Is There a Child Penalty in Pensions? The Role of Caregiver Credits in the French Retirement System

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Abstract

The effect of motherhood on women's labour supply has been the focus of a large body of economic literature over the last decades. Since the mid-1990s, increasing attention has been paid to the “family pay gap” or the “motherhood wage gap”, i.e., the differential in wages between women with and without children. As for the long-term effects of children on pension entitlements, the empirical evidence is limited. Nevertheless, different countries have introduced pension caregiver credits into their pension systems in order to compensate parents—especially mothers—for the impact that children can have on their careers and, ultimately, on their retirement benefits. Whether or not these caregiver credits achieve this objective is still an unresolved issue. We deal with this question in the French case, as the French pension system includes the widest range of caregiver credits compared to other countries. We first compute the family pension gap at given ages for women born between 1950 and 1966, initially while ignoring caregiver credits. This gap increases with the number of children. We then show that caregiver credits do fulfil their role of compensating women for the impact of children on their pension entitlements. Taking these benefits into account offsets almost completely the difference in pension entitlements among women, whatever the number of children. For men, children have almost no impact on their pension entitlements, and caregiver credits play a minor role with the one exception that they favour the fathers of at least three children.

Keywords Pension · Gender · Caregiver credits · Family pension gap · Gender pension gap

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1 Introduction

It has always been more difficult for women than for men to acquire individual pension rights. This difficulty arises mainly from women's lower participation in the labour market and their lower wages (see, e.g., Ponthieux and Meurs 2015), disadvantages that are linked in part to their still dominant role in domestic work and child rearing (Gimenez-Nadal and Sevilla 2012; Bianchi et al. 2012, for example). Numerous studies undertaken over many years have shown that career breaks are in general negatively associated with women's earnings (Mincer and Polachek 1974; Mincer and Ofek 1982). However, it was not until the mid-1990s that researchers' attention became attracted to the "family wage gap" between women with and without children (Waldfogel 1997, 1998; Lundberg and Rose 2000; Davies and Pierre 2005; Gangl and Ziefle 2009; Beblo et al. 2009; Meurs et al. 2010). There is now a broad consensus that having children leads to a wage penalty for women. With the exception of the Nordic countries, this penalty is regularly estimated at between 2 and 10% for one child and between 5 and 15% for two or more children (Ponthieux and Meurs 2015). Having children also changes labour market participation in various ways, resulting in withdrawals and part-time work, and it even sometimes influences the choice of occupation. However, the extent of the child wage penalty varies depending on the country, the period and the methodology used to assess it (Ponthieux and Meurs 2015). Most studies have focused on the impact of maternity on wages at a single point in time or at a given age, but up until now the cumulative impact has been little explored. However, some recent work examines these issues from a life-cycle perspective, showing that cumulative gains are significantly reduced by fertility (Adda et al. 2017). The impact of maternity on life-cycle earnings is usually reflected in lower pension entitlements, as shown by a growing body of literature (Davies et al. 2000; Brugiavini et al. 2011; Sefton et al. 2011; Möhring 2015; Peeters and De Tavernier 2015; Neels et al. 2018; Rutledge et al. 2017). However, the link between pensions and earnings is not direct, nor is it obvious. It depends on how the retirement system calculates the pension on the basis of individual careers (Sefton et al. 2011; Möhring 2015). It also depends on how mothers choose to acquire pension rights after childbirth, according to their characteristics (see, e.g., Neels et al. 2018 for a comparison between Belgian natives and migrant women), and on how the retirement system takes children into account when calculating pensions by means of the so-called caregiver credits (Möhring 2018).

Indeed, the question of how to "compensate" parents—mainly mothers—for having children is recurrent in public debate on pension reform (Iams and Sandell 1994; Jankowski 2011; Bonnet and Hourriez 2012a; Sass 2016). It goes hand-in-hand with the question of the adequacy of women's social security pensions, particularly in the present context of a trend towards a reduction in survivors' pensions (Jefferson 2009) and an unexpected slowdown in the closing of the gender gap in the labour market over the last decade (Ponthieux and Meurs 2015). In the USA, despite recurrent proposals for Social Security caregiver credits, especially for childcare, such credits have not been implemented (Herd 2006; Sass 2016). In

contrast, the majority of European Union member states have made sure that pension credits for time spent away from the labour market while caring for children are an established component of public pension schemes (Monticone et al. 2008; Bonnet and Geraci 2009). These arrangements usually complement a universal pension arrangement designed to reduce inequalities, mainly by loosening the link between careers and pensions, for example, by means of a minimum pension (Betti et al. 2015) for men and women as well as parents and non-parents alike.

Caregiver credits take different forms from one country to another (d'Addio 2013; Jankowski 2011). In most cases, additional entitlements are granted by attributing extra quarters, points or contributions (depending on how pensions are calculated) to individuals. Caregiver credits may or may not be conditional on withdrawal from the labour market (see d'Addio 2013). Legislation on this point has changed in a number of countries. In a four-country comparison, Bonnet and Geraci (2009) find that caregiver credits in Italy, Germany and the UK were initially available only to parents who were not working, which were mostly mothers; Sweden granted no caregiver credits, since everyone was entitled to a universal pension. However, since the mid-1990s, there has been a trend towards developing caregiver credits with similar characteristics in these four countries. In most cases, even working parents are now entitled to caregiver credits,¹ a change that reflects the fact that childbirth does not necessarily imply withdrawal from the workforce, since there are other ways to achieve a balance between work and family, such as part-time work. This policy is consistent with the goal of encouraging people to continue working during periods of child rearing and, more generally, to accrue pension entitlements throughout their lifetimes. The French system of pension caregiver credits is considered relatively generous (Jankowski 2011). Three programs are offered by all basic schemes, although under different conditions: (1) additional quarters of contributions granted for each child, a benefit that until very recently was made available only to women; (2) granting rights during periods of withdrawal from the labour market to the parent who withdraws in order to raise a child, which is usually the mother; and (3) a proportional increase in the pension of mothers and fathers of three or more children. Caregiver credits amount to EUR 16 billion in 2012, which represents 6.7% of the total payments (excluding survivor's pensions) made by all retirement schemes (Solard 2016).

The primary objective of these caregiver credits is to compensate for the impact that children can have on the careers of parents, especially women, and ultimately on retirement benefits (Bonnet et al. 2013). Children can indeed be considered a risk in terms of accruing pension rights (Anderson and Meyer 2006), and they can be seen as an occupational shock for which pension systems should aim to compensate. Although secondary objectives such as creating incentives for higher fertility or compensating parents for lost savings are sometimes cited, improving the adequacy of benefits for people whose careers are affected by childcare is the main goal (see Brocas 2004 for a historical presentation of caregiver credits in

¹ This has been the case in Germany since the reforms of 1999 and 2002, in Sweden since 1998, and in the UK since 2002.

France). However, the granting of caregiver credits to parents (mothers) can be questioned. Assuming that individuals control their fertility, behaviours associated with having children—particularly in terms of labour market participation—are above all a choice (Bonnet and Hourriez 2012a). Nevertheless, current debates widely support the idea that caregiver credits should be used to increase pensions for parents (especially mothers) whose lower pensions may result from lower lifetime earnings in connection with their commitment to child rearing. While this support can be explained by a desire for gender equality, it may also be because children create positive externalities for society. In particular, they constitute an investment in “human capital” for future economic production (Folbre 1994), and they help to ensure the sustainability of pay-as-you-go pension systems in which current contributors pay the pensions of current beneficiaries.² Lastly, in addition to raising children, women often perform other socially useful tasks that may also affect their presence in the labour market and that would otherwise have to be paid for by the community, such as caring for dependent family members (Bolin et al. 2008). It would therefore be unfair for them to end up being impoverished in retirement compared to men because they have not been able to acquire enough pension rights (Ginn 2004).

Although the main objectives of caregiver credits seem fairly clear, little attention has been paid to their effectiveness in achieving these objectives. As Jankowski (2011, p. 72) points out, “to date, there have been very few studies analysing the effectiveness of caregiver credit programs, and the studies that do evaluate those programs show mixed results” (see, however, Evandrou and Glaser 2003; Stahlberg et al. 2006; d’Addio 2013). France is no exception in this respect. Although two government reports have provided new information on the issue (COR 2008; Fragonard et al. 2015), no evaluation of the effectiveness of caregiver credits has been carried out to date—despite the fact that these arrangements were put in place a long time ago and that the way children affect careers may have changed over time.

The purpose of this article is twofold. First, we document the link that exists in the French private sector between accrued pension entitlements and the number of children for generations that have not yet retired, doing so in order to assess the family pension gap. To our knowledge, we are the first to provide such an assessment. Second, we assess the effects of caregiver credits on pensions in order to analyse the extent to which their existence compensates for the negative effects of children on pensions. Specifically, we focus on women with different numbers of children and examine whether differences in their pension rights disappear when pension credits for caregivers are taken into account. To do this, we use matched career data and demographic data to calculate pension entitlements with and without caregiver credits at each age. We calculate pension benefits based on the assumption that individuals can choose to retire at any age by applying retirement system formulas in order to obtain a measure of accrued pension entitlements at

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² The argument in favour of the sustainability of pension systems is used by those who advocate a closer link between retirement pensions and number of children, both in France (Bichot 1994) and elsewhere (Demeny 1987; Cigno and Werding 2007).

a given time. We look at different French birth cohorts born from 1950 to 1966 in order to analyse changes across cohorts in the possible penalty associated with having children. Our work focuses on women, the main beneficiaries of caregiver credits, but we extend some of our analysis to men. Indeed, two of the three existing caregiver credit programmes in France benefit mainly women, but the third (the pension bonus for mothers and fathers of three children or more) is received by both parents.

The remainder of this paper is structured as follows. The second section presents the pension system with a focus on caregiver credits. The third section describes our method and data set. The fourth section comments on the results. The final section discusses our findings and presents concluding remarks.

2 Institutional Background

2.1 The French Pension System

To the most extent, different occupational groups in France have distinct retirement schemes. In most cases, workers of a given occupational group contribute to several pension schemes: one or several compulsory complementary schemes that top up a basic scheme. People who have contributed to several basic pension schemes receive a pension from each of the schemes. Pension entitlements are calculated according to a set of complex rules that differ depending on the scheme one is affiliated to (as a private sector employee, a civil servant, a self-employed worker, etc.). The general rule is that the pension paid by a basic scheme depends on: the total number of quarters of contributions calculated for all schemes over the individual's entire working lifetime; the number of quarters accrued in the scheme; and the level of past earnings as a member of the scheme. The period of contributions to the scheme, expressed in quarters, includes periods when contributions were paid—that is, periods actually worked—and also periods for which contribution credits were awarded (periods of unemployment, illness and so on). For their part, complementary schemes are based on points. Since only private sector employees are considered in our empirical analysis, we describe below only the main features of the schemes those workers contribute to.

Pensions of Former Private Sector Employees

Private sector retirees receive a pension from the “General Scheme” (*Régime Général*), which is called a “basic pension”, and one or more pensions from compulsory complementary schemes: ARRCO for blue and white collar employees, AGIRC for white collar employees and IRCANTEC for public sector employees who do not have civil servant status. The minimum age of retirement in the private sector is 60.³

³ Beginning in 2011, the minimum age gradually increased for cohorts born after mid-1951; it reached 62 for cohorts born in or after 1955. Simultaneously, the age required for the full rate gradually increased for the same cohorts and reached 67 for cohorts born in and after 1955. For simplification, our presentation maintains the ages 60 and 65.

The benefits received from the General Scheme are calculated as the product of three terms: a rate; a pro rata coefficient that reduces the pension proportionately when the contribution period is shorter than the duration required for a full pension; and a reference wage.

More specifically, the pension formula before the 2010 reform was as follows:

$$P = [50\% \times (1 - d) \times (1 + s)] \times \min \left[\frac{D_{\text{scheme}}}{D_{\text{required}}}, 1 \right] \times w_{\text{ref}} \quad (1)$$

P represents the pension. d and s are, respectively, the penalty and the bonus on the rate. D_{required} represents the number of quarters of contributions required for a full pension, D_{scheme} is the number of quarters acquired in the scheme and w_{ref} the reference wage (see below for a description of all of those parameters).

The terms in the first bracket give the rate. The full rate is 50% (when $d = s = 0$). The rate is reduced ($d > 0$) for people who either retire before age 65 (see footnote 3) or do not have the number of quarters of contributions required for a full pension (D_{required}). The penalty is proportional to the time missing relative to the requirements for the full rate, that is, the number of quarters missing for either reaching age 65 or attaining the required number of quarters of contributions, which depends on the birth cohort. The number of missing quarters taken into account is at most 20, which correspond to the 5 years between age 60 (the minimum age of retirement) and age 65 (the full-rate age). The reduction in the rate for one missing quarter varies between 1.25% (cohorts born after 1953) and 2.5% (cohorts born before 1944) of the pension, depending on the birth cohort, so the rate (without taking the bonus s into account) is between 25 and 50% for cohorts born before 1944 and between 37.5 and 50% for cohorts born after 1953. Since 2003, workers who retire after having attained the minimum age and the required number of quarters of contributions receive a bonus that depends on the number of quarters worked after having fulfilled the two conditions ($s > 0$). In calculating the full rate, the number of quarters considered is the number of quarters acquired in all basic schemes, with the restriction that it is not possible to acquire more than four quarters per calendar year.

The second term ($\min \left[\frac{D_{\text{scheme}}}{D_{\text{required}}}, 1 \right]$) is the *pro rata* coefficient. It represents the ratio of the number of quarters acquired in the scheme over the number of quarters required to reach the full rate and cannot exceed 1.

The third term (w_{ref}) is the reference wage. It is calculated as the average of the worker's highest yearly wages capped by the Social Security ceiling (33,272 € per year in 2008 and 39,228 € in 2017) and adjusted for inflation. The number of years taken into account is between 10 and 25, depending on the birth cohort (Bonnet et al. 2018).

The General Scheme also features a mechanism designed to increase low pensions for people who retire at the full rate, in particular those who retire with a low reference wage. It is called the “minimum contributory pension” (*minimum contributif*). We will not consider this mechanism here because it is not directly linked to accrued rights. Indeed, it is applied after the pension has been calculated. It is nonetheless worth noting that since this mechanism is geared towards recipients of

low pensions and since women and particularly mothers are overrepresented in this group, women are more often beneficiaries of the minimum contributory pension than men (in 2010, 70% of the beneficiaries of the minimum contributory pension were women, see Bridenne and Couhin 2012).

Lastly, all compulsory complementary schemes in the private sector (ARRCO, AGIRC and IRCANTEC) are based on points. Contributions are used to “buy” points. When a worker retires, the total number of accumulated points is converted into a pension by multiplying the number of points by the current value of the point. Workers who retire without qualifying for the full rate (calculated in the same way as in the General Scheme) receive only a fraction of the benefit. Complementary pension schemes may provide a large share of the total pension for high-wage workers. Indeed, while the basic pension scheme is capped at 50% of the Social Security ceiling (excluding the bonus), individuals contribute on wages up to eight times the Social Security ceiling in the complementary schemes.

The French pension system is contributory in that the benefit depends mostly on the individual’s career (duration and wages). However, there exist several non-contributory mechanisms that do not depend on contributions paid from earnings to increase pensions. First, as mentioned above, the minimum contributory pension increases low pensions for people who retire at the full rate. Second, several provisions have been introduced to cover unemployment or disability. Third, various caregiver credits are granted to people who have raised children.

2.2 Pension Caregiver Credits

2.2.1 The Three Forms of Caregiver Credits

France is the country that grants the widest range of caregiver credits (Bonnet and Geraci 2009; Fultz 2011; Jankowski 2011) and for the longest time: (1) additional quarters of contributions granted for each child, a benefit that until very recently was made available only to women; (2) granting rights during periods of withdrawal from the labour market to the parent who withdraws in order to raise a child, which is usually the mother; and (3) a proportional increase in the pension of mothers and fathers of three or more children. The pension bonus for three children or more dates back to when the retirement system was first created in 1945. The two other types of caregiver credits were implemented at the beginning of the 1970s.

In France, most retirement schemes feature those three different forms of caregiver credits, although eligibility requirements and parameters may vary from one scheme to another.

2.2.1.1 Contribution Years for Mothers⁴ (*Majoration de durée d’assurance* [MDA]) This provision increases the contribution period by one quarter for each year devoted to

⁴ Until recently, private sector schemes granted this benefit only to mothers. However, for children born after 1 April 2010, the second four quarters of extra contributions can be granted to fathers or split between both parents upon request.

bringing up a child, up to a maximum of eight quarters per child. They are not conditional on any career break and are not linked to a particular year. They are added to the total number of quarters when the worker retires.

2.2.1.2 Old-Age Insurance for Non-working Parents (*Assurance Vieillesse des Parents au Foyer* [AVPF]) This program gives contribution credits to parents who stopped working or reduced their employment in order to raise children. AVPF was introduced in 1972 and has undergone a number of changes since then. In particular, it was extended to men in the mid-1980s. Entitlement is means-tested⁵ and conditional on receipt of certain family benefits, namely the family income supplement (*Complément familial*) or the early child benefit program (*Prestation d'accueil du jeune enfant* [PAJE]). Given the eligibility requirements of these benefits, AVPF now targets certain types of households: those with at least one child under age three (around two-thirds of beneficiaries, see Fragonard et al. 2015); those with three children or more (around one-third of beneficiaries); and those caring for a disabled child or a disabled adult (very few beneficiaries). In addition, beneficiaries living with a partner must not be employed or their earnings must be below a certain threshold (Fragonard et al. 2015); however, there is no limit on earnings for single parents.

This scheme concerns both men and women, but, in practice, the benefit is rarely paid to men. Contributions are paid by the *Family Allowance Funds* (*Caisse d'allocations familiales*) as if the beneficiary were earning the minimum wage. It should be noted that AVPF does not entitle beneficiaries to any benefits from complementary pension plans. AVPF can benefit workers in all sectors under the same conditions, regardless of the pension schemes they have paid into.

2.2.1.3 Pension Bonus for Parents of Three Children or More This bonus applies to all retirees who have had three or more children. Adopted or fostered children are also taken into account, provided the pensioner has raised them for a period of at least 9 years before the children reach the age of 16. The size of the pension bonus varies from one scheme to another, but it is always proportional to the main pension. Pensions paid out by the General Scheme and by ARRCO and AGIRC (the complementary private sector pension schemes) are increased by 10%. IRCANTEC (the complementary scheme for public sector employees who do not have civil servant status) increases pensions by 10% for three children, plus 5% for each additional child (with a maximum of 30% for seven children or more). Before 2012, ARRCO paid a bonus equal to 5% of the pension and AGIRC paid a bonus equal to 8% for three children, plus 4% more for each additional child (with a maximum of 24% for seven or more children).

This pension bonus is unlike the first two caregiver credit mechanisms referred to above as MDA and AVPF—which benefit mainly mothers—in that the bonus goes to both parents. At its creation in 1945, this specifically French mechanism was a

⁵ In 2017, the household income could not exceed 24,404 yearly € with one child, +5632 € per extra child.

pronatalist policy measure, unlike the other forms of pension caregiver credits that were introduced in the 1970s in order to improve women's pensions.

2.2.2 How Do Caregiver Credits Affect the Pension Benefit?

Each of the three terms for calculating the benefit in Eq. 1 can be modified by caregiver credits. Old-age insurance for non-working parents (AVPF) may affect the reference wage. This effect may be positive, neutral or negative, depending on the individual's wage levels and career length. It is neutral if the year in which the pensioner received the AVPF benefit is not included in the 25 best earnings years used for computing the reference wage, but it is positive or negative if this year increases or decreases the reference wage. For example, the reference wage of a mother with a short (less than 25 years) but well-paid career (always above the minimum wage) will be reduced if the years of AVPF, for which the contributions are at the minimum wage level, are included. Since the number of quarters acquired for a given year depends on a worker's earnings during the year⁶ (up to four quarters), AVPF may increase the number of quarters of contributions to the General Scheme. This in turn may increase the rate if the person did not previously qualify for the full rate, and it may also increase the *pro rata* coefficient if the person did not previously have the number of quarters required for a full pension.

Secondly, contribution years for mothers (MDA) may increase both the rate and the *pro rata* coefficient, since they increase the number of quarters (without being conditional on a break).

Lastly, the bonus for parents of three children or more does not have a direct impact on retirement conditions, but it increases pension levels. It thus alters the conditions of the retirement decision by making retirement more desirable.

3 Methodology and Description of the Data

3.1 Methodology

Our first goal is to determine the impact of the number of children on pension rights. We also want to determine whether mothers and fathers are actually compensated by the mechanisms in France that are intended to compensate them for the supposedly negative effect on their pension entitlement due to having children. To do so, we consider individuals at each age, starting at their entry into the labour market or, more precisely, at the first time they accrue pension rights. We then apply the pension formula for the different schemes to calculate the rights accrued by individuals based on the career elements observed. This approach does not fully correspond to the legal framework regarding pensions, since people cannot retire before reaching the minimum retirement age. However, it allows us to measure the accrual of rights

⁶ For private sector employees, a quarter is not actually defined as a period: a worker acquires a quarter as soon as she has contributed on a wage corresponding to 200 h (150 since 2014) at the minimum wage.

throughout an individual career while including the possible impact of children, and, in addition, we can gauge the role played by caregiver credits because we calculate pensions with and without these credits. Since we calculate entitlements up to relatively young ages (only the 1950 cohort is observed until age 55), the penalty applied to pensions (d in Eq. 1) is maximum for all retirees and, therefore, the rate considered is 37.5% for all the cohorts that we study (33.75% for the 1950 cohort because of the 2003 reform).

Compared to analyses of the impact of births on wages or labour market participation, our approach avoids certain difficulties—in particular, the problem of sample selection that results from the unobserved wages for non-working people (see, e.g., Heckman 1979). It means that the parameter estimates are biased when non-randomly selected samples are used (working people). Indeed, in our analysis, as soon as they enter the labour market, individuals acquire pension rights. Thus, even if they withdraw from paid employment, their pension entitlements are preserved; they simply do not increase during periods when paid employment is interrupted. We even take into account rights accrued during periods of unemployment, illness or disability. Since almost everyone acquires pension rights, even if they are sometimes very low, our samples do not suffer from the problem of sample selection, which simplifies the econometric analysis. Moreover, note that our objective is not to identify a causal impact of children on pension entitlements, but to determine whether caregiver credits achieve their objective, which also simplifies the econometric analysis. Hence, we do not seek to identify the channels through which children might affect pension entitlements, nor do we examine the incentives generated by caregiver credits. In particular, it is not necessary in our analysis to know whether the impact of having children on pensions stems from a decrease in labour market participation, from part-time work, lower wages or from a choice of lower-paid jobs. We determine only whether parents receive lower pensions and to what extent caregiver credits offset the child penalty on pensions. To this end, we successively compute and compare four pension measures for different numbers of children⁷ and for different birth cohorts. The number of children is observed at age 39, which is the latest age of the youngest cohort considered (1966).

The four pension indicators are the following:

Measure A = Pension level before caregiver credits

Measure B = Measure A + old-age insurance for non-working parents (AVPF)

Measure C = Measure B + contribution years for mothers

Measure D = Measure C + pension bonus for parents of three children or more

Comparing those measures will allow us to assess the global impact of caregiver credits on pension levels. However, we also split the impact of caregiver credits on

⁷ Our reasoning is based on the number of children individuals have had. We do not know whether parents actually raised their children after birth (in the event of divorce, for example). Similarly, we do not know how many stepchildren people have raised in the context of stepfamilies, although these children may also have had an impact on pension entitlements.

Table 1 Sample size according to birth cohort. *Source:* EIC 2005 and EDP data sets matched

Birth cohort	Men	Women
1950	1042	1301
1954	1023	1253
1958	1124	1349
1962	1247	1467
1966	1396	1497
Total	5832	6867

pensions—specifically between their effect on the number of accumulated quarters and their effect on the reference wage—in order to understand which determinants of the pension are mainly affected. Our analysis by cohort also gives us samples of people who have lived under similar macroeconomic conditions and experienced the same legislation.

3.2 The Data

We use two datasets: administrative data from French Social Security records (the “Inter-Scheme Sample of Contributors”—*Echantillon interrégimes des cotisants* or EIC) and the “Permanent Demographic Sample”, (*Echantillon démographique permanent* or EDP), a long-term sample that is representative of the French population at different dates. The two datasets are matched by using individual national identification numbers. The EIC provides detailed yearly information on careers, unemployment spells and pension entitlements, including individuals’ annual wages and data on the number of quarters of contributions they have acquired. We use all this information to recalculate pension levels with and without caregiver credits. The EDP collects socio-demographic information on a representative sample of the population of France (excluding overseas territories). It is enriched each year with data from annual census surveys and civil status records, including precise information on births (month and year, rank).

We use the 2005-matched EIC/EDP to study five cohorts born between 1950 and 1966: 1950, 1954, 1958, 1962 and 1966. This long-term perspective enables us to compare different cohorts at a given age. The last cohort we consider was born in 1966; thus, in 2005, the women of this cohort were at age 39 and close to the end of their reproductive lives. As mentioned above, we limit our analysis to individuals who were employed mainly in the private sector and hence contributed mostly to the General Scheme.⁸ Indeed, studying the impact of children on the pension rights of self-employed workers or civil servants is problematic for two distinct reasons. First, it is difficult to trace self-employed workers’ incomes, particularly through data on

⁸ Specifically, we excluded from our analysis workers who have more than 12 quarters outside the General Scheme by age 39. Our sample represents 73% of women (between 71 and 76%, depending on the cohort) and 64% of men (between 61 and 72%).

pension contributions. Second, data on civil servants' earnings are available only beginning in 1978. Nonetheless, career choices determine one's pension scheme, and these choices are not independent from decisions concerning fertility. However, our analysis cannot take this dimension into account.

The sample is composed of 5832 men and 6867 women (Table 1).

4 Results

Our analysis concerns five cohorts (1950, 1954, 1958, 1962 and 1966), but we present results in our graphs for only three cohorts (1950, 1958 and 1966) in order to make the graphs more legible. Patterns for the other two cohorts are very similar.⁹ We first provide descriptive statistics before investigating whether our descriptive results on the links between pensions and number of children still hold after controlling for certain characteristics of parents.

4.1 The Impact of Caregiver Credits on Pensions by Number of Children: Descriptive Statistics

4.1.1 The Impact of Caregiver Credits on Pension Benefits

First of all, we consider Measure A, that is, the pension level without caregiver credits. For all cohorts, pension entitlements are significantly lower for mothers than for childless women (Fig. 1, Measure A). At each age, pensions are quite similar for childless women and mothers of one child, but the child penalty becomes large from the second child onwards, regardless of the birth cohort. Moreover, this penalty increases with age. Indeed, women with two or more children experience slower growth in pension rights with age compared to childless women or mothers of a single child.

We then include old-age insurance for non-working parents (AVPF) in our computation (Measure B). The pension gap between mothers of two or more children and childless women or mothers of a single child is now significantly reduced (Fig. 1, Measure B). The effect of AVPF is less marked for the 1950 cohort than for subsequent cohorts (1958 and 1966). Indeed, because AVPF was introduced in 1972, the 1950 cohort became eligible for the benefit only at age 22, while later cohorts were eligible as of age 18. However, even with AVPF benefits, the child penalty for pensions remains high and it still increases with age.

Our third pension measure (Measure C) includes not only old-age insurance for non-working parents (AVPF) but also contribution years for mothers (MDA). The latter benefit further reduces the child penalty, regardless of the age considered (Fig. 1, Measure C). In particular, including MDA makes the pension entitlement accrual profile similar for mothers of two, three or four children, and it also becomes

⁹ Graphs for the other two cohorts are available on request.

Fig. 1 Different measures of average pension (in constant 2006 euros), according to birth cohort and number of children (at age 39), women. *Note* age is on X-axis; pension level on Y-axis. Measure A: Pension level before caregiver credits; Measure B = Measure A + old-age insurance for non-working parents; Measure C = Measure B + contribution years for mothers; Measure D = Measure C + pension bonus for three children or more. *Source*: Inter-Scheme sample of Contributors (EIC 2005) matched with the Permanent Demographic Sample

similar for childless women and mothers with only one child. Nonetheless, a small gap remains between these two groups. For the youngest cohort, born in 1966, contribution years for mothers actually allow women with two or more children (born before the mother reached age 39) to attain the same pension entitlement as childless women or women with only one child.¹⁰

Lastly, when all three forms of pension caregiver credits are taken into account (old-age insurance for non-working parents, contribution years for mothers, the pension bonus for parents with three children or more), the pension gap between women vanishes almost completely, regardless of the number of children (Fig. 1, Measure D).¹¹ For the youngest cohort (1966) at age 39 (the last age observed for this cohort), it seems that, on average, differences in initial pension entitlement (calculated before taking caregiver credits into account) between childless women and mothers are more than compensated for. In fact, pensions of women born in 1966 increase with the number of children once caregiver credits are taken into account. For the other cohorts, there is still a child penalty, but it is much smaller than in the situation without caregiver credits. In the 1950 cohort, mothers of two children appear to be the most disadvantaged. Indeed, they do not have access to the bonus for parents of three children or more, which is the only benefit having a direct effect on pension levels in complementary schemes. Furthermore, the old-age insurance for non-working parents (AVPF) plays a more limited role for older generations.

Corresponding figures for men highlight the fact that childless men accumulate significantly lower pension entitlements than fathers, which is consistent with the fact that childless men more frequently have a low level of qualification than fathers do and are less often in relationships (Köppen et al. 2017). Among men who have children, there is little difference between ages or cohorts (Appendix Fig. 3). The only caregiver benefit that has a significant impact on fathers is the pension bonus for parents of three or more children, a measure that has no effect on fathers of one or two children.

4.1.2 The Channels Through Which the Effects of Caregiver Credits Pass

As explained in Sect. 2.2, with the exception of the pension bonus for parents of three children or more, which directly affects the pension level, the effect of caregiver credits on pensions may pass through a change in contribution periods or a change in the reference wage—the two main elements used to calculate the pension.

¹⁰ Due to the trend towards postponing motherhood, childless women or those with only one child at age 39 may have different characteristics, depending on their cohort. Thus, the same analysis based on completed fertility (which the oldest cohorts are closest to at age 39) could lead to slightly different findings for cohorts born in the 1960s.

¹¹ Comparing the pension gap at the same age across cohorts leads us to consider individuals who may (on average) be at different stages of their careers, depending on their cohort. In particular, younger cohorts entered the labour market at a later age (see, e.g. Rapoport 2012) and therefore the career length they reach at age 39 will be shorter on average than for older cohorts. This difference in the observation window of different cohorts may create gaps between cohorts.

Table 2 Contribution of caregiver credits to reductions in the pension gap, according to birth cohort and number of children

Birth cohort	Pension gap between 0 and <i>n</i> children	Initial pension gap at age 39 (constant €2006)	Effect through		Residual (%)	Final pension gap at age 39 (constant €2006)
			Contribution years (%)	Earnings measure (%)		
1950	Gap 0-1	123	-172	3	69	-85
	Gap 0-2	816	-51	-3	-46	376
	Gap 0-3	1423	-51	-18	-16	228
	Gap 0-4	1948	-46	-29	-13	253
1954	Gap 0-1	341	-76	-6	-18	62
	Gap 0-2	879	-56	-7	-37	327
	Gap 0-3	1727	-49	-21	-15	267
	Gap 0-4	2444	-40	-36	-11	313
1958	Gap 0-1	265	-99	-19	18	-47
	Gap 0-2	780	-61	-16	-23	179
	Gap 0-3	1502	-53	-31	3	-41
	Gap 0-4	2273	-41	-45	-2	49
1962	Gap 0-1	731	-35	-11	-54	395
	Gap 0-2	533	-101	-26	27	-144
	Gap 0-3	1466	-56	-41	18	-268
	Gap 0-4	2365	-38	-56	8	-178
1966	Gap 0-1	-41	691	153	-944	-384
	Gap 0-2	362	-156	-44	100	-363
	Gap 0-3	1251	-64	-56	45	-560
	Gap 0-4	1979	-48	-70	35	-691

For the 1950 birth cohort, the initial pension gap at age 39 between mothers with two children and childless women reaches 816€ (per year, in constant 2006 euros). The initial gap does not take any pension caregiver credits into account. Including these benefits increases the contribution years of mothers with two children, reducing the gap by 51% (the gap reaches 399€); these benefits also increase the earning measure slightly and induce a further decrease in the gap by 3% (the gap reaches 376€). This is the final gap, as the third caregiver credit (the pension bonus for three children or more) does not benefit these mothers with two children. The remaining gap equals 46% of the initial one

In order to highlight the influence of caregiver credits on these two elements, we apply the same methodology as before: we first compute contribution periods and the reference wage without caregiver credits; we then introduce each of the three types of caregiver credits in turn. Results by birth cohort are reported in Appendix Figs. 5 and 6, and they are summarized in Table 2. For each cohort, we compare the raw average pension (without any caregiver credit) of mothers, depending on their number of children (1, 2, 3 or 4+) with the average pension of childless women, at age 39. This is the initial gap (third column of Table 2). We then calculate the gap after taking into account caregiver credits (last column). Then, we calculate the contribution of each of the possible channels (contribution years, earnings measure, pension bonus) to reducing the gap (see the footnote after Table 2, for example). A positive percentage indicates that the gap is increased, while a negative percentage signals that it is decreased. A decrease of more than 100% (ex: -172%) means that the gap is more than closed: it is inverted. Lastly, the column entitled “residual” gives the reduction still required to completely close the gap.

Additional periods of contributions due to caregiver credits (old-age insurance for non-working parents or contribution years for mothers) offset between one-half and two-thirds of the initial difference in pension entitlements between women with and without children. This compensation is higher for women with a single child in the oldest cohorts (1950–1958) and for women with two children in the 1966 cohort. Initial inequalities among women born in 1966 are relatively small; thus, the contribution years for mothers (MDA) are sufficient to compensate or even overcompensate it (effects that exceed (in absolute value) -100% in Table 2).¹²

Only the old-age insurance for non-working parents (AVPF) affects the reference wage. Compared to additional periods of contributions, AVPF generally contributes less to the reduction of the child penalty in pensions, especially for the oldest cohorts. For example, the change in the reference wage for women with two children reduces the initial pension gap by only 3% for the 1950 cohort and 7% for the 1954 cohort (Table 2). However, this effect is much larger for the cohorts born in 1962 (26%) and in 1966 (44%); this is because AVPF has gradually become widespread since it was introduced in 1972. Specifically in regard to our sample, 35% of mothers in the 1950 cohort who had a child before age 39 benefited from AVPF as compared to 44% in the 1954 cohort and 50% in the youngest cohorts. Similarly, 57% of the women with two children in the 1950 cohort benefited from AVPF compared to 72% in the 1966 cohort.

Moreover, this caregiver credit has a much larger impact on the reference wage of mothers with three or more children compared to mothers with one or two children. The main explanation is that AVPF more frequently benefits women with low pay and short careers, thus having a greater effect for them, and it is mothers with three or more children who are more often in this situation. Additionally, AVPF initially targeted families with three children or more but was subsequently extended to

¹² The effects (in percentage terms) are positive and appear to be very high among women born in 1966 (comparison of childless women and mothers with one child). This results from the low level of the initial gap (41€).

Fig. 2 Marginal effect of the number of children on pension entitlements at age 39, according to birth cohort (in constant 2006 euros, annual). *Note* the number of children is at age 39; childless women are the reference category. We control for level of education, pension entitlement at age 20, number of children at age 20, age at entry into the labour market, age at the first stable job, and birthplace. Interpretation: all things being equal, the expected annual pension at age 39 for two-child mothers of the 1950 birth cohort is around 800 euros lower compared to childless women (Measure A). If we include old-age insurance for non-working parents (Measure B), the penalty is only slightly reduced. If we also take into account contribution years for mothers (Measure C), the gap with childless women is reduced to about 400 euros. There is no further reduction when we also include the bonus for three children or more (Measure D), as the mothers of two children are not concerned. *Source:* Inter-Scheme sample of Contributors (EIC 2005) matched with the Permanent Demographic Sample (EDP)

smaller families. As a result, for mothers from the youngest cohorts who have three or more children, the effect of AVPF on the reference wage may even exceed the effect of added contribution years for mothers.

Finally, the pension bonus for parents of three children or more directly increases the pension without passing through contribution periods or reference wage. The impact slightly increases from one cohort to the next and is higher for mothers of three children than for those with four or more children. Indeed, mothers of four or more children have lower pensions on average and therefore their gain from this (proportional) bonus is also lower on average.

4.2 Marginal Effects of Children on Pension Entitlements at Age 39: Regression Results

Up until now, our analysis has ignored the fact that women's characteristics may differ depending on the number of children they have; and this is especially true in

regard to their level of education, which affects career opportunities. In this section, we investigate whether our results still hold after controlling for certain characteristics. The answer is largely positive.

Given the administrative origin of our data, few socio-demographic characteristics are available, but we can control for variables that are assumed to influence pension entitlements, such as wages or educational attainment. Using OLS regressions, we compute the marginal effect of the number of children (at age 39) on pension entitlements at age 39, using the different measures of pensions defined in Sect. 3.1. We control for level of education, pension entitlement at age 20, number of children at age 20, age at entry into the labour market, age at the first stable job and birthplace. Childless women are the reference category.

Without caregiver credits, each additional child has a cumulative negative impact on pension entitlement (Measure A). For the first child, the effect is only slightly significant; it is more pronounced for the second one and for subsequent children. Using the 1954 birth cohort at age 39, for example, we see that each additional child “costs” a woman around 500€ in lost pension rights (Fig. 2). The effect is similar for all the birth cohorts considered.

When old-age insurance for non-working parents (Measure B, Fig. 2) is taken into account, the penalty for the first two children is only slightly reduced. For three children or more, the reduction is much larger. Old-age insurance for non-working parents decreases the penalty by 30–50%. We also observe that the estimated effect is slightly larger and more precise for the youngest cohorts, which is consistent with the increasing use of this program. Next, extra contribution years for mothers (Measure C, Fig. 2) have a large impact. The magnitude of the effect is similar to that of old-age insurance for non-working parents for the third child and subsequent children, and it is larger for the first two children. Taken together, these two forms of caregiver credit offset the child penalty in almost all cases, regardless of the number of children and the birth cohort. Only mothers born in 1950 and 1954 who have two or three children have lower pension entitlements, even with these two forms of caregiver credit: their child penalty is still negative and significant.

Lastly, when the pension bonus for parents of three children or more is taken into account, we find the expected increase in the pension entitlements of mothers of three children or more; the marginal effect of having children on pension rights is even slightly positive when taking into account the combined effect of the whole package of caregiver credits (Measure D, Fig. 2). In particular, for women with three or more children, the child penalty is completely offset for the 1950 and 1954 birth cohorts. All in all, when the bonus for three children or more is added, a penalty remains only for mothers of two children in the oldest birth cohorts (1950 and 1954).

Note that including caregiver credits for women born in 1966 (and, to a lesser extent, in 1962) even induces a “bonus” for mothers of four or more children (and for mothers of three children in the 1966 cohort). However, given the trend towards postponing motherhood, women in the 1966 birth cohort may not have reached the end of their child-bearing years at age 39, unlike women in the older cohorts. As a consequence, the distribution of women by the number of children they have had at

age 39 might not have exactly the same meaning for the youngest cohorts and the oldest ones.

For men, the effect of having a child is the same on average and when observable characteristics are controlled for. Fathers accrue more rights than childless men, and the gap is greatest for fathers of two, three or four children (Appendix Fig. 4). Taking pension bonuses for parents of three children or more into account increases the gap only for fathers of three or more children (however, the differences between the effects for the different measures are not significant).

5 Discussion and Conclusion

This paper adds to the small but growing literature on the impact of children on financial outcomes in later life, such as pension benefits. Using administrative data from French Social Security records matched with census data, we calculated the increase in pension entitlements of private sector employees from five cohorts (1950, 1954, 1958, 1962 and 1966) throughout their careers, year by year. By basing our approach on comparing accrued pension entitlements rather than pensions, we do not have to take into account retirement decisions, which are highly dependent on individual choices. We then compared people's accrued rights depending on how many children they have. Finally, we examined the effect of the three caregiver credit programs in the French pension system: old-age insurance for non-working parents, additional contribution quarters for mothers and the pension bonus for mothers and fathers of three or more children. For the cohorts studied, having children without caregiver credits leads to a reduction in pension entitlements at all ages for women, and this penalty increases with their number of children. In contrast, there is little difference between fathers with different numbers of children, while men without children have accrued lower pension rights. We showed that caregiver credits significantly reduce differences between women and in fact offset them in almost all cases, regardless of the number of children and the birth cohort. When caregiver credits are included in the pension calculation, women from the youngest cohorts (especially the 1966 cohort) who have had four or more children by age 39 even have higher pensions than other women. For men, the only caregiver credit that really matters is the bonus for parents of three children or more: it increases the pensions of these fathers without changing other men's pensions. These results hold when conducting a multivariate analysis that allows us to control in particular for education, age at entry into the labour market and situation at age 20.

As a result, pension caregiver credits could be considered an element of a generous French family policy. Thus, under the combined effect of both increased female labour force participation and caregiver credits, mothers born in 1950 and later have pension rights that are very similar to those of childless women, regardless of how many children they have had. Hence, caregiver credits contribute to reducing the inequalities in women's pension rights induced by having children, in particular for mothers of three or more children.

The design of French caregiver credits implies that they compensate and often overcompensate for mothers' shorter contribution periods. There are,

nonetheless, some persistent gaps due to differences in the earnings levels used to compute pension benefits—gaps that are not completely compensated for. This result has policy implications. By not only offsetting career breaks but also providing extra quarters of contributions independently of career breaks, legislation enables mothers from the cohorts under study to qualify for a full pension at a younger age. Indeed, we found that the total contribution period (including caregiver credits) at a given age increases with the number of children. Although this mechanism seems positive at first sight, it has unintended consequences. First of all, mothers can retire earlier than men or childless women, a result that is not necessarily desirable in a context where policymakers generally want people to postpone retirement. Second, because they retire earlier, these mothers retire with lower pensions. Indeed, caregiver credits in the basic scheme compensate only partially for the impact of children on wages, while complementary retirement schemes do not grant any caregiver credits. If the choice of retirement age is viewed as a trade-off between retiring early with a lower pension and retiring later with a higher pension, caregiver credits in France clearly encourage the first option. This has an influence on inequalities between men and women and on inequalities among women. In this perspective, it would be interesting to add to our study the dimension of educational attainment by allowing heterogeneous impacts of caregiver credits. Children are indeed known to have different effects on women's careers—and thus on their accrual of pension rights—depending on a mother's level of education. It follows that the compensating effect of caregiver credits may also be different.

In future, pension inequalities by number of children and also pension inequalities between men and women will stem from persistent wage gaps rather than from gaps in contribution periods (Bonnet and Hourriez 2012b). In the present context of pension reform, our findings could provide direction for policy. If differences in earnings become the main source of pension inequalities between men and women and between mothers and childless women, caregiver credits should compensate for low average lifetime earnings rather than for short work histories in order to improve the adequacy of old-age benefits for parents and especially for mothers. Finally, although the penalty on accrued pension entitlements due to having children seems to be well compensated for by the French pension system, it could increasingly be accompanied by another penalty that is not directly compensated for at present: the penalty due to work interruptions late in one's career to care for an elderly dependant (see Evandrou and Glaser 2003 for a discussion of the British case).

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Appendix 1: Effect of caregiver credits on average pension, depending on the number of children and birthcohort, men

see Figs. 3, 4.

Fig. 3 Effect of caregiver credits on average pension, depending on the number of children and birth cohort, men. *Note* age is on X-axis; pension level on Y-axis. Measure A: pension level before caregiver credits; Measure D=Pension level including all caregiver credits. *Source:* French Contributor Inter-Scheme sample (EIC 2005) matched with the Permanent Demographic Sample (EDP)

Fig. 4 Marginal effects of the number of children on pension entitlements at age 39, according to birth cohort (in constant 2006 euros, annual). *Note* the number of children is at age 39; childless men are the reference category. We control for level of education, pension entitlement at age 20, number of children at age 20, age at entry into the labour market, age at the first stable job and birthplace. *Source*: Inter-Scheme sample of Contributors (EIC2005) matched with the Permanent Demographic Sample (EDP). Interpretation: all things being equal, the expected annual pension at age 39 for two-child fathers of the 1950 birth cohort is roughly 1100 euros higher compared to childless men (Measure A). When considering Measure D, which includes all caregiver credits, the bonus is increased for fathers of three children or more. The gap reaches roughly 1500 euros

Appendix 2: Breakdown of the Effects of Caregiver Credits on Pension Calculation

The Impact of Caregiver Credits on the Contribution Period

When no caregiver credits are included, the graphs for the number of quarters by age and number of children are fairly similar to those for pensions (Fig. 5). However, from a certain age—which increases with the number of children—the differences between contribution periods stabilize regardless of the number of children, reflecting the fact that after a certain age women increase their contribution periods at the same pace, regardless of how many children they have. Thus, at age 55, the contribution periods of women in the 1950 cohort had reached 117, 99, 86 and 70 quarters for mothers with one, two, three and four or more children, respectively. Having at least a child results in a contribution duration that is shorter by about 2.8 years on average. The gap is similar at age 39. When AVPF (old-age insurance

Fig. 5 Different measures of contribution years, according to birth cohort and number of children (at age 39), women. *Note* age is on X-axis; contribution years on Y-axis. *Source*: Inter-Scheme sample of Contributors (EIC 2005) matched with the Permanent Demographic Sample (EDP)

for non-working parents) is taken into account (Measure B), differences in duration are virtually netted out at all ages. For example, at age 55, mothers in the 1950 cohort had acquired 119, 106, 112 and 113 quarters with one, two, three and four or more children, respectively. The gap is therefore much smaller, but it still persists for the mothers of two children who could not fully benefit from the AVPF, which was introduced in 1972 (such mothers were 22 years old in 1972, and some of them already had two children). In the 1966 cohort, the number of quarters at age 39 is the same for all women regardless of the number of children, except for mothers of four or more children who have slightly fewer quarters of contributions. Since AVPF already significantly reduces differences in quarters according to the number of children, taking MDA (contribution years for mothers) into account (eight quarters per child) (Measure C) completely reverses the order of the curves and transforms the initial penalty into a bonus: the number of quarters of contributions at a given age increases with the number of children.

The Impact of Caregiver Credits on the Reference Wage

The effect of caregiver credits on the reference wage is less striking. AVPF (old-age insurance for non-working parents) reduces the differences in reference wage that appear relatively early and tend to increase over time, but it does not offset them completely (Fig. 6). In particular for the 1966 cohort at 39 years of age, the reference

Fig. 6 Earnings measure (in constant 2006 euros), according to birth cohort and number of children (at age 39), women, with and without old-age insurance for non-working parents (Measures A and B). Note age is on X-axis; earnings measure on Y-axis. Source: Inter-Scheme sample of Contributors (EIC 2005) matched with the Permanent Demographic Sample (EDP)

wage of childless women is equal to that of mothers of one child (Measure A). And compared to the reference wage of mothers with one child, that of mothers with two children is 10% lower; that of mothers with three children is 30% lower; and that of mothers with four or more children is 43% lower. AVPF reduces these differences. Indeed, the reference wage of mothers with three or more children is “only” 10% lower than the reference wage of mothers with one child when AVPF is taken into account. For the 1950–1962 cohorts, the impact of AVPF is less significant. For the 1950 cohort at age 39, differences in the reference wage without AVPF are quite similar to those of the 1966 cohort (although they are slightly higher between mothers with one or two children and childless women). With AVPF, the differences remain significant: on the order of 20–25% for mothers of three or four or more children (compared to childless women).

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