatment effects are expressed in termsof the employment probability, conform (11). Standard errors in parentheses.

**: significant at 5% level; * significant at 10% level

A Estimation of the wage equation

We estimate the parameters of the wage equation (3) jointly with an equation for participation. If we let d_{it} be a dummy indicator for particpation ($d_{it} = 1$ if participating, 0 if not), m_{it} a vector of observables, ζ a parameter vector, and e_{it} an unobserved error, the participation is modelled by

$$d^*_{it} = m'_{it}\zeta + e_{it}, \text{ and } d_{it} = \iota(d^*_{it} > 0) \tag{18}$$

The parameters η and σ_ν if the wage equation (3) and the parameter of ζ of the participation equation are jointly estimated by maximum likelihood. The outcomes for the wage equation serve as input for the second, main stage of the estimation of the difference-in-difference model. The parameters of the wage equation can be found in table A.1. The two higher education levels have been combined in the estimation of the wage equation, as the number of observations with the highest education level that are eligible for the tax credit is very low.

Table A.1: Parameter estimates of the wage equation

Variable	Parameter	Standard error
Ln Age	-41.6**	3.4
(Ln Age) Squared	11.9**	0.95
(Ln Age) Cube	-1.1**	0.09
Ln Experience	0.20**	0.009
(Ln Experience) squared	-0.072**	0.003
Education level 1	-0.46**	0.006
Education level 2	-0.35**	0.006
Education level 3	-0.33**	0.004
Education level 4	-0.22**	0.004
Ile de France	0.14**	0.003
Year 2001	0.14**	0.003
Year 2002	0.026**	0.003
Year 1999	-0.019**	0.003
Incercept	51.2**	3.9
σ_ν	0.30**	0.0009

**: significant at 5% level;

*: significant at 10% level

B Complete set of estimates for entire sample

Table B.1: Parameter estimates of the Difference-in-difference model
Entire sample, no selection on probability of eligibility

Variable	Parameter	Standard error
Intercept	-20.471**	2.145
Education level 1	-1.249**	0.300
Education level 2	-0.785**	0.235
Education level 3	-0.684**	0.228
Education level 4	-0.381**	0.154
Education level 5	0.032	0.024
Ln age	11.118**	0.967
Square of Ln age	-1.417**	0.112
Any Children younger than 3	-0.447**	0.017
Number of children	-0.282**	0.012
French Nationality	0.472**	0.026
Married	0.043**	0.022
Cohabitating	-0.014	0.015
chaard0	-0.368**	0.084
Haute Normandie	-0.283**	0.078
Basse Normandie	-0.187**	0.082
Picardie	-0.287**	0.080
Centre	-0.120	0.074
Bourgogne	-0.312**	0.079
Calais	-0.596**	0.086
Lorraine	-0.346**	0.080
Alsace	-0.106	0.072
Franche Comte	-0.192**	0.078
Loire	-0.216**	0.076
Bretagne	-0.153**	0.075
Poutou Charente	-0.267**	0.078
Aquitanie	-0.356**	0.078
Midi Pyrenes	-0.369**	0.079
Limousin	-0.179**	0.077
Rhones Alpes	-0.212**	0.071
Auvergne	-0.395**	0.083
Languedoc Roussillon	-0.640**	0.087
Provence	-0.489**	0.081
Year 2000	0.057**	0.017
Year 2001	0.098**	0.015
Year 2002	0.160**	0.042
α	0.456	0.480
γ (treatment)	-0.043	0.037
ρ	-0.238	0.291

**: significant at 5% level;

*: significant at 10% level

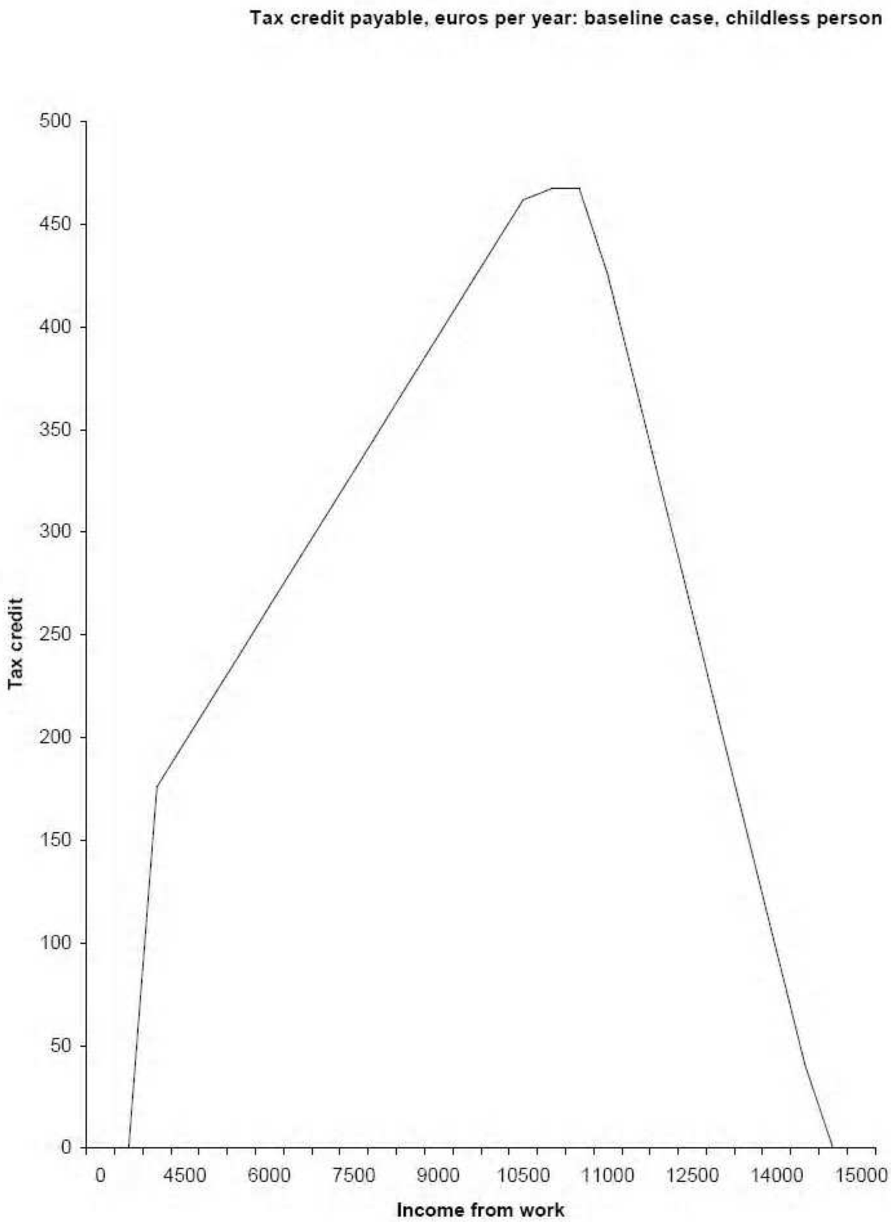

Figure 1: Amount of tax credit by earnings

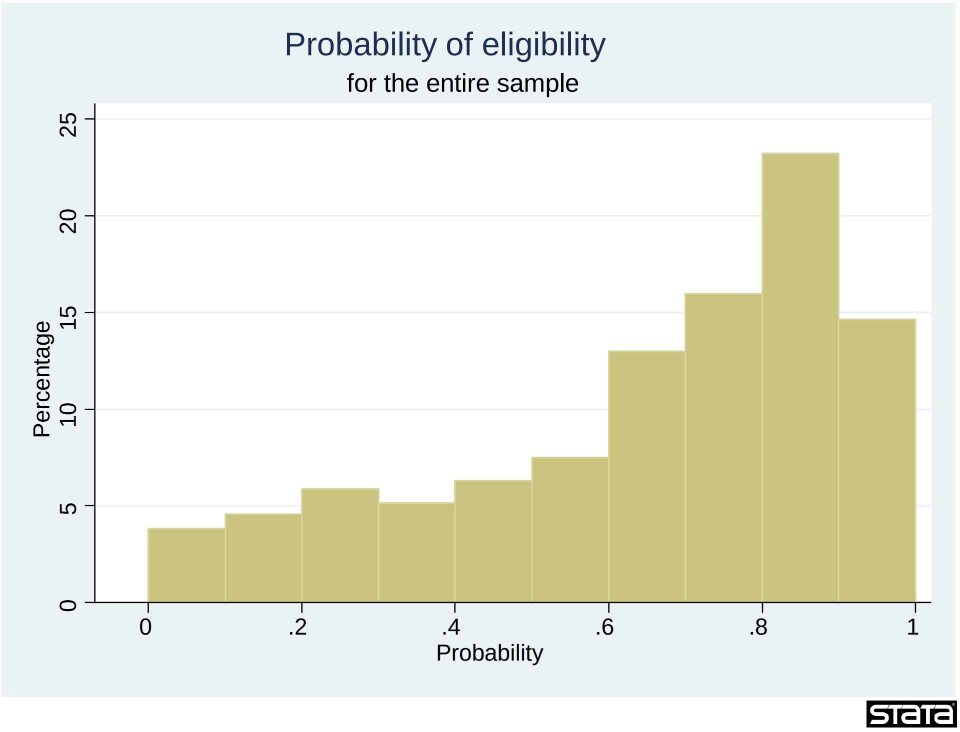

Figure 2: probability of eligibility, entire sample

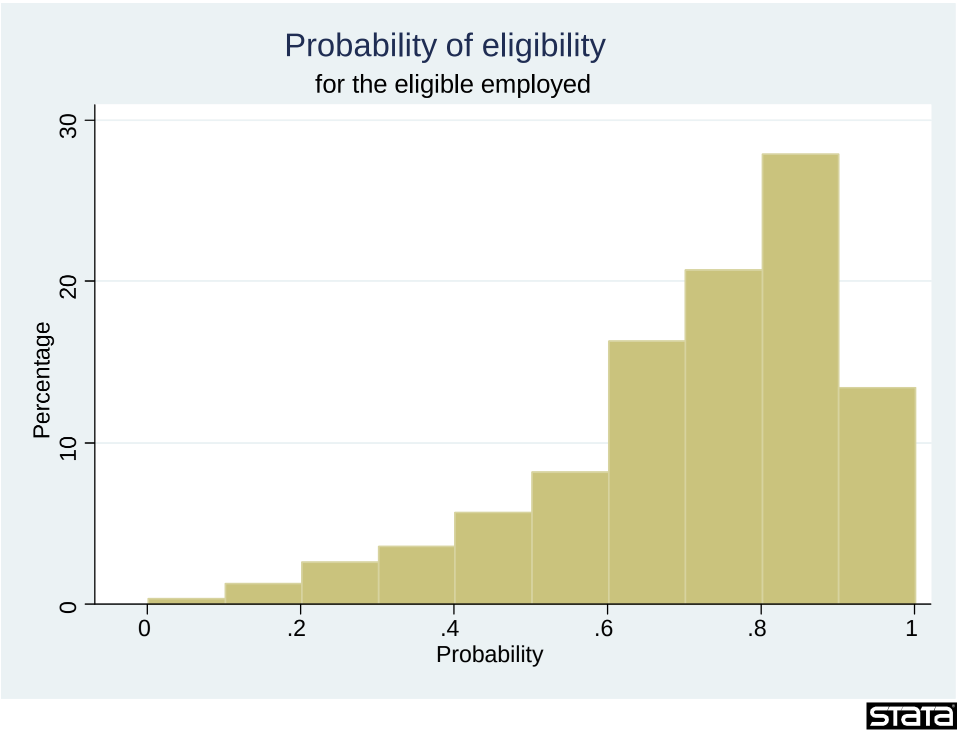

Figure 3: probability of eligibility, subsample of the employed eligible

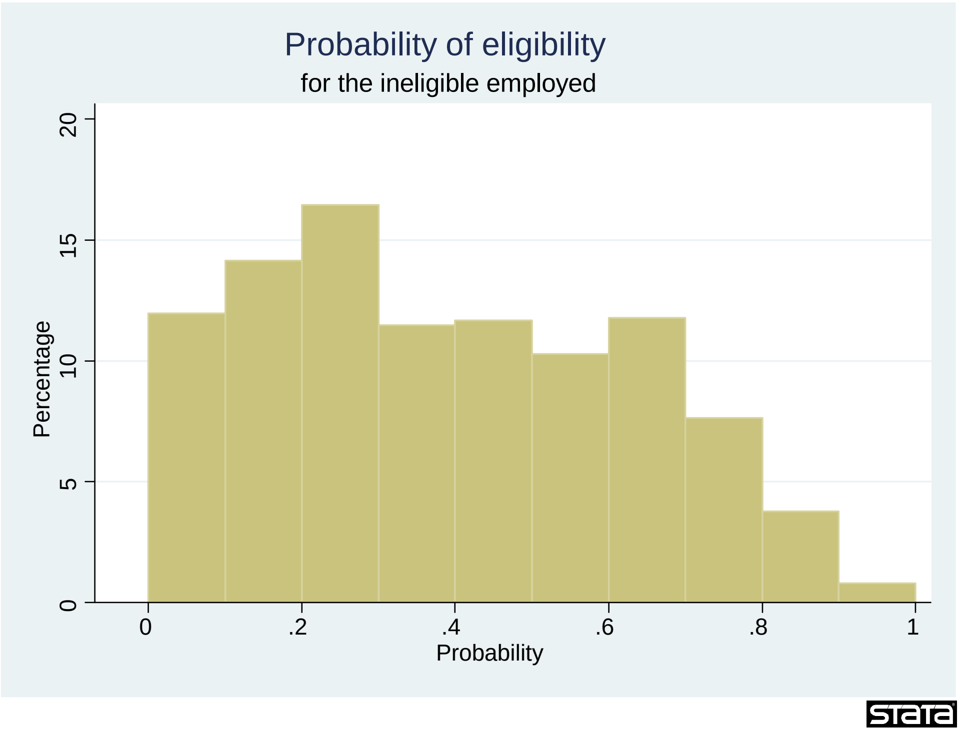

Figure 4: probability of eligibility, subsample of employed ineligible

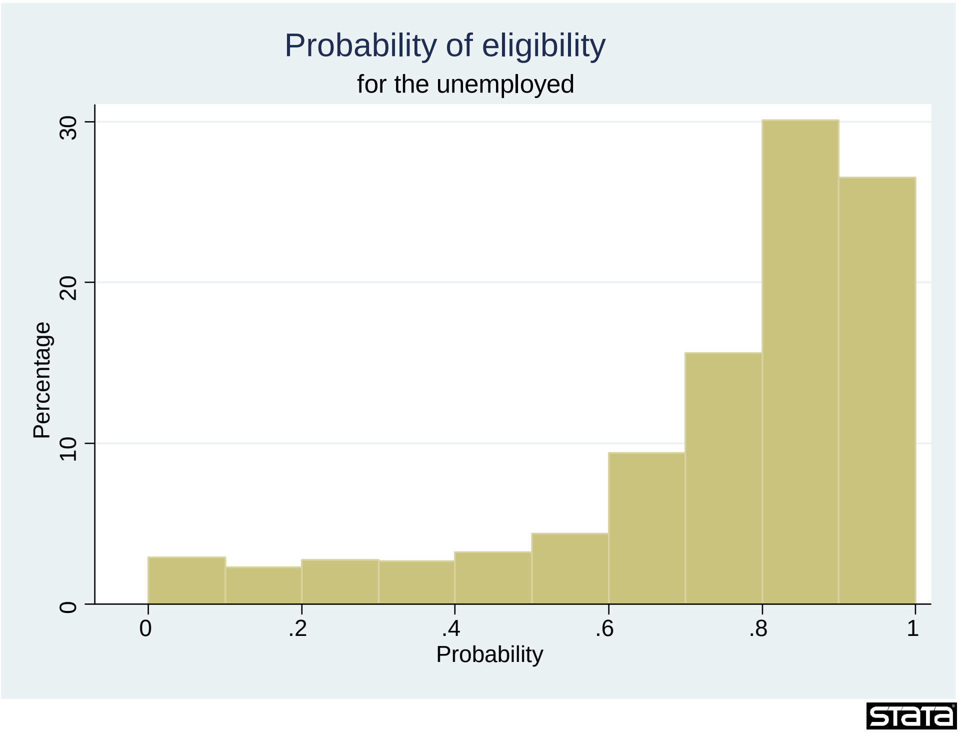

Figure 5: probability of eligibility, subsample of nonemployed