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Stephen Bazen
Xavier Joutard
Hélène Périvier

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Stephen Bazen
Aix-Marseille Université, CNRS, EHESS, Ecole Centrale, AMSE and IZA

Xavier Joutard
Aix-Marseille Université, CNRS, LEST and OFCE, Sciences Po Paris

Hélène Périvier
OFCE, Sciences Po Paris

OCTOBER 2021

ABSTRACT

Measuring the Child Penalty Early in a Career: The Case of Young Adults in France[1]

There is a large literature on the existence of a child penalty for mothers after the birth of a child. There is little discernible effect on fathers' labour incomes, although some studies find that there is a premium. We measure the penalty due to the birth of a first child for both parents for cohorts of young adults after leaving the educational system. Using an event study approach, this paper contributes to the literature by examining the child penalty in France not only in terms of monthly earnings, but also the employment rate, working hours, hourly earnings, and other outcomes. Using on a rich dataset, we estimate child penalty by educational level and for different cohorts. We find evidence of a significant child penalty for mothers: 23% in monthly earnings overall, rising to 35% for those with secondary education only. For the 2010 cohort, we observe the same level of absolute child penalties for mothers, whereas the relative penalty has narrowed. This is due to a decrease in monthly earnings, and more precisely in employment rate of fathers before and after the birth of the child in the aftermath of the 2008 crisis.

JEL Classification:	J08, J16, J13
Keywords:	child penalty, young adults, event study

Corresponding author:
Stephen Bazen
Aix-Marseille Université
AMSE
3-5 boulevard Maurice Bourdet
13205 Marseille cedex 1
France
E-mail: stephen.bazen@univ-amu.fr

1. Introduction

Most high-income countries have experienced major increases in female participation in the labour market throughout the past century, but remaining gender inequalities persist in both wages and employment (Olivetti et Petrongolo, 2016). One of the main sources of the gender gap in labour market outcomes is related to childbearing and sexual division of labour within couples. A large literature has identified this phenomenon which has come to be known as the child penalty or family pay gap or motherhood penalty. These studies shed light on the empirical regularity of wage gap associated with children leading to a penalty for mothers (Waldfogel, 1997; Juhn and McCue, 2017; Kleven et al., 2019). This observation is of interest in the design family and social policies to achieve gender equality.

Most studies use panel data, and the more recent ones adopt an event study approach. This methodology consists of regarding the birth of a child as an event that causes a change in the time profile of various labour market outcomes, such as earnings, the employment rate, and working hours. The same regression is run for fathers and mothers separately. Results show clear evidence of a child penalty for the mothers whereas there is little discernible effect either way on fathers' outcomes, and in some cases an earnings premium for fathers is observed. In France, studies suggest a child penalty for mothers of around 30% over the five years following a birth (Meurs and Pora, 2019).

In the present paper, we estimate the impact of the birth of a child on different labour market outcomes for young adults during the years following their exit from the full-time education system in France. We use the three cohorts of the French generation survey, "Enquête génération" produced by the CEREQ. Using these surveys, we apply an event study design centered around the birth of the first child using the same type of specification as Kleven, Landais and Søgaard (2019). We extend the event studies applied to child penalty with two key respects. Firstly, to detail the child penalty in terms of monthly earnings, we estimate the child penalty on employment rate, working hours, hourly earnings, and other outcomes. Secondly, as the dataset contains variables such as actual labour market experience and changes in marital status, we can introduce control variables in the econometric analysis, that are generally not possible in the literature using an event study to estimate child penalty. The Generation surveys provide detailed information for seven years after leaving full-time education for the cohorts leaving in the years 1998, 2004 and 2010. The respondents fill in a month-by-month calendar of their professional activities and personal lives. While these data concern only the early part of a career, we find evidence of a significant child penalty for mothers: 23% in monthly earnings overall, rising to 35% for those with secondary education only.

In addition to these technical contributions, the paper contributes to the literature with four ways. First our estimates confirm that a large child penalty for young mothers exists across different cohorts for France, a country where paid maternity leave provisions and access to childcare are more facilitating than in most European countries. Fathers do not experience any significant variations of their labour outcomes after the birth of their first child. Second, we assess the role of education and show that the effect of childbirth is significantly smaller for mothers with a higher education level. This heterogeneity is absent from almost all other the studies of the child penalty. Thirdly, we estimate how the child penalty changes across cohorts which are subject to different institutional arrangements and labour market conditions, notably after the crisis of 2008. Finally, we examine other impacts of maternity on factors

that influence career progression and job opportunities, such as access to training programmes or obtaining a managerial position. Maternity has also further consequences in terms of career progression and mobility which could induce earnings penalties in the longer run.

2. Evidence from the literature

Since the 1990's, a large literature has been devoted to measuring the impact of having children on wages of women and on gender inequalities. Some studies compared wages of women with children, mostly the hourly wage, with those of childless women to identify a motherhood pay gap or a family pay gap (Waldfogel, 1997, 1998; Budig and England, 2001). A significant motherhood penalty has been found in many countries (Harkness and Waldfogel, 1999). There is no evidence that men suffer such a penalty; their wages are either unaffected or even increase following the birth of a child (Lundberg and Rose, 2000). Comparing parents and nonparents by gender entails a limitation in the way the control group is characterized and induces bias in the measurement of the causal impact of children on the situation of mothers in the labour market. In the absence of a natural control group, a counterfactual scenario can be obtained using statistical regularities in the outcome variable identifiable prior to an event. This approach has been popular in finance (see for example MacKinlay, 1997) where an official announcement or institutional intervention in the markets can be regarded as an 'event', and the consequences quantified relative to what was happening prior to that event. The key assumption giving validity to the event approach is that the path of the outcome of interest would in the absence of the event have evolved is a similar manner on average. The no-event path would therefore be smooth. Event studies provide a robust methodology to measure the impact of the birth of a child, which is considered as the event, on labour market outcomes for parents.

Using an event study design, Kleven et al. (2019) present evidence of child penalties in earnings for mothers in six countries which range from 21% in Denmark to 61% in Germany – the other countries included in increasing order of child penalty are Sweden, the United States, the United Kingdom and Austria. They argue that these differences in child penalties are due to countries' attitudes towards working mothers and gender norms. In a further paper, Kleven, Landais and Søgaard (2019) analyse other labour market outcomes such as participation and hours of work for Denmark and find evidence of significant decreases in income from work following the birth of the first child. Sieppi and Pehkonen (2019) find that women encounter large, short- and long-term child penalties in gross labor earnings in Finland. They show that these penalties are associated with employment participation. Similar results are found for Spain: in the year after the first child is born, mothers' annual earnings drop by 11 percent while men's earnings remain unaffected (Quinot, Hospido and Sanz, 2020). In Russia, child penalties are mainly due to lower employment after birth, and no child penalty is observed in terms of working hours or hourly wage rates (Lebedinski, Perugini and Vladisavljević, 2020). Recent papers show that long-run child penalties are identical for adoptive and biological mothers, suggesting that gender norms are key to explain this gap between mothers and fathers (Kleven et al., 2021; Rosenbaum, 2021). Child penalties can affect not only mothers but also grandmothers who experience a decrease in their wage after having a first grandchild (Gørtz Sander and Sevilla, 2020). Regarding France, Meurs and Pora

(2019) use administrative data 2005-2015 consisting of a demographic panel survey matched with employer earnings declarations. Their findings suggest a child penalty of around 30% over the five years following a birth. Pora and Wilner (2019) undertake a detailed analysis of this penalty at different points in the earnings distribution. For a similar period, Lucifora et al (2019) examine the child penalty for female employees of a large French firm and analyse the role of human resource management factors. Their findings suggest a child penalty of 9% of overall earnings and an even larger one for bonuses.

In this paper, we estimate the impact of the birth of a first child during the years after having left the education system in France. To our knowledge, very few studies measure the child penalty during the early part of the career. Staff and Mortimer (2012) use longitudinal data for the United States and consider jointly the time spent in employment and schooling. They explain the gap in pay between mothers and nonmothers. They examine whether the residual motherhood wage penalty results from differences between mothers and other women in the accumulation of work interruptions and breaks in schooling. Their results indicate that accumulated months not in the labour force and not being enrolled in school explain the residual pay gap between mothers and other women.

3. Methodology and data

3.1. The event study approach

Following Kleven, Landais and Søgaard (2019), we use an event study approach around the birth of the first child. For men and women who become parents during the seven-year observation window available in the survey, we estimate separately models of the following form:

$$y_{igt} = m_{ig} + \sum_{j=-4}^{4} \alpha_{jg} I_{t=j} + X'_{igt}\beta_g + \varepsilon_{igt}$$

The outcome is denoted by y_{itg} for parent i of gender g and at event time t. The event time t for each parent is indexed relative to the year of the firstborn child. This specification for individual i at time t used here has the advantage of not confounding age with calendar time, since we use *actual* labour market experience (and its square) along with dummies ($I_{t=j}$) representing successive twelve-month periods, noted j, prior to and after the birth of the first child.

The dataset allows additional controls to included, consisting of a cohort dummy (m_i), and time-varying variables, denoted X_{it}, such as the unemployment rate, diploma level, marital status, age, months of actual labour market experience and its square. This improves the quality of the estimates. As we compare men and women, and as women have their first child earlier in comparison with men, it is important to control for age and experience to capture precisely what can be attributed to a child penalty in relative to what is due to the gender gap in experience. These controls are usually not introduced in most event studies due to the limitation of the data set. This constitutes one of the contributions of our paper.

The child penalty is calculated from the estimated coefficients in two ways. The first is the gross penalty for parents in each year after the birth, that is calculated using the estimates of α_{jg} $j > 0$ as a proportion of the counterfactual outcome:

$$P_{igj}^{Gross} = \frac{\alpha_{jg}}{y_{igj}^{CF}} \quad j > 0$$

with $y_{igt}^{CF} = m_{ig}^{G} + X_{igt}'\beta_g + \varepsilon_{igt} \quad j > 0, t > j$

The average value of P_{igj}^{Gross} is then determined over the four years after the birth to obtain the overall gross penalty. The second is the child penalty for females (*g=female*) relative to males (*g=male*) as a proportion of the same counterfactual outcome and aggregated in the same way:

$$P_{ij}^{Relative} = \frac{\alpha_j^{male} - \alpha_j^{female}}{y_{ij}^{CF}}$$

This approach provides a robust method to identify the causal effect of parenthood on different labour market outcomes.

3.2. Three cohorts of the "French Generation surveys"

The data are taken from the Generation surveys run by the CEREQ for the 1998, 2004 and 2010 cohorts. A cohort is defined by the year in which an individual leaves full-time education (eg 1998), and not by the date of birth. This implies that individuals in a same 'cohort' have different ages depending on the length of their studies. Respondents are interviewed on three occasions after having left full-time education: at three, five and seven years. On each occasion they are asked to provide information about their current activities and changes in personal characteristics. In addition, they are asked to fill-in a month-by-month calendar of events in their life, both personal and professional. This will include various forms of labour and geographic mobility, changes in marital status and having children. Based on this information, the periods before and after the birth of the first child (this is deemed to be an 'event') are divided into twelve-month intervals using the date of birth as the reference. An event study involves comparing what happens in the intervals before and after the event to evaluate its impact on various labour market outcomes (labour income, participation, hours of work and hourly wages).

The actual cohort survey data are organised as 'episodes', which are defined as a spell spent in a given labour market state (unemployed, inactive, employed). For each spell of employment, the respondent is asked to provide full details of nature of the job (sector, contract type, post occupied and so forth) and the wage and hours of work at the beginning of the spell. This latter information is also provided either when the spell of employment ends or for ongoing spells at the time of interview. Individuals are asked how much they earn per month net of social security contributions. The earnings variable is deflated by a regional price index firstly because the respondents are in the sample for a period of seven years, and secondly because we are studying three separate cohorts covering nearly twenty years.

Weekly hours of work, *h,* are declared with the same frequency as monthly earnings, *M*, and in the questionnaire are given in ranges. The midpoint of the interval is used in the event study and are used to calculate an hourly wage, *w*, as follows:

$$w = \frac{M \times 12}{h \times 52}$$

4. Results and commentary

4.1. The French context

In France, there are several features of the labour market that bear on fertility and career decisions. Most young people are hired with fixed term contracts and have a sequence of such positions before stabilisation (Bazen and Maman Waziri, 2019). For an individual leaving in 2010 with only secondary education (up to and including *baccalauréat*), the average time before obtaining a permanent employment contract is 4.3 years. For someone with university or similar education level, it is about half of this (2.3 years). Less than half of those with secondary education only have a permanent employment contract after seven years in the labour market. Youth unemployment is high in France: in 2020, 7.5% of people aged between 15 and 24 years were unemployed compared to an average of 6.9% for the Euro zone (Eurostat). The average time to obtaining *initial* employment is over a year for the less qualified for school leavers in 2010.

The cohorts studied experienced very different labour market conditions. As Figures 1a to 2b show, women experience more difficulties when entering in the labour market than men, including those with higher education. They are more often found in part-time employment. The situation of individuals with secondary education only has worsened for the most recent cohort (2010 compared to 1998): after seven years into their working lives less than half (45%) of young men with low education background have a permanent job in the 2010 cohort compared to two thirds for those entering the labour force in 1998. The situation of men with secondary education is now comparable to that of women with the same level of education, the proportion of whom obtaining a permanent contract after seven years was 46% in 1998 and 54% in 2010. Figure 1b shows that the situation of men with higher education level is stable from one cohort to another: seven years after having left the educational system around 75% of them obtain a full-time permanent contract[2].

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[2] A peak in inactivity for educated men in the 1998 is due to military service that was abolished soon afterwards.

Figure 1a

Evolution of employment status after leaving the educational sytem
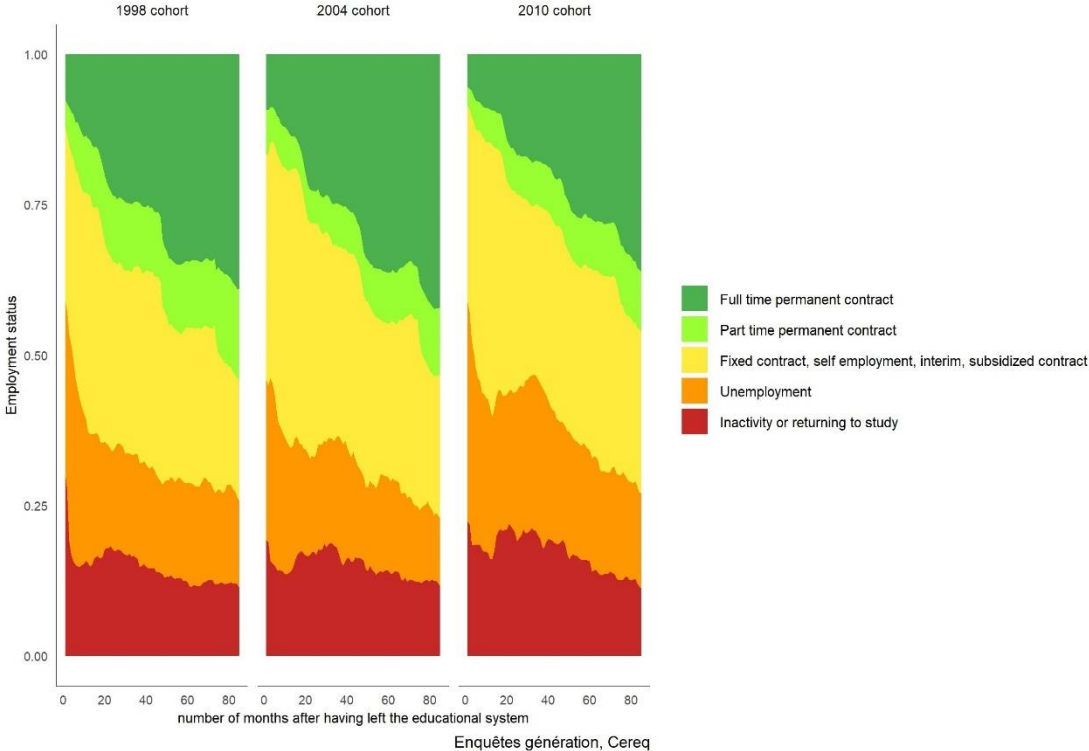Women with secondary education level

Enquêtes génération, Cereq

Figure 1b

Evolution of employment status after leaving the educational sytem
Women with higher education level

Enquêtes génération, Cereq
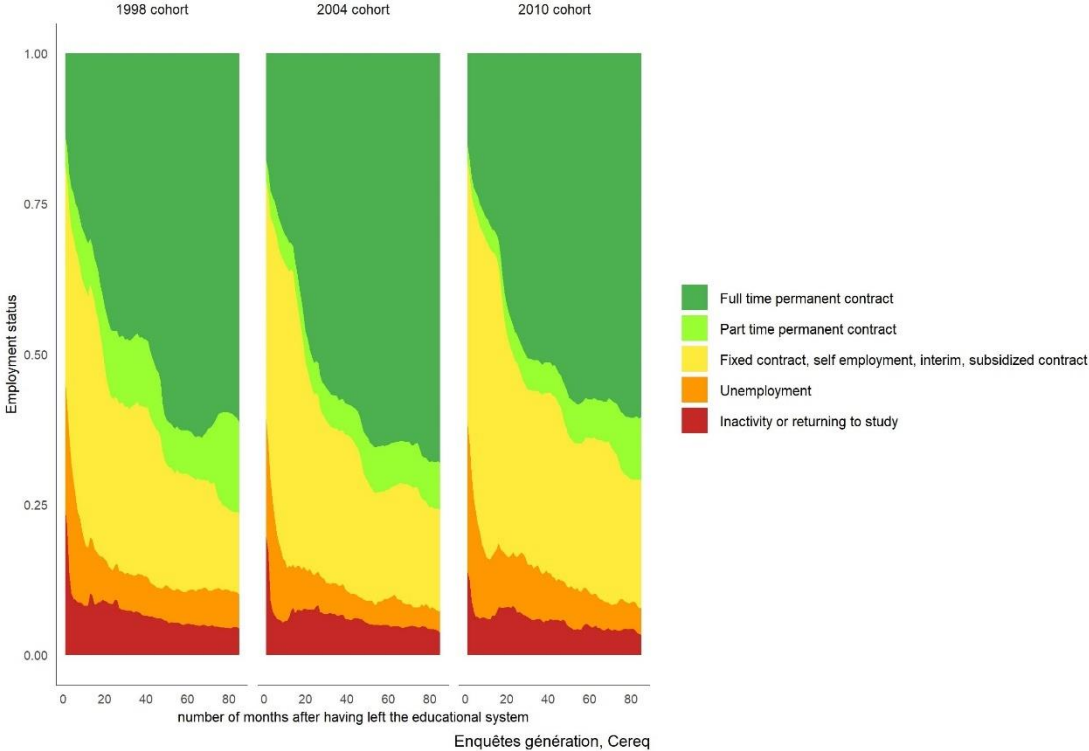
Figure 2a

Evolution of employment status after leaving the educational sytem
Men with secondary education level

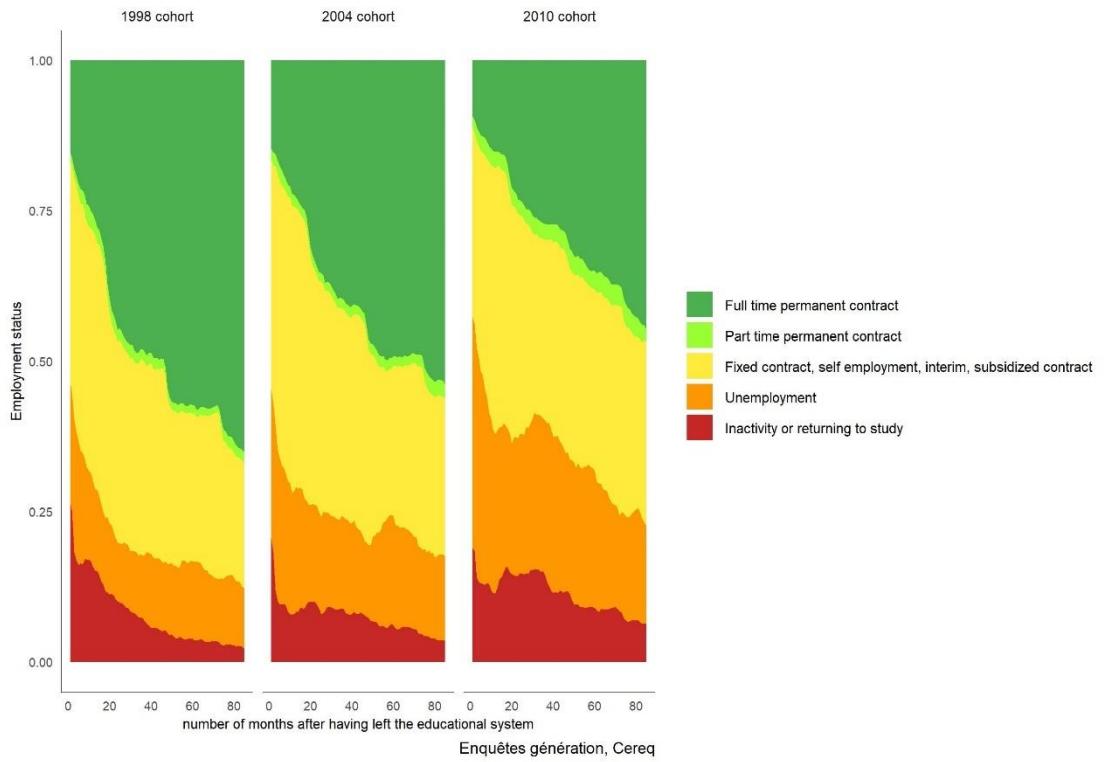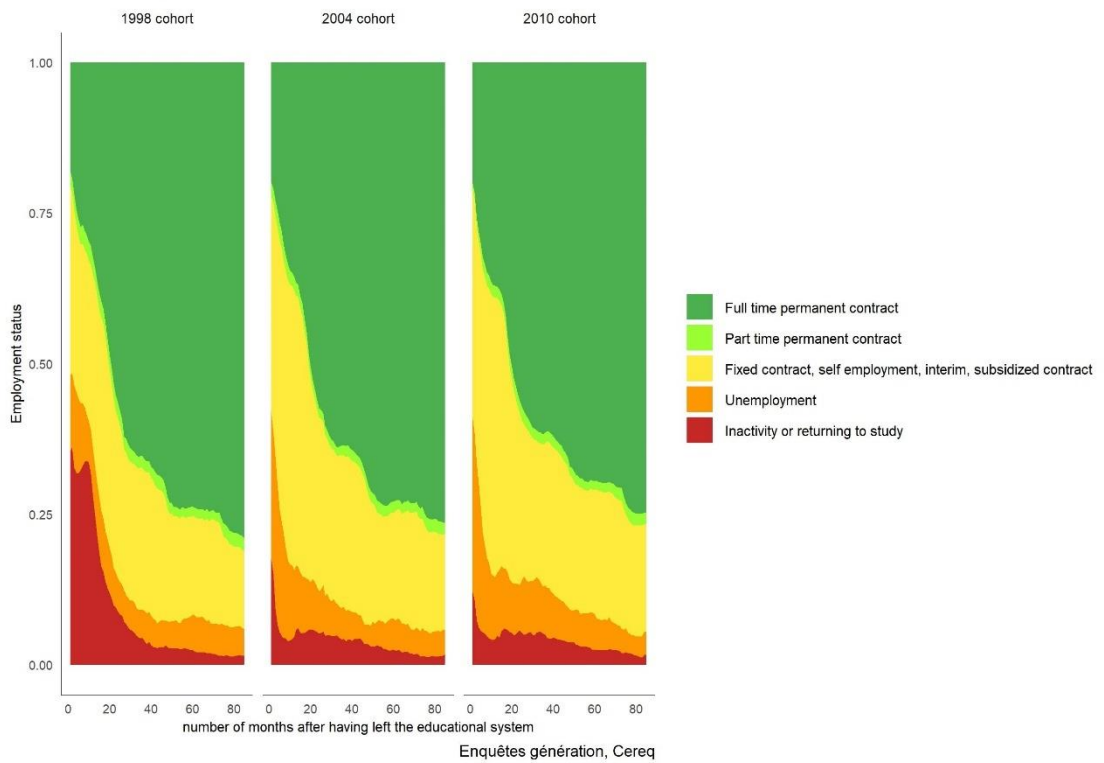Enquêtes génération, Cereq

Figure 2b

Evolution of employment status after leaving the educational sytem
Men with higher education level

Enquêtes génération, Cereq

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Among the 1998 cohort, more than half of females in the survey had at least one child in the seven years after leaving full-time education, and the proportion is slightly higher for those with some higher education (a difference of 3 percentage points). The figures for the 2010 cohort are lower, less than 50% had at least one child for both education groups and the difference by the education level also increased (to percentage 9 points). For males, parenthood is less common for those with secondary education only (21% for the 1998 and 15% for the 2010 cohort). Men with higher education were more likely to have at least one child during their first seven years in the labour force (35% and 29% for the respective cohorts).

Table 1: Descriptive statistics on the three cohorts

	Women		Men	
	Secondary only	Higher Education	Secondary only	Higher Education
At least one child (in %):				
1998 cohort	50.5	53.5	21.0	35.0
2004 cohort	50.0	54.5	21.0	36.0
2010 cohort	38.5	47.5	15.5	29.0
Having a first child while studying (in %):				
1998 cohort	2.1	3.6	0.7	3.3
2004 cohort	2.6	3.2	1.6	2.0
2010 cohort	2.2	5.1	1.2	2.2
Median period to first child (months):				
1998 cohort	47	50	59.5	54.5
2004 cohort	50.5	52	58.5	55.5
2010 cohort	47.5	51	56.5	53.5
Parental leave for the first child (in %):				
1998 cohort	20.0	15.0	14.5	7.5
2004 cohort	30.5	22.5	17.0	14.0
2010 cohort	34.0	22.5	11.5	4.0
Resignation due to the first child (in %):				
1998 cohort	10.0	7.0	3.0	2.5
2004 cohort	9.5	6.0	4.0	3.0
2010 cohort	9.0	6.0	6.0	2.5
Professional mobility due to the first child (in %):				
1998 cohort	8.0	11.0	3.0	4.0
2004 cohort	6.5	9.5	2.5	3.5
2010 cohort	8.0	9.5	5.5	4.0

Scope: The median is calculated on the only individuals having at least a child in the seven years after leaving education

Source: Enquêtes Génération, 1998, 2004, 2010, Cereq.

It is important to take work-life balance policies into account when analysing fertility decisions and labour supply. The absence of legal protection, such as a paid maternity leave, leaves mothers exposed to a higher motherhood pay gap (Waldfogel, 1998). In France, paid maternity leave lasts sixteen weeks of which eight are mandatory, with a minimum of six weeks to be taken after the birth, for a first or second child. Longer spells of leave are possible for health reasons and nearly two thirds of mothers benefited from this possibility (Drees, 2014). Eligibility for paid maternity leave requires claimants to have contributed to the social security system prior to taking the leave, depending on the employment status. Paid paternity leave of 11 days is available, with the same conditions of entitlement as maternity leave[3].

Besides these two leave entitlements, parents can also take unpaid parental leave, depending on previous job tenure (at least twelve months prior to the birth). Parents who opt for taking leave can benefit from a job guarantee for one year, which can be extended for another two years. In addition to time off work, parents can receive a parental leave allowance, that amounts to around one third of the minimum wage, with a maximum duration of 2 years per parent up to the child's third birthday. More than 97% of the beneficiaries of this scheme are mothers, despite the incentives for fathers to take advantage of the leave entitlement introduced in 2015 (Périvier and Verdugo, 2020). Only one third of the mothers take paid parental leave, which is much lower than in Scandinavian countries. Half of children under three are cared for in official childcare facilities. The cost is partly subsidized through tax credits and allowances. Almost all children from the age of three are enrolled in pre-elementary schools and municipalities provide childcare services before and after school hours for children attending the school. In addition to this, school attendance can be complemented by subsidised and tax-deductible childcare. Therefore, it is during the child's first three years that the most significant impact on mothers' careers is likely to occur.

4.2. Child penalties for mothers

Following other event studies of the child penalty, we first examine the effects on labour force participation and labour income (defined here as monthly earnings from work). The former is the key but not the sole determinant of the latter. In terms of the calendar-form of the data used here, the participation outcome is measured as the proportion of months in which the individual is occupied within a given interval. Around the birth, statutory maternity leave will obviously be a factor. To remove this mechanical effect on participation and labour income, these latter averages are calculated for the first six months of the twelve-month spell prior to the birth and the second six months of the interval following the birth.

Figures 3a to 3d present the effects of parenthood on outcomes in the labour market, along with a 95% confidence interval. The presence of parallel pre-trends in outcomes provides robustness for the

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[3] The duration of leave has been increased by 28 days for children born after the July 1st, 2021, this new legislation does not concern the cohort studied in this paper.

analysis that uses men as a control group for women. In the years *prior* to the birth of the first child there is no significant difference between the trends of the variable for future mothers and fathers. The effects on monthly earnings are estimated for all males and females (who become parents), and so include some individuals with zero earnings. In gross terms the effect is negative for mothers and not significantly different from zero for fathers over the four years after the birth: mothers experience a decrease in their monthly earnings due to the birth of the child whereas fathers' earnings are not affected (Figure 3a). The estimated relative child penalty (calculated using $P_{ij}^{Relative}$) implies that the monthly earnings of mothers is 23.5% lower than those of fathers due to the birth of the child. While these results are over a short period after the birth of a child, they suggest a smaller child penalty for young adults than for all mothers as in other studies for France such as Meurs and Pora (2020).

In view of the availability in childcare and parental leave provisions, the child penalty is likely to be incurred mainly in the three years following the birth. This penalty is mainly, though not solely, the consequence of the withdrawal of mothers from employment following the birth: in the twelve months after the birth, the employment rate of mothers is significantly reduced, and this decrease is progressively narrowing in the 2nd and subsequent years. The overall child penalty in *employment* for mothers is 20% over the four years (Figure 3b). The effects on hourly earnings, hours of work and employment status are estimated only for persons who were employed in a given twelve-month interval. In terms of hourly earnings *for those in work* the relative child penalty is around 5% but is not generally significant at conventional levels (Figure 3c). There is small statistically significant reduction in hours of mothers (3% relative to fathers) (Figure 3d).

Figure 3a

Effect of the first child on monthly earnings
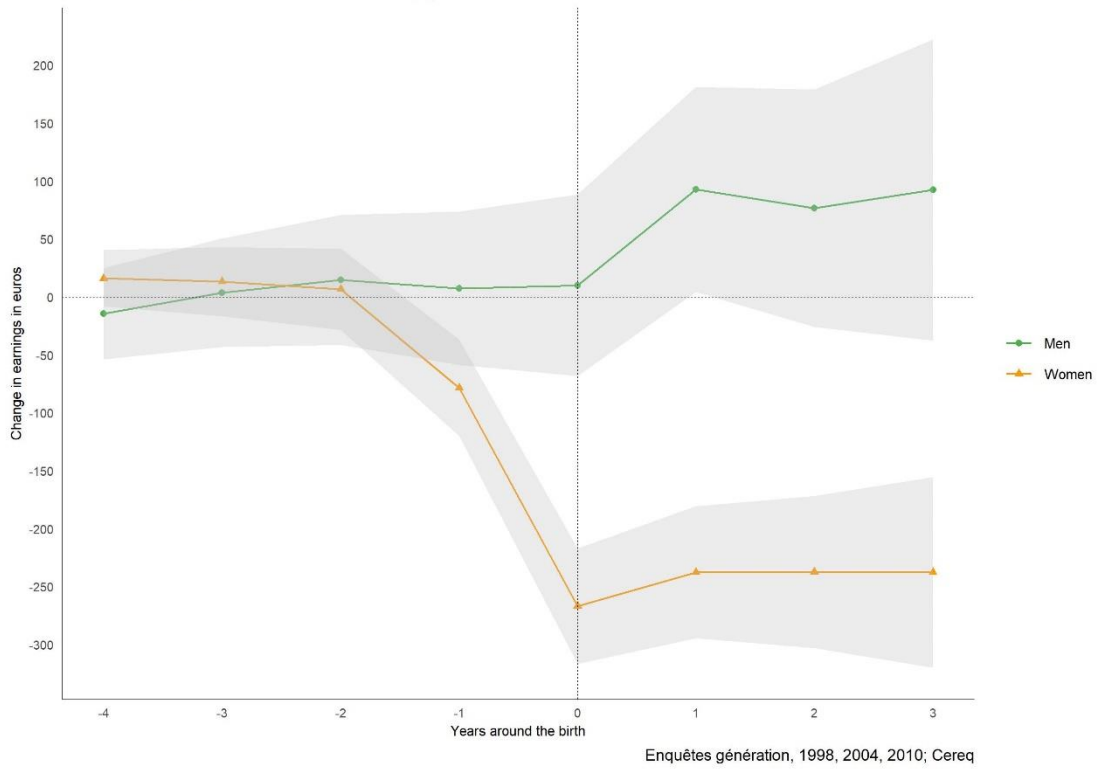All cohorts, all levels of education and by gender

Figure 3b

Effect of the first child on employment
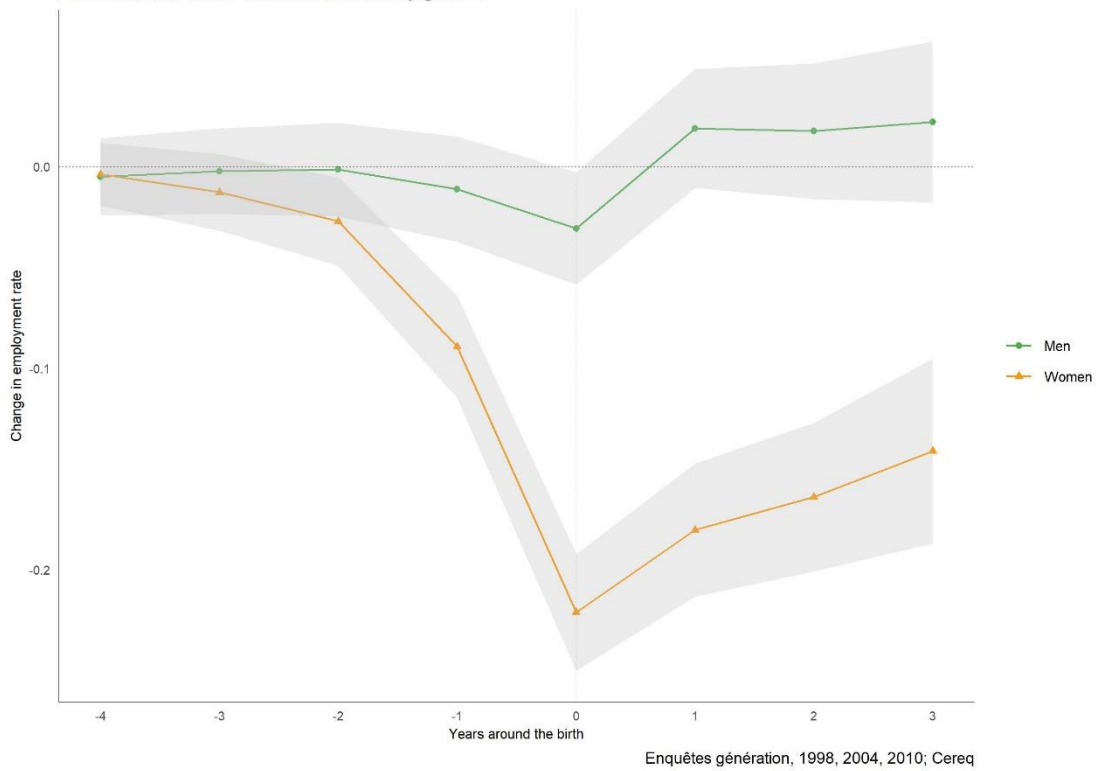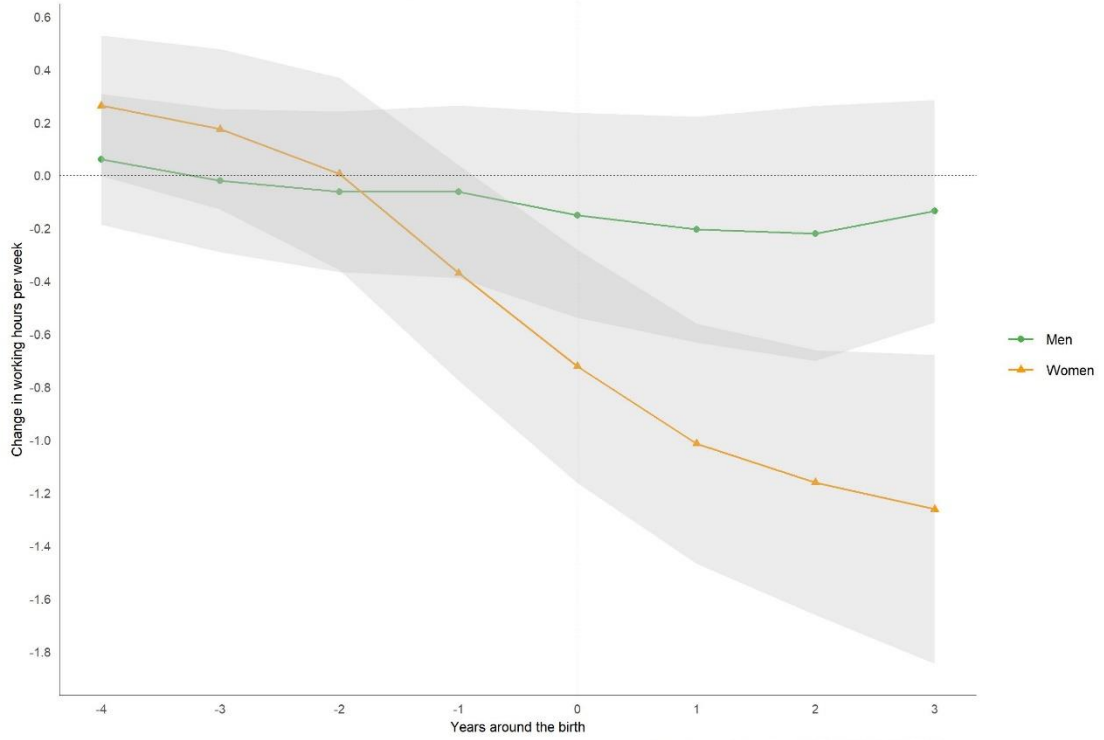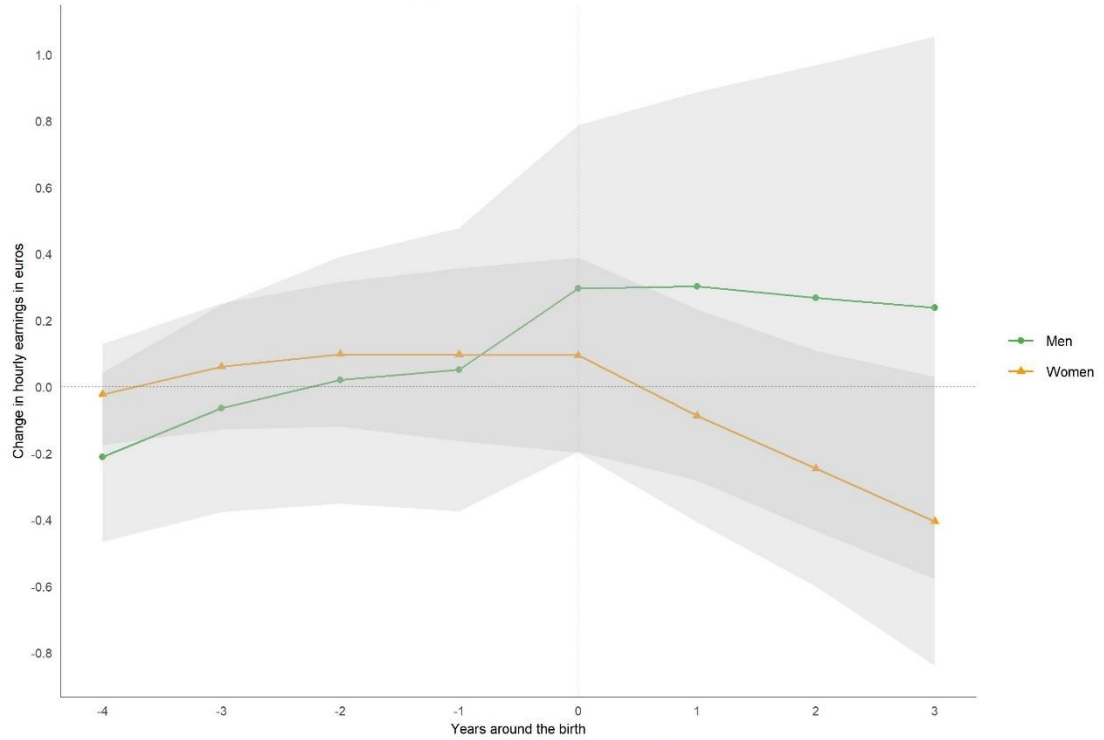All cohorts, all levels of education and by gender

Figure 3c

Effect of the first child on weekly working hours
All cohorts, all levels of education and by gender

Enquêtes génération, 1998, 2004, 2010; Cereq

Figure 3d

Effect of the first child on hourly earnings
All cohorts, all levels of education and by gender

Enquêtes génération, 1998, 2004, 2010; Cereq

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4.3. Child penalties by education level

It is likely that the child penalty will differ by education level in view of the size of human capital investments and the opportunity of costs of career interruption. Taking a year or more out of the labour market to have children will be more costly for someone with a high level of education at the beginning of their career and may involve a more rapid return to work after the birth than someone in a less career-oriented occupation. This will reflect not only career choices, but also possessing the financial means of paying for pre-school childcare. In Figures 4a to 4d, the child penalty is presented separately by broad education level: secondary education up to and including *baccalauréat*, and higher education level (university or similar).

Figure 4a

Effect of the first child on monthly earnings
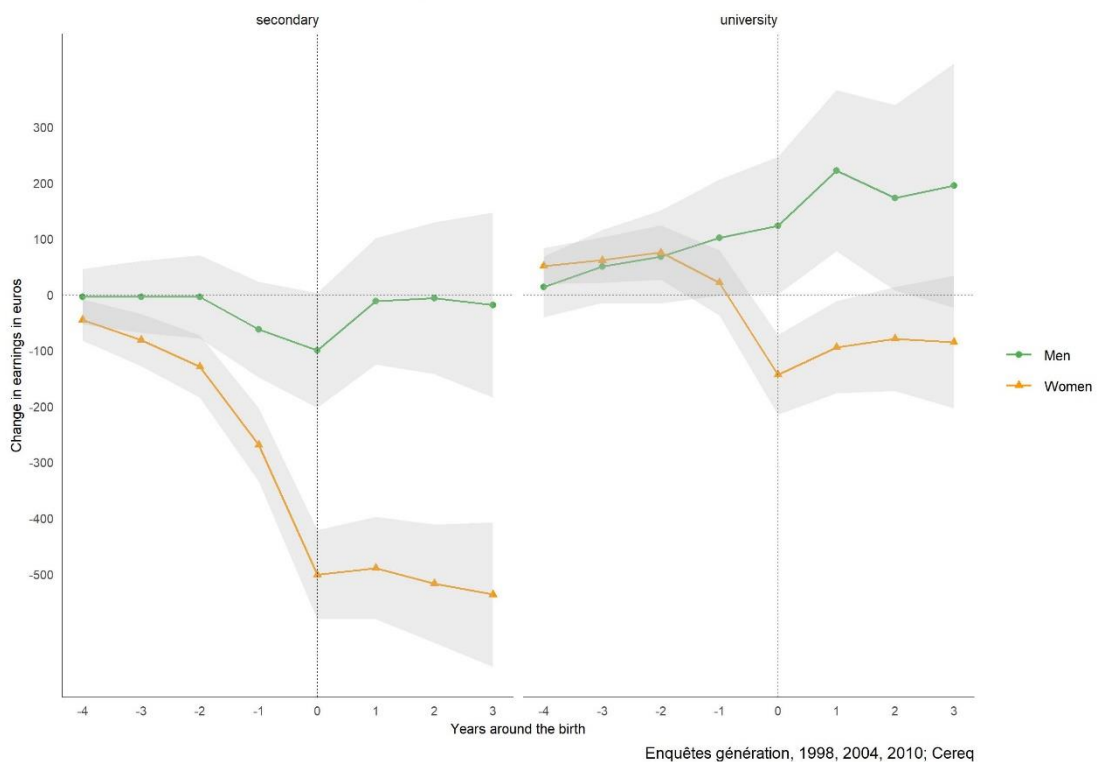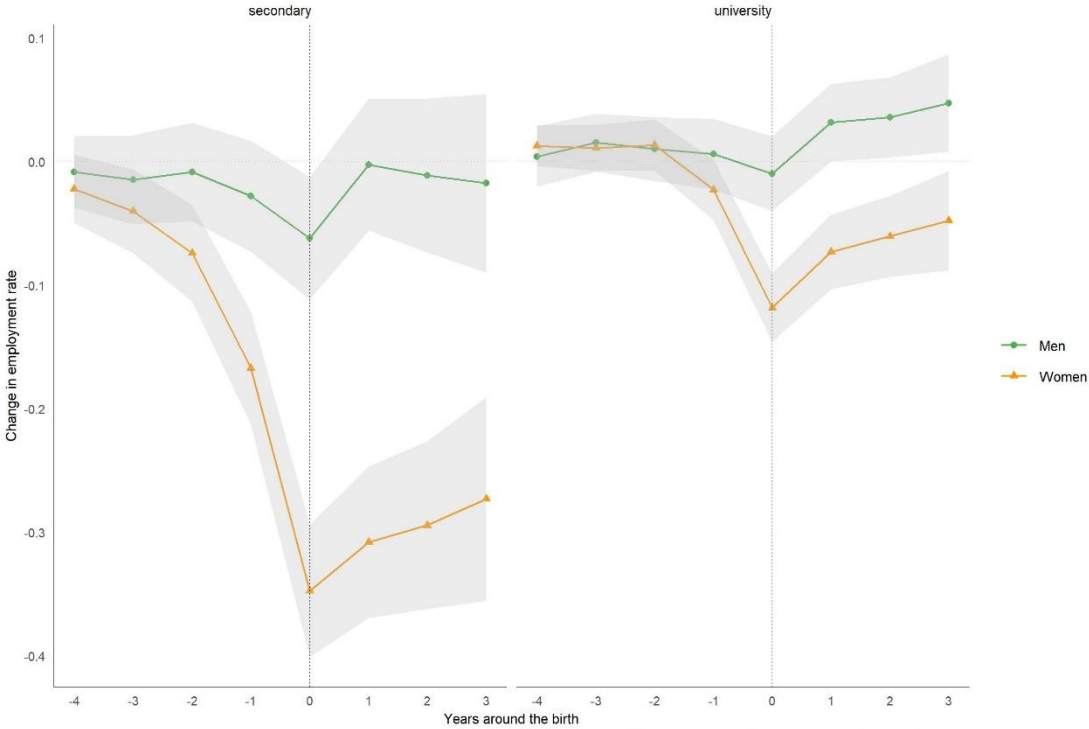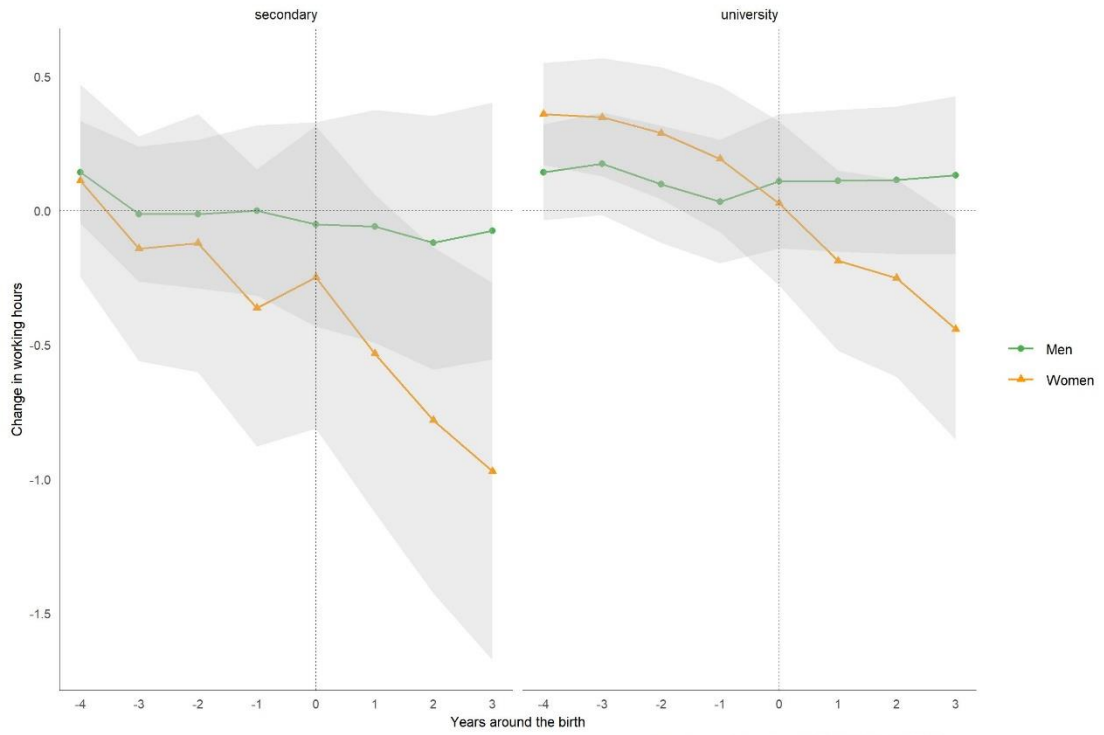All cohorts, by level of education and by gender

Enquêtes génération, 1998, 2004, 2010; Cereq

Figure 4b

Effect of the first child on employment rate
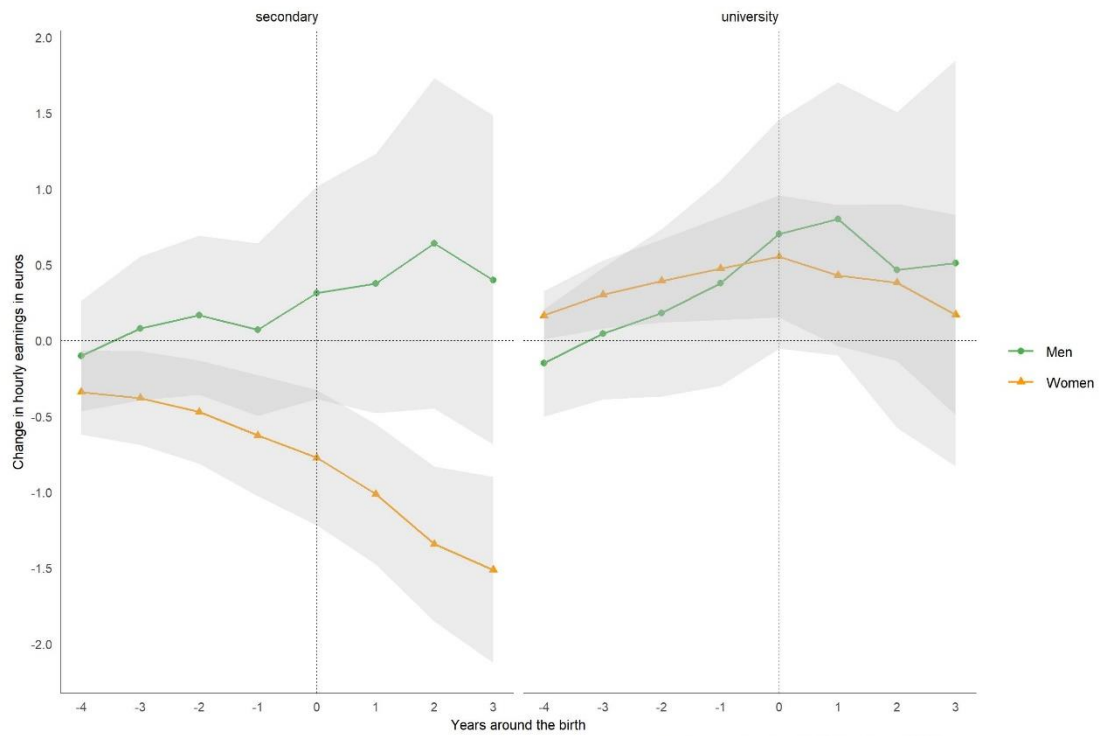### All cohorts, by level of education and by gender

Figure 4c

Effect of the first child on working hours
All cohorts, by level of education and by gender

Enquêtes génération, 1998, 2004, 2010; Cereq

Figure 4d

Effect of the first child on hourly earnings
All cohorts, by level of education and by gender

Enquêtes génération, 1998, 2004, 2010; Cereq

For those mothers with a higher education level, the gross child penalty in monthly earnings is estimated to be only 5% although relative to fathers it is 18% (Table 2). These penalties are significantly lower than those for less qualified mothers (35% relative to fathers). It is also worth noting that there is no child penalty in earnings for fathers. These male-female differences reflect to a large extent an interruption in employment. For more highly educated mothers the relative child penalty in employment is 10% compared with 33% for the less qualified. For the former, the gross penalty falls from 12.5% (33% for less qualified) in the year following the birth to 5% (35% respectively) four years after, suggesting that more qualified mothers return to work more rapidly after the birth.

Table 2:

Child penalties in earnings for mothers relatively to fathers by level of education

Child penalty	Secondary education	University
Monthly earnings	34.6%	18%
Hourly earnings	11.7%	ns

In terms of hours of work and hourly earnings *for those in work* there are no significant child penalties for more educated mothers either in gross or relative terms. In contrast, although less qualified mothers experience a gross hourly earnings penalty of 8% in the first year rising to 15% after four years following the birth. Relative to fathers the figures are 11% and 19%, respectively. There is also 5% relative penalty in hours worked[4].

4.4 The child penalty in other outcomes

Besides the child penalties in terms of earnings, employment and working hours, the birth of the child may induce further consequences in terms of career progression and mobility. Kleven, Landais and Søgaard (2019) examine mobility between sectors, occupations, and firms for Denmark. Lucifora et al (2020) examine how motherhood affects prospects in the internal market of a large multinational firm. In this section we assess what happens to mothers returning to work after maternity leave. Extended parental leave and the likelihood of having additional children may involve further child penalties in terms of a lower probability of a mother being promoted to a higher grade or being given a supervisory role. For couples, the presence of children may lead to lower occupational or sectoral mobility particularly if this involves geographic mobility. These issues may be particularly relevant given that the individuals being studied are in the first seven years of their working lives. They could also help explaining the origins and mechanisms underlying the differences in child penalties by education level.

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[4] Table A.1. in the Appendix provides details of the results.

Mothers returning to the same job after maternity leave can experience a lower probability of being promoted to a higher grade within their existing firm or organisation. In the Generation surveys, respondents are asked whether they have changed position in the occupational hierarchy and if so to which grade. For higher educated mothers there is no significant difference compared either to the pre-maternity period or to fathers (Figure 5). However, for less educated mothers there is evidence of a reduced likelihood of being promoted after the birth whereas for less educated fathers the opposite is the case. These effects are significant at the 10% level three years after the birth.

Based on answers to the question of how many persons the respondent is the supervisor, Figure 6 indicates that mothers having undergone further education are more likely to move into supervisory roles from the second and subsequent years after childbirth than their male counterpart as we observe an increase in the share of women who declare moving to a supervising position. This dynamic involves more responsibilities for educated mothers and a sort of positive dynamic in their career after the birth of the first child. Nevertheless, this trend is not promotion per se, and it is not necessarily accompanied by an increase in wages or bonuses.

In contrast, women with a lower education background experience a relative child penalty, though it is not significant, regarding the outcome of moving to a supervising position, as the share of men with the same education level that declare having moved to a supervising position increased after the birth. The increase in the propensity to hold a supervisory role for fathers is statistically significant from the second year after the arrival of a first child compared to the period prior to becoming a father.

Figure 5

Effect of the first child on being promoted
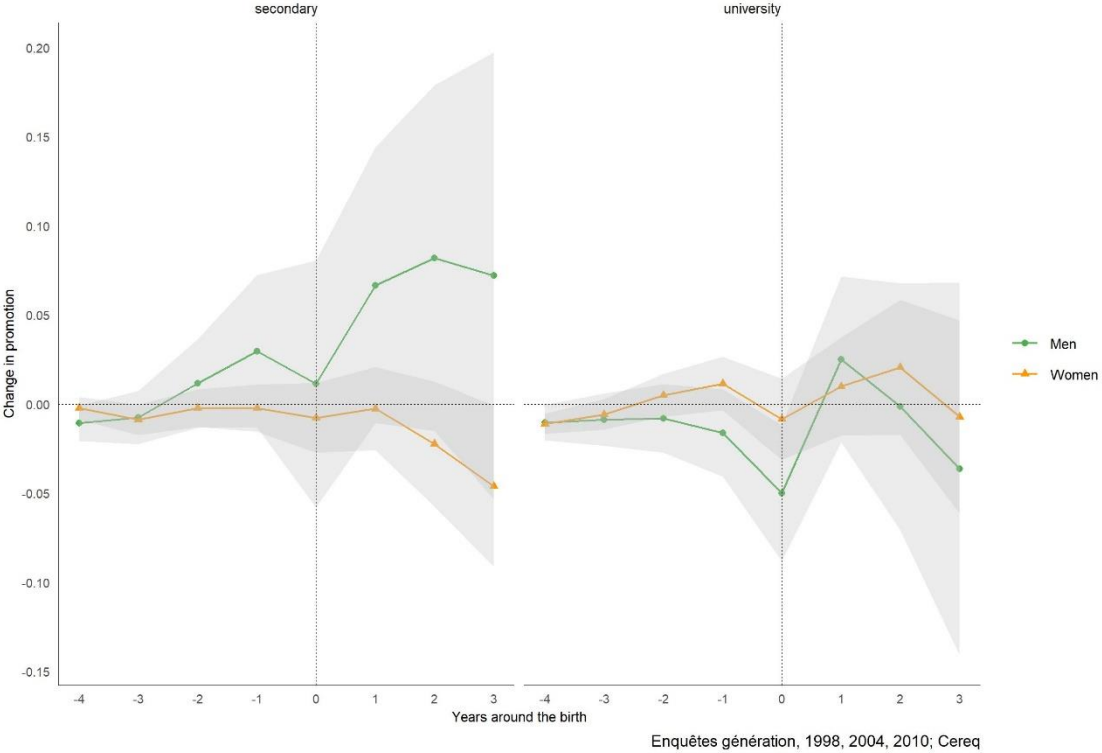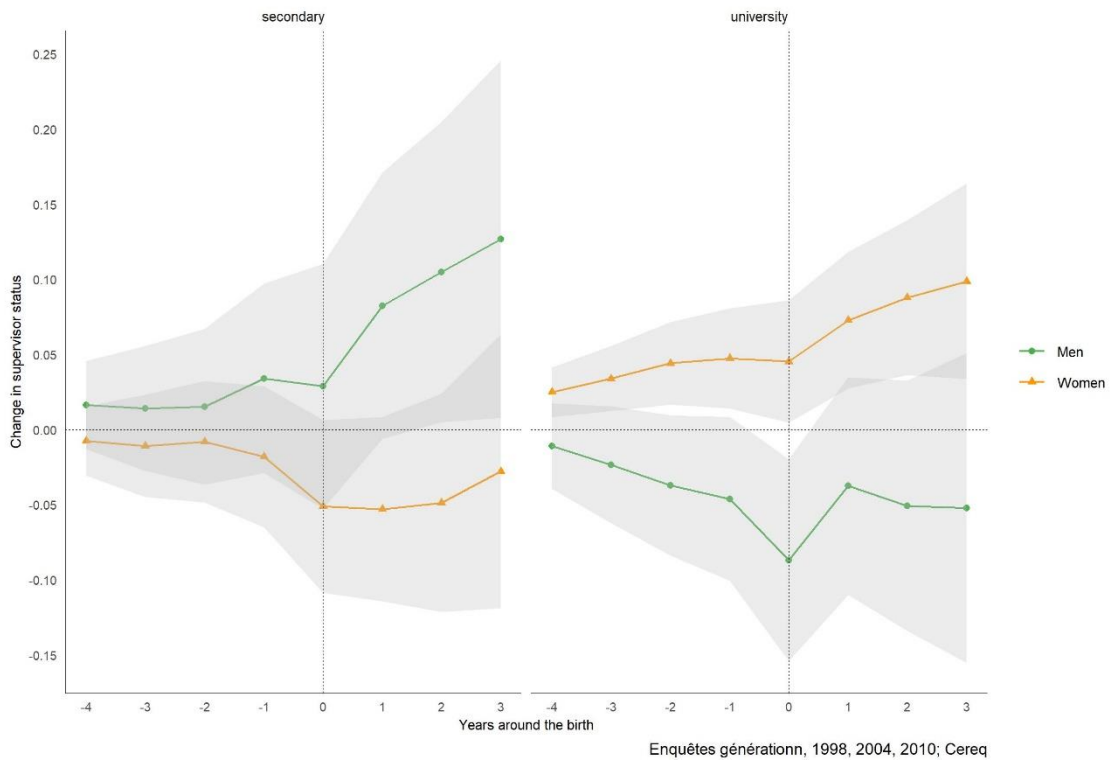All cohorts, by level of education and by gender

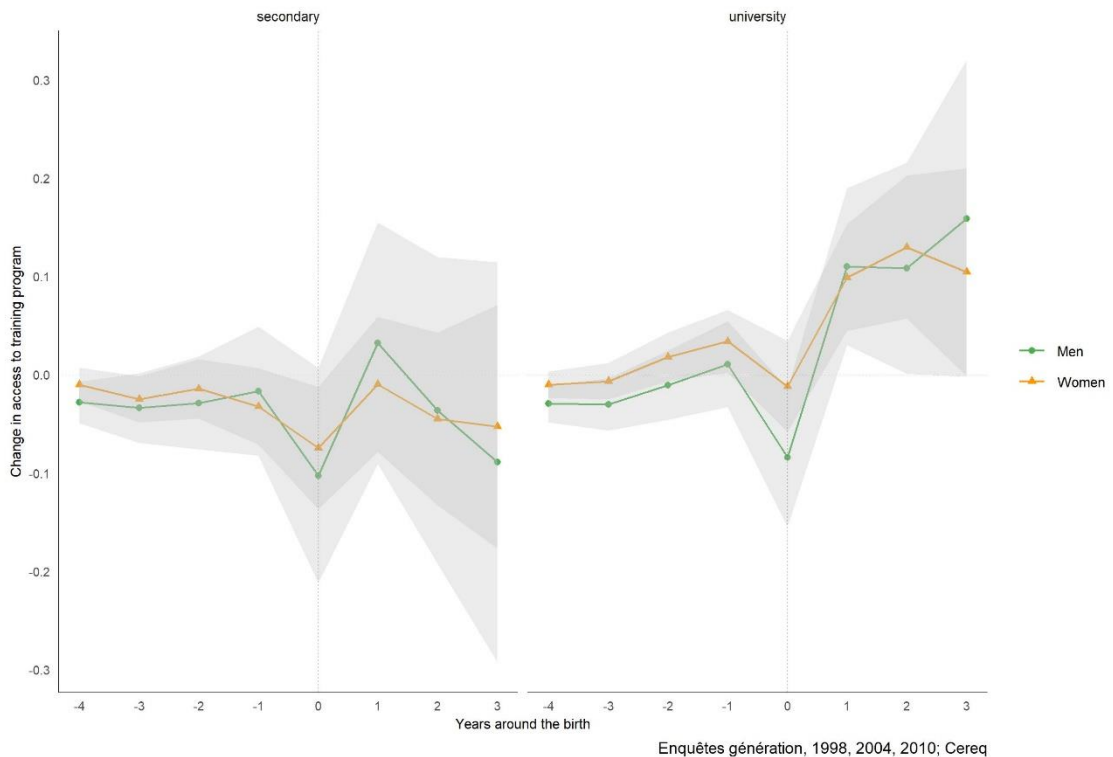Enquêtes génération, 1998, 2004, 2010; Cereq

Figure 6

Effect of the first child on access to supervisor status

All cohorts, by level of education and by gender

Enquêtes générationn, 1998, 2004, 2010; Cereq

Mothers with more than secondary education are more likely to undergo training provided or financed by the employer relative to the period prior to childbirth (Figure 7). This occurs mainly (ie is significant) in the second and third years following the birth. While there is a similar effect for fathers, this is not statistically significant. This additional training could represent a catching-up effect for the time spent on maternity leave and is possibly complementary to the increased propensity to occupy a supervisory role. For mothers (or fathers) with only secondary education, there is no tendency to undergo additional

Figure 7

Effect of the first child on participating in a training program

All cohorts, by level of education and by gender

Enquêtes génération, 1998, 2004, 2010; Cereq

employer-provided training following the birth of a first child.

Not all first-time mothers return to employment or return to work with the same employer. Those who change employer do not in general change sector of economic activity: Figure 8 suggests there is significantly less job-changing between sectors after maternity than either prior to childbirth or compared to the fathers, especially among the more educated. There is also evidence that mothers with secondary education only have a significantly lower propensity to change occupation following maternity leave while fathers in the same educational category have an increased tendency. This would suggest that having child reduces progression for these mothers relative to the period prior to the birth and compared to fathers. For the more educated group, there is no clear trend.

Figure 8

Effect of the first child on changing sector
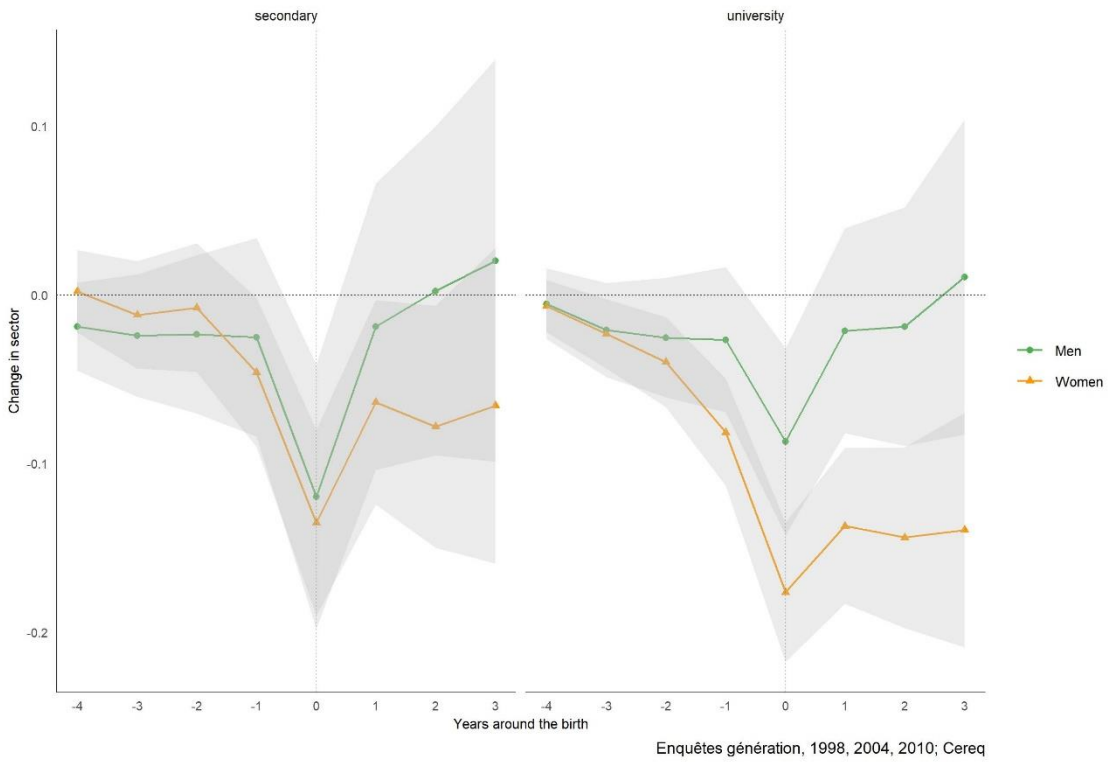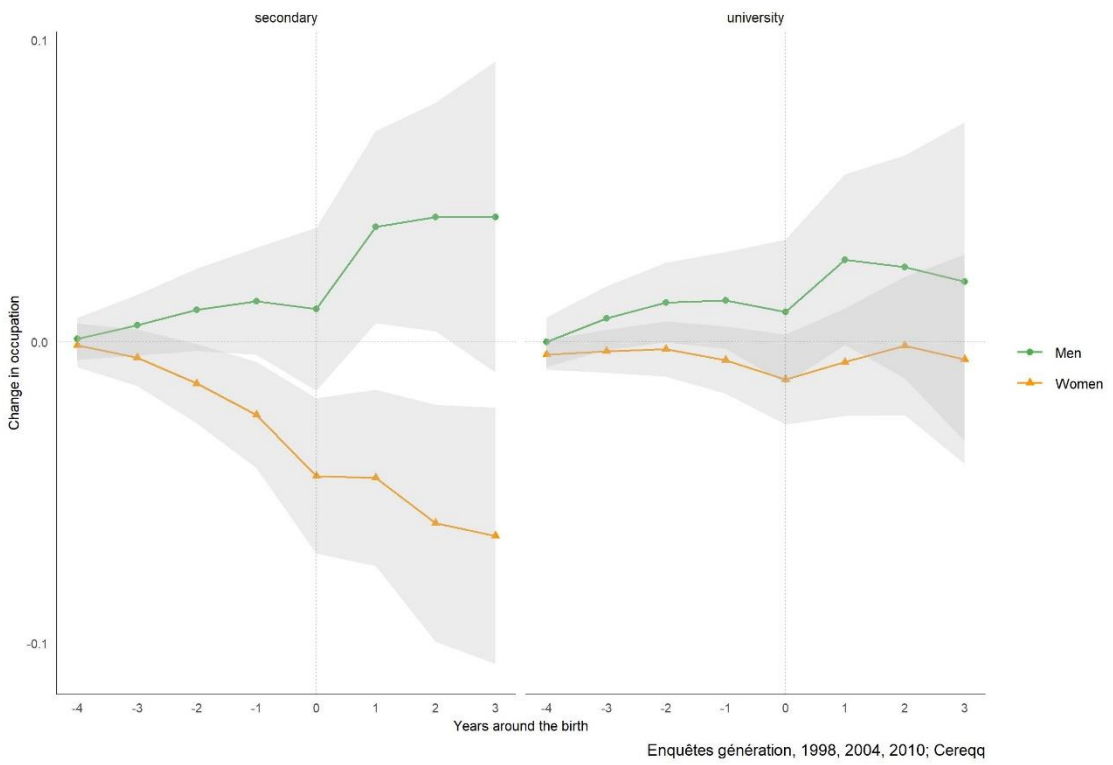All cohorts, by level of education and by gender

Enquêtes génération, 1998, 2004, 2010; Cereq

Figure 9

Effect of the first child on changing occupation
All cohorts, by level of education and by gender

Enquêtes génération, 1998, 2004, 2010; Cereqq

4.5. Analysis by cohort

The previous section has shown that the level of education is key to the size of the child penalties in relative or absolute terms. Women with a low education background experience the largest child penalty in absolute terms and relative to men. In this section, we explore a possible cohort effect by education level. Indeed, labour supply decisions and employment opportunities after the birth of the first child depend on the economic context. This matters particularly for young people entering the labour market after studying, as they have no experience and are usually more affected by unemployment than other workers.
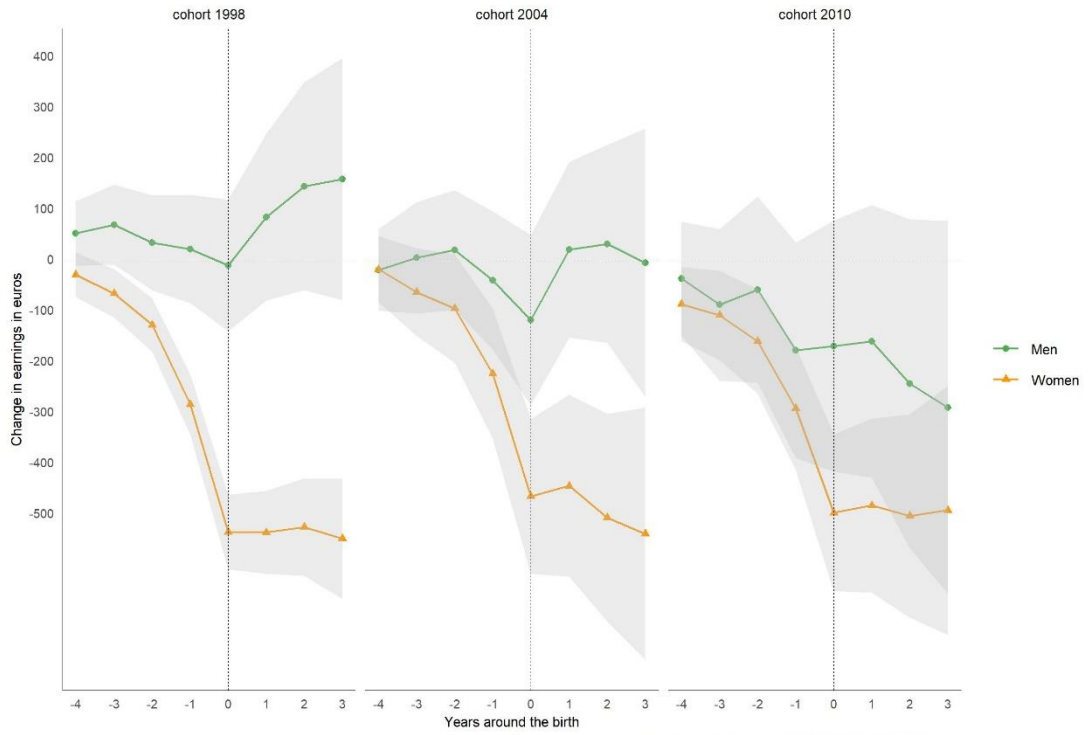
We first examine the cohort effect on child penalty regarding different labour market outcome, for people with a secondary level of education. Women who left the educational system in 1998 face a large monthly earnings child penalty whereas their male counterparts experience no significant change after the birth of their first child (Figure 10a). This penalty is mainly due to a decrease in the employment rate of less educated women after the birth, and to a lesser extent to the reduction of their working hours. For men in the same cohort, there are no significant effects on these outcomes, except the number hours they work, which increase after the birth of the first child. This illustrates the role of male breadwinner that is particularly strong for less educated men: they tend to increase their earnings by working more to sustain the living standard of their family; and to compensate the cost associated with having a child and the possible decrease in labour supply of their partner.

The estimates for the 2004 cohorts show a slight decrease in the child penalties, due to a smaller decrease in employment rate of mothers compared to the 1998 cohort. The trends in working hours (Figure 10c) must be interpreted with caution as in the early 2000, the implementation of a law reducing the standard working week from 39 to 35 hours might explain the decrease of working hours for both fathers and mothers including prior to the birth of the child. For the 2010 cohort, we observe the same level of absolute child penalties for mothers, whereas the relative penalty has narrowed. This is due to a decrease in monthly earnings, and in employment rate of fathers before and after the birth of the child. This may be a consequence of the deterioration of the labour market prospects for the less qualified after 2010 in the aftermath of the great recession that has particularly affected young unskilled men (Périvier, 2018).
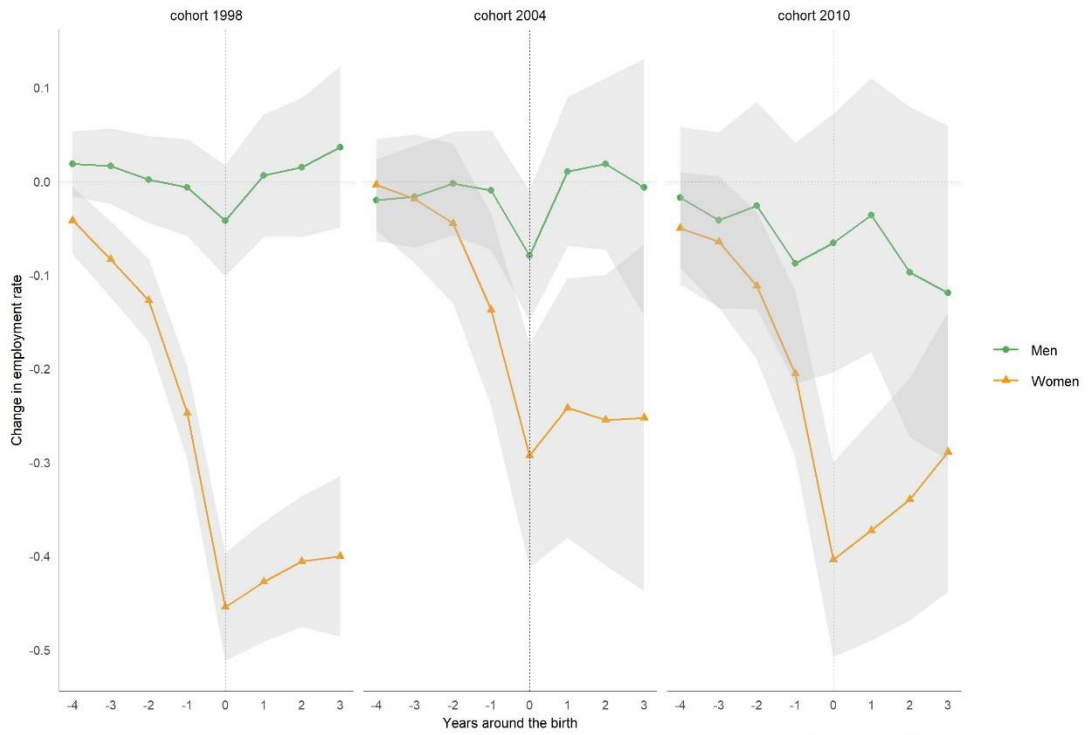
Figure 10a

Effect of the first child on monthly earnings
Secondary education level, by cohort and gender

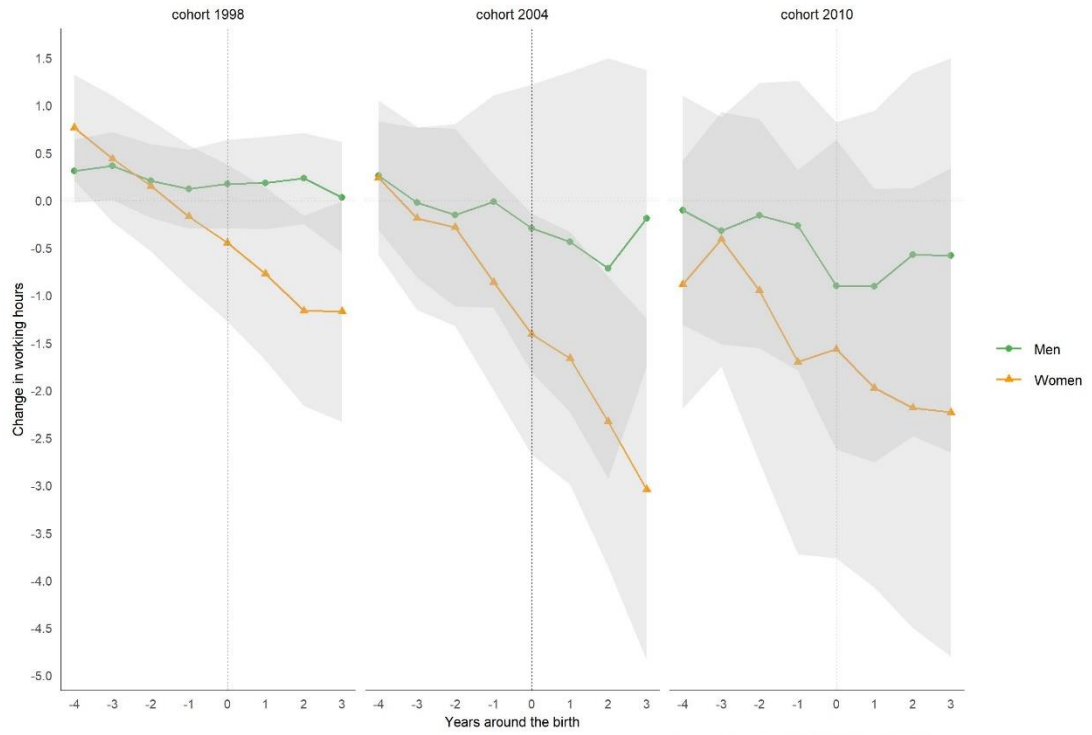Enquêtes génération, 1998, 2004, 2010; Cereq

Figure 10b

Effect of the first child on employment rate
Secondary education level, by cohort and gender
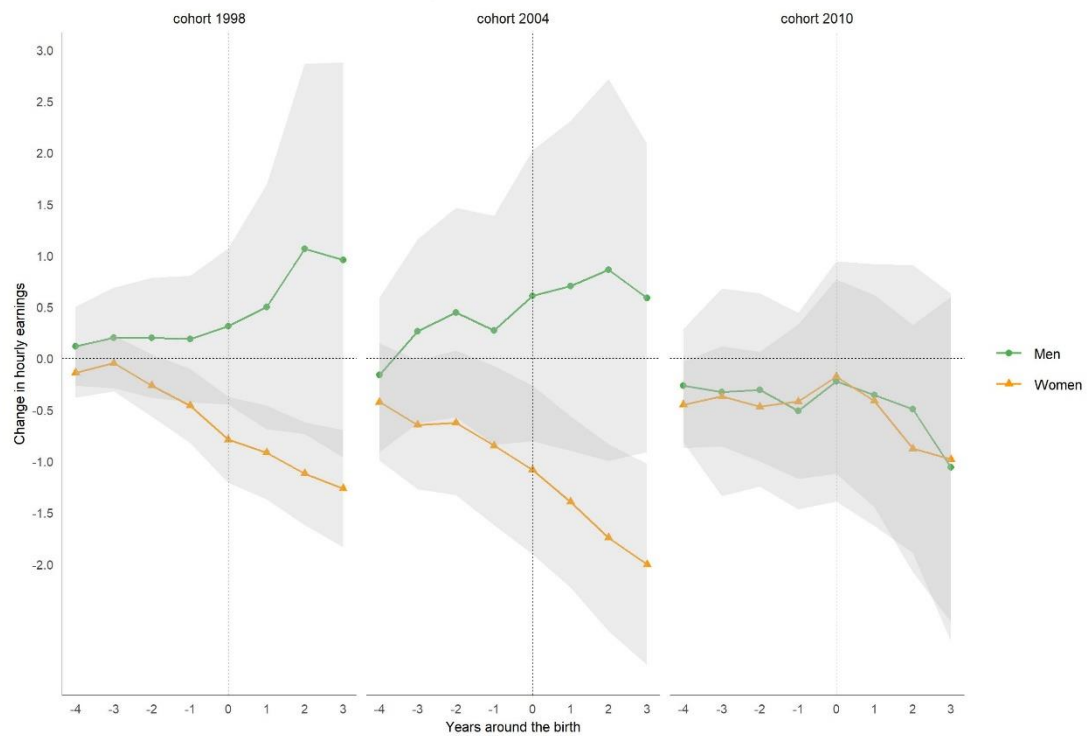

Enquêtes génération, 1998, 2004, 2010; Cereq

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Effect of the first child on working hours
Secondary education level, by cohort and gender

Enquêtes génération, 1998, 2004, 2010; Cereq

Effect of the first child on hourly earnings
Secondary education level, by cohort and gender

Enquêtes génération, 1998, 2004, 2010; Cereq

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The same analysis is undertaken for people with a university (or similar) level of education (Figures 11a to 11d). Women who left the educational system in 1998 experience a significant absolute child penalty in terms of employment rate. The relative child penalty is also significant, as male employment rate increases significantly after the birth. The child penalty in employment rate does not lead to a significant child penalty in their monthly earnings relatively to men, but there is a decrease in their income due to the birth of the child for the 1998 cohort. This absolute child penalty is no longer significant for 2004 and 2010 cohorts. Whereas the employment rate of fathers increased after the birth for the 1998 cohort, it is stable for more recent ones. More educated men were not much affected by the 2008 crisis, contrary to their less educated counterparts. This change in educated fathers' labour supply can be explained at least partially by a decline in the male breadwinner model during the two decades of observation.

5. Concluding remarks

One of the key results emerging from these results is that for mothers at the beginning of their working lives, the overall figures (all education levels) of the child penalty in *monthly earnings* (23.5%) are lower than those found for most countries including France for mothers of all ages and education levels. Only in Denmark would the child penalty appear to be lower (21%). The degree of comparability of the estimates needs to be qualified since our estimates refer to effects at the beginning of an individual's working life and over a relatively short time interval following the birth. However, an important finding is that there is only a limited *gross* child penalty in monthly earnings for mothers with some higher education, although relative to equally qualified fathers is larger at 18%. This is mainly the consequence of a shorter career interruption than less qualified mothers for whom there is a substantial earnings penalty in both gross and relative terms (more than 35%).

The results also show that mothers with a low education background experience a large absolute penalty regardless of their cohort. The relative child penalties are smaller for the 2010 cohorts due to the deterioration of the labour market for men with a low education level. These penalties are not only found for monthly earnings and employment, but are also in hourly earnings, hours of work, occupational mobility, and promotion prospects. The category that is spared from any type of penalty is men with higher education, for whom the birth of a child either has no effect or leads to an improvement of their professional position.

Figure 11a

Effect of the first child on monthly earnings
University education level, by cohort and by gender

Figure 11b

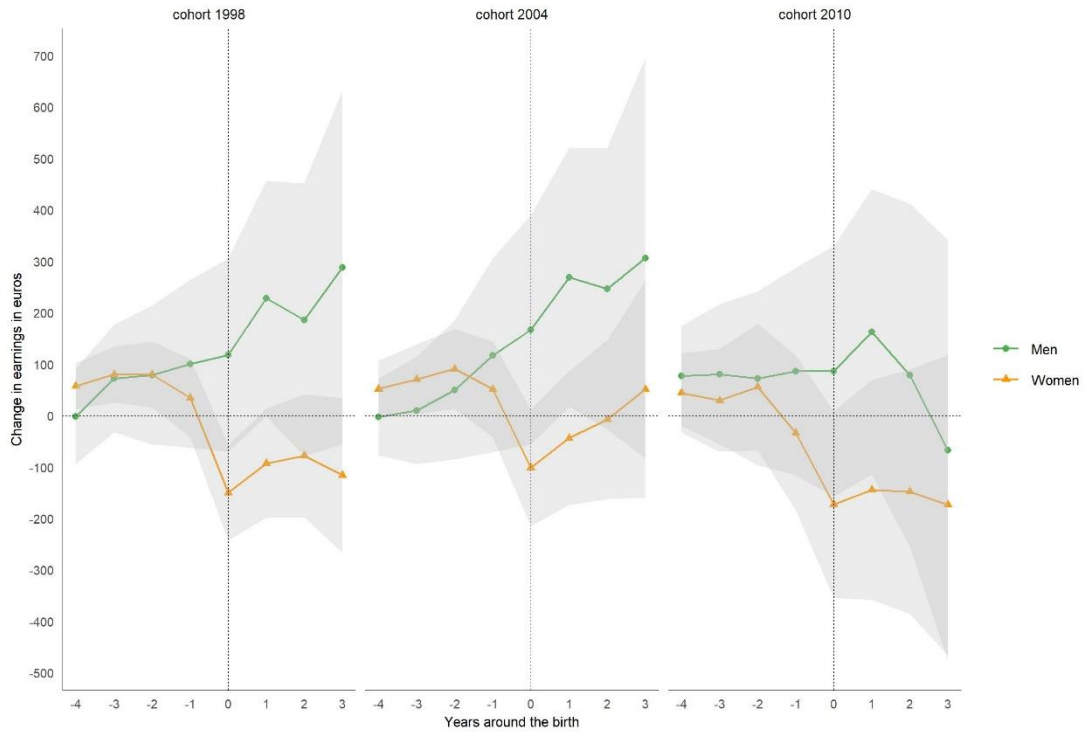## Effect of the first child on employment rate
University education level, by cohort and gender

Figure 11c

Effect of the first child on working hours
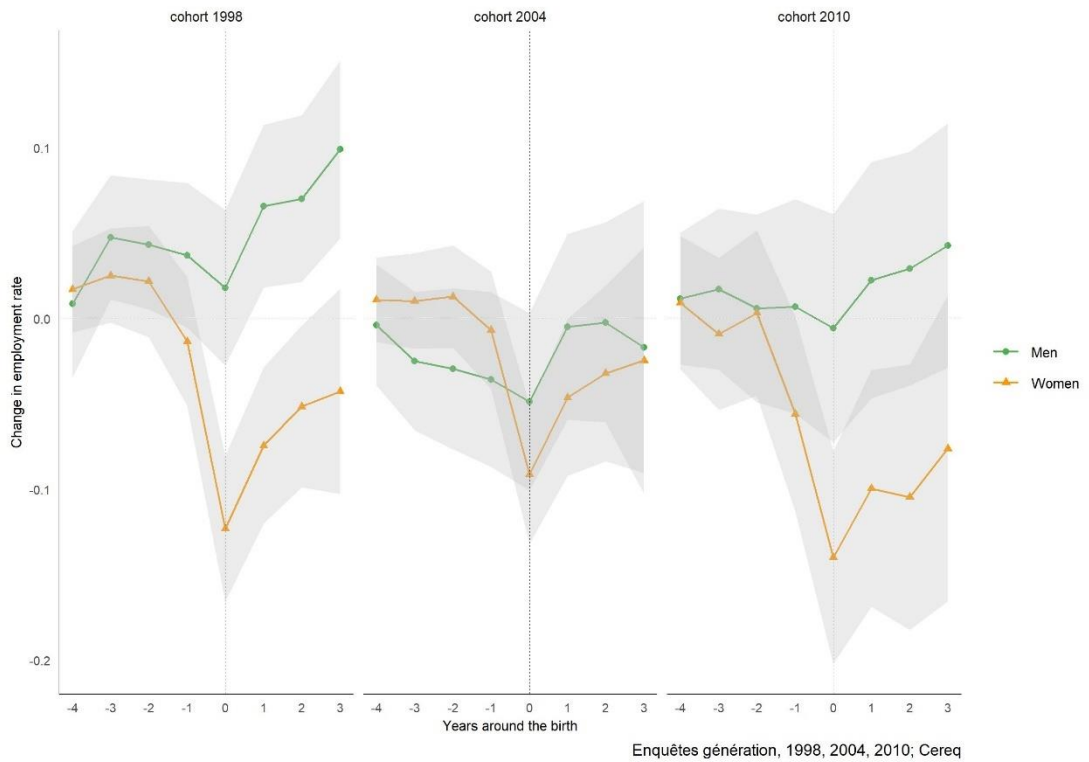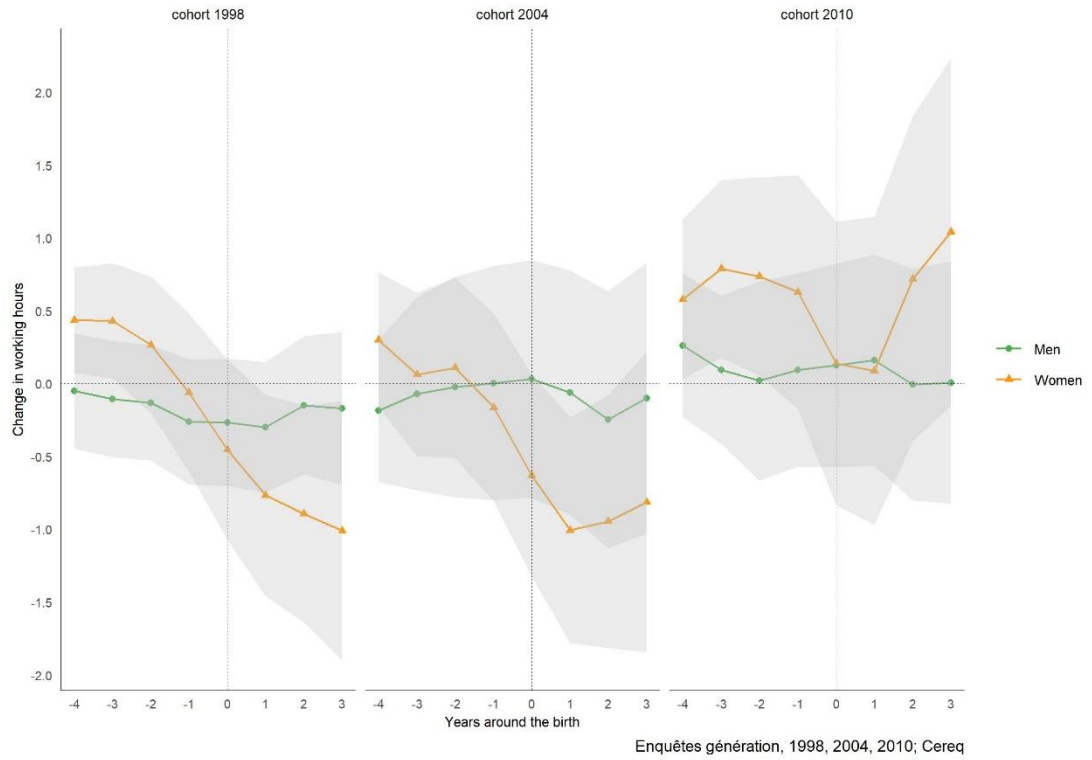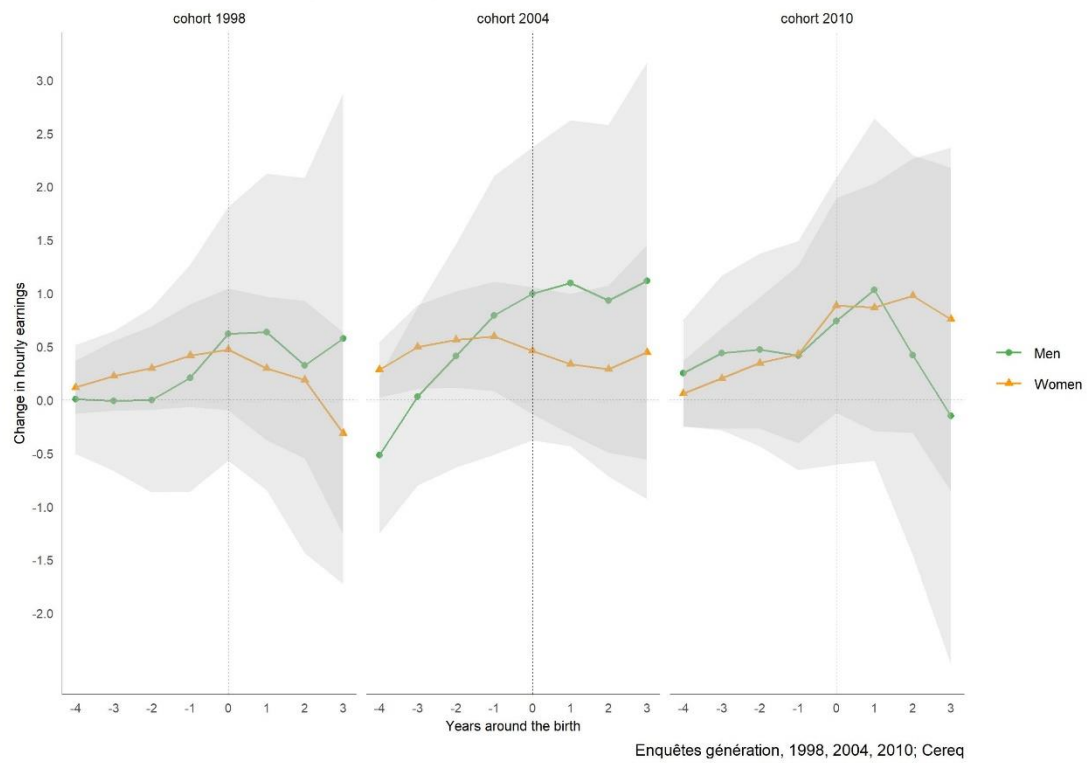University education level, by cohort and gender

Enquêtes génération, 1998, 2004, 2010; Cereq

Figure 11d

Effect of the first child on hourly earnings
University education level, by cohort and gender

Enquêtes génération, 1998, 2004, 2010; Cereq

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Appendix

Table A.1 Relative child penalties (relative to fathers)

Monthly earnings			
	Overall	Higher education	No higher education
T+1	21.2	12.1	32.3
T+2	24.1	13.7	37.1
T+3	23.0	9.7	40.3
T+4	35.9	11.1	41.9
Total	23.5	11.7	37.9

Hourly earnings (conditional on positive hours)			
	Overall	Higher education	No higher education
T+1	2.1	+4.4	11.3
T+2	3.8	+3.7	14.4
T+3	4.9	+5.8	20.0
T+4	5.9	+4.2	19.0
Total	4.2	+4.5	16.2

Employment rate			
	Overall	Higher education	No higher education
T+1	20.1	11.4	31.0
T+2	20.7	10.9	32.7
T+3	19.4	10.2	31.2
T+4	19.4	10.7	31.3
Total	20.0	10.8	31.6

Hours of work (conditional on positive hours)			
	Overall	Higher education	No higher education
T+1	2.3	1.2	3.5
T+2	2.9	1.9	4.1
T+3	3.3	1.6	5.5
T+4	3.9	1.5	6.8
Total	3.1	1.6	5.0

A 'placebo' test

To check the results, we undertake the placebo test proposed by Kleven, Landais and Søgaard (2019). Using the mean and variance for parents in the sample, we artificially attribute a birth to those individuals who do not have children during the observation period. This is done by randomly drawing a birth date from a truncated normal distribution using the sample estimates of the parameters. We then estimate the effect of 'a birth' on the principal outcome variables using only these individuals and in principle the effect of this placebo should have no effect. The estimates of the effect on monthly earnings are not significantly different from zero and suggest if anything earnings gain for females (see Figure A.1.).The

estimates for employment and hourly earnings also statistically insignificant and if anything, also suggest a negative effect of children for males. Compared to the significant results obtained for actual parents, these results suggest that our findings are robust.

Figure A.1 A placebo test

Effect of the first child on monthly earnings
All cohorts, all levels of education and by gender

Enquêtes génération, 1998, 2004, 2010; Cereq