Allowing People with Lower Life Expectancies to Retire Earlier: What Are the Outcomes of the Reforms Implemented in France Since 1970?

Patrick Aubert*

Abstract – The reforms that have been implemented in France since the 1970s have greatly increased the options for retiring early with a full-rate pension, the idea being that this would benefit those individuals presumed to have the shortest life expectancies. These options were initially aimed at individuals who had been declared unfit for work, but they are now largely based on having worked a full career, with this criterion intended to benefit persons who started working at a younger age, who are presumed to be in poorer health. However, although the life expectancy at 60 years of age of this latter group is indeed lower, this trend is only observed for those who started their careers before the age of 20 for men and 18 for women. In practice, no positive relationship can be observed between life expectancy at 60 years of age and the age at which a person is entitled to retire with a full-rate pension. Among women, the relationship even appears to be negative.

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Keywords: pension reform, early retirement, retirement age, length of career, life expectancy

**Institut des Politiques Publiques (IPP).* Correspondence*: patrick.aubert@ipp.eu*

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The French pension system was introduced in 1945 with the aim of allowing persons covered by social security a "freedom of choice"[1] with regard to their retirement age, with the minimum age set at 60. In practice, this system provided for the adjustment of the pension amount depending on the recipient's retirement age, so as to compensate for the impact of earlier or later retirement on the amount of time for which the pension was paid out. Those retiring later, resulting in a shorter retirement, would receive a higher pension amount, while those taking earlier retirement would receive a lower pension amount to counterbalance the increased duration of their retirement owing to it commencing at an earlier age. More specifically, during the calculation of pensions for the general pension scheme, this adjustment would involve multiplication by an age-dependent pension rate. This rate was set, in 1945, at 20% for those retiring at the minimum age of 60, increasing by four percentage points for each year by which retirement was delayed beyond that age. This scale did not strictly equate to an actuarial scale,[2] but it wasn't far off: for example, retiring at 64 years of age rather than 65 years of age resulted in a 10% reduction, which is roughly equal to (albeit a little more than) the increase in the length of retirement associated with taking early retirement at this age, which is around 8%.

However, in addition to these general principles of actuarial neutrality, the pension system has, from the very start, provided for derogations allowing certain individuals considered to have suffered "premature wear and tear on the body" to take early retirement. In practice, this option manifests as the ability to retire at the minimum age of 60 at what is considered to be the "full" pension rate, normally only granted to those retiring at 65 years of age, which therefore enables people to obtain the same level of pension (at a given wage and length of career) while retiring five years early.

These provisions have subsequently been gradually broadened, by extending the existing arrangements and by creating new early retirement schemes, initially to grant the full pension amount, but later to reduce the minimum age of entitlement (Box 1). Initially included by way of derogation, they now represent a significant majority, to the point that retirement at the full rate from the minimum age of entitlement (i.e. 60 until 2010, 62 following the reform in 2010, and finally 64 following the full implementation of the 2023 reform) is today often seen as the "normal" retirement situation. The fact remains, however, that the *unconditional* retirement age for receipt of the full pension rate has never actually been lowered in France. It remained at 65 until 2010, after which it was increased to 67, with retirement before that age at the full pension rate only being permitted *under certain circumstances*.

1. This expression is used here with the definition applied to it during the 2003 pension reform: freedom of choice is understood to mean that an individual will not be penalised financially if they choose to retire later and, likewise, will not gain an advantage in terms of the cumulative amount of pension received as a result of retiring at the earliest possible opportunity.
2. In other words, a scale for calculating pensions, such as age-dependent pension reductions or increases, aims to offset the impact of early or delayed retirement on the total pension amount received (paid over the entire retirement period). With a scale of this type, the total pension that a person can mathematically expect to receive (taking into account the probability of dying at each age and pension revaluations) is identical regardless of retirement age at a given level of contribution.

Box 1 – **40 Years of Reforms Aimed at Allowing Certain Individuals to Retire Earlier**

From the outset, the ordinance of 1945 "establishing the social insurance scheme applicable to persons employed in non-agricultural occupations" granted certain individuals the possibility of retiring from the age of 60 with a pension rate usually granted to persons at the age of 65. The derogation provided for therefore forms the basis of the current scheme of granting the full rate to persons deemed unfit for work; however, it is more restrictive, since it makes the benefit subject to a person having paid into the system for at least 30 years. The scheme is therefore conditional on the presence of a number of factors that allow every person today to take early retirement, assessed on an individual basis: incapacity for work observed at the time of retirement or exposure to hardship criteria during the course of a career, and the fact of having worked a full career (in other words, the fact of having contributed at least the statutory number of quarters "required for the full rate"). It was only with the introduction of the law of 1971 "improving old-age pensions under the general social security scheme and the scheme for salaried agricultural workers" that pension coverage was expanded for those unable to work, since this law removed the condition stipulating the number of quarters to be contributed and the reference to strenuous jobs as a cause of disability.

The law of 1975 "relating to the conditions of access to retirement for certain manual workers" extends the possibility of benefiting from the pension rate normally granted to individuals at the age of 65 at a younger age to "salaried manual workers who have contributed a large number of quarters". Its implementing decrees set the necessary contribution period at 43 years, then 42 years and finally 41 years. The law therefore introduced, for the first time, the criterion of career length as a condition for obtaining the full rate at a younger age, although it still retained a second condition concerning the "manual" nature of the work. It should also be noted that the number of quarters required was then set with a higher threshold than the statutory length of a full career, as is used to calculate the pension amount (i.e. 37.5 years following the law of 1971). ➔

Box 1 – *(contd.)*

The law of 1975 also provides for a second early retirement case, aimed at working-class mothers who have raised at least three children. The provisions aimed at women were expanded significantly by the law of 1977 "granting women covered by the general social security regime the old-age pension at the rate normally applicable to persons reaching the age of sixty-five upon reaching sixty years of age", which this time provided for early retirement at the full rate for all women who had worked a full career (37.5 years at the time).

The ordinance of 1982 "relating to the lowering of the retirement age for individuals covered by the general scheme and the agricultural social insurance regime" was intended to shift the focus by defining what was previously regarded as a derogating framework for early retirement as a benchmark situation. Where the ordinance of 1945 defined the pension rate as a minimum rate in the event of taking retirement at 60 years of age, increased by postponement coefficients in the event of delaying retirement to an older age, the ordinance of 1983 officially introduced the concept of "full rate" as a reference rate (equal to 50% of the reference wage), supplemented by reduction coefficients (now referred to as discounts), calculated on the basis of the number of missing contributions for employees who have not yet contributed the full 150 quarters by the time they reach 60 years of age. In spite of this change of focus, 65 is still the age at which an individual can obtain the full rate without being subject to any conditions. Although the ability to obtain the full rate at the age of 60 on the basis of the number of quarters contributed is not officially considered an early retirement scheme, with the law instead presenting it as the general case, it can still be considered as such by comparing it with the situation in which the full rate is obtained unconditionally.

While the reforms implemented between 1975 and 1983 pushed the criterion of the number of quarters contributed by way of justification for early retirement at the full rate without the need for an individual to be officially declared unfit for work, this still hinged on the assumed poorer health of the social categories that would benefit from the reform in question. For example, the report submitted prior to the ordinance of 1982 highlighted the fact that "*blue- and white-collar workers who started working at a young age pay contributions towards their pension over a longer period of time, but benefit from that pension over a shorter period of time [...] this ordinance will help to reduce these social inequalities*". However, the legislator failed to adopt an actuarial approach, which would have sought to modify the return on a year of pension contributions according to career characteristics. It is, above all, the normative vision that it must be possible for individuals to retire once they have worked a full career that appears to underpin the scheme.

The early retirement provided for in the pension reforms leading up to the 1983 reform allowed individuals to benefit from the full rate before reaching 65 years of age, but not before reaching the minimum age under common law, which was set at 60 years in 1945. In the reforms adopted from the 2000s onwards, the focus of the regulatory changes was no longer on early retirement at the full rate, but on lowering that minimum age. The 2003 pension reform therefore created the scheme allowing early retirement for those having worked a long career, allowing them to retire at the full rate from the age of 56. As indicated by the *long* career qualifier, this scheme is conditional on having contributed a higher number of quarters than that which allows individuals to benefit from the full rate upon reaching 60 years of age: the former therefore requires eight additional quarters when compared with the latter, in other words, a total of 42 years of contributions, compared with 40 years in order to obtain the full rate at 60 years of age for the generation reaching that age in 2003. A further two conditions must also be met: one concerning a minimum *contribution* period (in other words, the number of quarters contributed reduced to just those relating to periods of employment, as well as a very limited number of other quarters) and the other concerning the age at which the individual started work. The early retirement scheme for those who have worked a long career was subsequently amended (restriction in 2008 followed by extensions in 2012 and 2023); however, these changes retained the initial characteristics, in particular, the condition of having a minimum contribution period (thereby keeping it more restrictive than the total number of quarters contributed, even though certain quarters accrued by means other than employment are now included in that contribution period) and of having started work at a certain age.

The reforms that have taken place since 2003 have also created various schemes aimed more specifically at disabled individuals who have been declared unfit for work or at individuals who have performed arduous work, for example the early retirement schemes for disabled people (aged 55 and over) created in 2003 and those aimed at individuals suffering from a work-related permanent disability or those benefiting from the allowance for persons working with asbestos (both from 60 years of age) created in 2010, or even the scheme aimed at taking into account the arduous nature of certain jobs, which was introduced in 2014. The 2023 pension reform kept the minimum retirement age for individuals declared unfit for work or disabled persons at 62, while gradually increasing the minimum age under common law to 64.

Although the early retirement schemes have undergone significant change since 1945, they are all still conditional on at least one of the three main reasons for early retirement that have been present from the outset: official recognition of an incapacity for work, the performance of harmful activities during a career that are likely to result in premature wear and tear or the fact of having worked for a long time. The reforms that have served to create or broaden early retirement schemes on the basis of these criteria have always justified this, with varying degrees of assertiveness, by pointing out the link between those criteria and poor health or a reduced life expectancy. However, when these reforms were discussed, this link was only assessed in qualitative terms. In other words, the creation or extension of early retirement schemes was frequently justified in the explanatory memorandums by the shorter retirement

or poorer health experienced during retirement of the presumed beneficiaries; however, none of the proposed reforms has ever been based on ex-ante evaluations of these differences in the length of retirement with a view to verifying that the early retirement is indeed in proportion to the differences in life expectancy or healthy life expectancy *actually observed* based on the criteria used to define early retirement.

This relationship is still relatively poorly studied in the scientific literature. Although many analyses have been dedicated to differences in mortality and life expectancy between social categories, these do not generally take into consideration the criteria used by the French pension system to determine the age at which people can retire with a full pension (Box 2). This study therefore aims to precisely assess the link between the conditions for obtaining a full pension and differences in mortality. It looks at all of the schemes that have been created or reformed since the 1970s with a view to offering an assessment from the perspective of inequalities in the length of retirement resulting from correlations between mortality and the characteristics incorporated into the pension scales used to determine retirement age. In order to do so, it relies on the DREES *échantillons interrégimes de retraités* (Inter-Scheme Samples of Retirees – EIR), which allow us to monitor retirement characteristics across generations for a period of almost 50 years. The first part describes the data used and the main indicators and concepts discussed in the analysis. The second part then goes on to describe the trends in early retirement with full-rate over the generations. The next part presents an estimate of the differences in life expectancy based on the criteria that determine the award of the full pension amount in order to assess whether and to what extent these criteria offset these differences and mitigate inequalities in the length of retirement.[3]

3. Additional findings not presented and discussed here are available in French in a working paper version of this study (Aubert, 2024).

Box 2 – **Life Expectancy and Retirement Characteristics in France: What Does the Scientific Literature Tell Us?**

The link between life expectancy and the age at which the French pension system allows an individual to retire is still relatively poorly studied in the scientific literature. Indeed, although many analyses have been dedicated to differences in mortality between social categories, these do not generally take into consideration the precise regulatory criteria used to determine the age at which individuals can retire with a full pension. Research in the international literature generally relates to inequalities in income. For France, Blanpain (2018) highlights a substantial difference in life expectancy (up to thirteen years) between the wealthiest and the poorest individuals, with more marked differences being observed among men than among women. Many French studies have also highlighted differences in life expectancy according to socio-professional category, profession or even education (see, for example, Blanpain, 2024). At 35 years of age, the life expectancy of executives is therefore around six years higher than that of blue-collar workers for men and around three years higher for women; a difference that has changed little since the 1970s. It becomes even more pronounced when we consider life expectancy without disability (Cambois *et al*., 2008).

Although these findings are well-known and well-documented, they provide little information regarding the relationship between the disparities in the ages at which individuals are able to retire at the full rate within the French system and differences in life expectancy, as there is no clear link between income or social category and obtaining the full rate. For example, many retired executives were able to retire at 60 years of age, while certain blue- or white-collar workers had to wait until they reached 65 years of age in order to obtain the full rate, owing to their incomplete careers. Some analyses have focused on differences in life expectancy according to retirement characteristics, but they are less common. Within the confines of the general scheme, Goujon (2019) estimates significant differences in life expectancy (between four and six years depending on gender) between individuals receiving a "normal" pension and those receiving a pension aimed at those who have been declared unfit for work or who are disabled. However, no details are provided regarding the differences in life expectancy among recipients of normal pensions according to the age at which they obtained the full rate or the length of their career. Several recent studies have looked at retired civil servants (Buisson & Senghor, 2016; Bulcourt *et al*., 2022), but once again from the point of view of analysis based on the category that said civil servants belong to or their profession. Looking at all schemes together, Aubert & Christel-Andrieux (2010) and Andrieux & Chantel (2013) took their analysis slightly further by detailing the differences in life expectancy and the length of retirement according to the number of pension quarters contributed. They demonstrate that these differences are smaller than the gap between the two legal retirement age limits (i.e. 60 and 65 for the generations included in the study) and that, although a negative correlation is actually observed between life expectancy and length of career, this is only true of the longest careers (beyond 40 years), since the correlation for careers of 40 years or less actually appears to be positive. On the basis of data pertaining to the general scheme, the *Secretariat-General* of the *Conseil d'orientation des retraites* (Pension Advisory Council, COR) (2014) returned similar findings, placing the point at which the correlation between life expectancy and length of career turns negative at 42 years rather than 40 years. Here, too, the findings are nevertheless insufficient to allow us to assess the relationship between the full rate scales within the pension system and differences in mortality, as they do not break down the latter according to *all* of the factors that determine eligibility for the full rate.

1. Data and Indicators

1.1. The Sample Used

The findings presented in this article are based on data from the *échantillon interrégimes de retraités* (Inter-Scheme Sample of Retirees – EIR) compiled by DREES (the statistical directorate of the French Ministry in charge of Social Affairs). This sample is established by collecting and harmonising administrative data from the information systems of almost every mandatory pension scheme (general scheme, special schemes and statutory supplementary schemes). The coverage of the analysis is therefore all pensioners living in France, across all schemes – a robustness analysis is nevertheless available in Online Appendix S3 concerning the coverage excluding civil servants and those covered by special schemes given the specific nature of the rules of these schemes in terms of retirement age (link to the Online Appendix at the end of the article).

The EIR includes information regarding pension amounts and their composition within each pension scheme, as well as the factors determining the amounts received: age and circumstances of the receipt of pension entitlements, pension quarters contributed and points, reference wage, etc. The individuals included in the sample were selected based on their day of birth. However, not all generations (or years of birth) of pensioners are included: only one in every two or three (depending on the age group) of the oldest generations are observed. It was therefore only possible to present findings below for certain generations observed in the EIR.

The first wave of the EIR looked at the situation of pensioners as at 31 December 1988, then new waves were collected every four years up until the wave relating to the situation as at the end of 2016 (the wave concerning the situation as at the end of 2020 was being finalised, and thus not available, at the time of writing of this article). The information included and the coverage of the sample (most notably in terms of the generations selected) have been steadily expanded over time, such that the number of observations has steadily increased. The 1988 EIR therefore covered 20,000 pensioners, while the 2016 wave included almost 650,000.

It is possible to observe the mortality of the pensioners included in the EIR thanks to information provided by INSEE regarding the month and year of death based on data from the *Répertoire national d'identification des personnes physiques* (National Register for the Identification of Individuals – RNIPP), supplemented by information on deaths submitted by pension funds. In this study, we use mortality observations from the last ten years available, i.e. from 2012 to 2021. The estimate of the differences in life expectancy depending on retirement characteristics is based on the cohort of persons directly entitled to pension payments, residing in France and born in or before 1950 (this generation having been chosen as it is the last generation that can be considered as almost entirely retired in the most recent wave of the EIR available at the time of conducting this study, i.e. 2016). The EIR data allow for the direct calculation of mortality quotients per year, gender and age; however, as they are only a sample of the population, these are often noisy. In addition, owing to the selection criteria used for the generations included in the sample, not all ages are observed for all years, since the EIR only includes one in two or three of the oldest generations. The mortality quotients for each retirement characteristic are therefore smoothed prior to calculating life expectancies (see Online Appendix S1).

1.2. Monitoring Trends Over Generations

It is not possible to compare retirement characteristics from one generation to the next on the basis of pensioners still alive at a given date, as, on such a date, not all generations are observed at the same age. Indeed, the characteristics of the population of pensioners changes for a given generation depending on the age at which they are observed, since mortality is itself dependent on retirement characteristics. In this study, comparisons are therefore made across all persons in each generation who are resident in France and who have availed themselves of a direct pension entitlement, regardless of their date of death (provided that they died after having retired).

In practice, all persons observed are included in at least one wave of the EIR as soon as they have availed themselves of a direct pension entitlement, regardless of whether or not they are still alive in the last available wave. In addition, a correction has been made for generations entering into the EIR late, who were therefore not observed immediately from the age at which they retired. For example, the oldest generation observed, those born in 1906, would have been 82 years of age during the first wave of the EIR (which concerned pensioners at the end of 1988), so the characteristics of pensioners born in 1906 who died before reaching 82 years of age are not known. This bias, which is linked to the composition of the sample, is corrected for by

reweighting each pensioner using the inverse of the probability that they will have died between the age at which they retired and the age at which they are first observed in the EIR. We therefore overweight pensioners who, in view of their characteristics, have the greatest risk of dying before being observed in the EIR, such that the distribution of retirement characteristics is representative of all persons in receipt of a pension and not just surviving pensioners. An individual's probability of death is itself estimated on the basis of the average probability of dying at each age within the group of pensioners with the same characteristics as the individual in question. We used the characteristics that best determine mortality: whether or not an individual has been declared unfit for work, cross-referenced with the amount of pension received (broken down into ten groups for persons considered fit for work and four groups for those declared unfit for work). Separate estimates are made for each gender and generation group (born before or after 1930). In reality, these estimates concern the difference between the probability of dying for each category and the average probability estimated by INSEE (the French National Institute for Statistics) for each gender, age and year. These differences are smoothed using the method described in Online Appendix S1.

1.3. The Age at which Individuals Start Work and "Obtain the Full Rate"

Two breakdown criteria are used to study the adequacy of the pension system with regard to social inequalities affecting life expectancy:

- The **age at which an individual starts work**, since this is very frequently raised in the public debate in France as the dimension that appears, for many people, to be the most appropriate for regulating retirement options. This idea is generally based on a simplified vision of careers, in which individuals start work once they have completed their studies and then pursue their careers continuously until such time as they can retire on a full pension: according to this vision, the age at which an individual retires appears, with a given required period, to essentially be determined by the age at which that individual started work.
- The **age at which the individual "obtains the full rate"**, since this reflects the normative dimension of pension rules, insofar as these do not adopt a completely neutral presentation of the various possible ages at which people can retire, instead focusing on a specific age, namely the age at which the individual can "retire on a full pension".

The age at which an individual starts work is considered to be the age reached during the year in which they recorded the first quarter of their retirement insurance period following a period of employment. This information is provided directly by each scheme in the EIR, and we used the minimum age for all schemes combined. Unfortunately, the information is fully or partially missing for certain schemes, in particular those for civil servants, for farmers and agricultural workers, and for certain liberal professions, as well as for certain special schemes. For these schemes, we therefore imputed the age of the first contribution by assuming that the majority of individuals concerned remained enrolled in the scheme on a continuous basis from starting work through to their retirement.[4]

As regards the retirement age, this article deliberately moves away from other analyses performed in this area, which generally focus on *actual* retirement ages. These may actually be misleading when it comes to assessing pension scales. For example, a person who retires at 60 years of age with a five-year pension penalty[5] (due to the fact that they are not entitled to a full-rate pension before age 65) may appear to be in the same situation as a person who retired at the same age at the full rate; however, this does not reflect the reality, since the first person is penalised with a lower return on the pension quarters they have contributed when compared with the second person. The former effectively has their pension reduced in addition to it being calculated on a pro rata basis according to the length of their career. Conversely, a person retiring at 65 years of age with a five-year bonus (due to the fact that they could have retired with full-rate at age 60) may appear to be less privileged due to their shorter retirement period; however, this disadvantage should be offset against the increased payments that more or less compensate for the lost years of retirement in terms of the total amount of benefits received over the entire retirement period. We have therefore defined an "age at which the full rate is obtained" indicator, which we will use in the remainder of this study. This is calculated as the actual retirement age plus any discounted period or minus any bonus period. In the previous

4. A robustness analysis is available in Online Appendix S2 based on data from the échantillon interrégimes de cotisants *(Inter-Scheme Sample of Contributors – EIC). These allow for a more precise measurement of the age at which individuals started working, but at the cost of noisier results due to the reduced sample size. The estimated differences in life expectancy appear to be similar.*

5. The pension penalty is implemented through a reduced pension rate, the reduction being proportional to the number of years (5 years in the example) that the person should wait before being entitled to retire with full-rate.

examples, the amount received by the individual retiring at 60 years of age with a five-year pension penalty is therefore equivalent to them having obtained the full rate at 65 years of age, while the amount received by the individual retiring at 65 years of age with a five-year bonus is equivalent to them having obtained the full rate at 60 years of age. The definition of the age at which an individual obtains the full rate stems, in this case, from the idea that the adjustment of the pension amount according to retirement age is strictly calculated in relation to a "pivot" age: the age at which each individual obtains the full rate is therefore the pivot age used to calculate any penalties or bonuses, taking into account the actual retirement age of that individual.[6]

1.4. Interpretation of Life Expectancy Inequalities

This article takes a descriptive approach: we attempt to illustrate the correlations between the mortality observed within the various categories of pensioners (which determines the life expectancies, and therefore the length of retirement, of individuals within these categories) and the ages at which individuals start work or obtain the full rate, without questioning the possible causalities that could explain some or all of these correlations.

We make no attempt to understand the retirement behaviours of individuals, and in particular to establish whether the pension rules mean that there is an "optimal" retirement age for each individual, which would maximise the amount of pension that they could expect to receive given their retired life expectancy, nor do we attempt to determine whether individuals actually start drawing their pension at that age. As mentioned in the previous sub-section, we do, however, acknowledge the normative nature of the French pension system, the rules of which highlight the reference to the "full rate" – the majority of retirements recorded still take place at the age when this rate is obtained.[7] It should be pointed out that this concept of full rate originates from the formula for calculating pensions in annuity-based schemes and therefore primarily concerns basic pension schemes; however, since the 1983 reform, obtaining the full rate in these schemes also involves the cancellation of the pension penalty (i.e. the reduction in the amount of pension received applied in the event of early retirement) in supplementary schemes, which means that, in practice, this concept proves to be decisive in all of the statutory schemes.

In order to interpret the correlations observed between life expectancy and the age at which the full rate is obtained, we take the approach developed in Aubert (2015). This provides a global assessment of the inequalities between categories in terms of the differences in pension return, while also neutralising some of the redistribution mechanisms that can affect this return. By granting the full rate at different ages depending on the characteristics of the individuals in question, the pension system actually implicitly redistributes sums between said individuals, since the early payment of the full rate effectively results in an increase in the pension return at a given retirement age. Such redistributions can only be considered to be correcting inequalities in mortality if they serve to neutralise the differences in the contribution gap between individuals (i.e. the difference between the contributions paid throughout their working life and the payments received throughout their retirement) by counterbalancing the mechanical disadvantage suffered by individuals with lower life expectancies with the earlier payment of the full rate. In other words, the scale that determines the age at which the full rate is obtained based on the characteristics of the individuals in question would be implicitly consistent with a profile of life expectancies differentiated according to those characteristics, insofar as the balance of contributions were the same for all individuals in the event of retirement at the full rate and taking into account life expectancies. In order to assess the relevance of the full rate scale in view of its objective of correcting differences in life expectancy, we must compare the theoretical differences that are consistent with this scale and the differences observed empirically at the various ages at which the full rate is obtained. In reality, however, the situation is more complex than this, as the French pension system is by no means seeking just to equalise the actuarial differences between all individuals in terms of the contributions paid and the pensions received. It also aims to correct many other inequalities and therefore to perform further redistributions in addition to those linked to life expectancy: between persons who have suffered occupational accidents and those who have not experienced unemployment or sickness, between women and

6. However, the age at which the full rate is obtained, as defined above, must not be seen as a counterfactual simulation, which would correspond to the age at which the individual would have retired had they decided to wait until they were eligible to receive the full rate. A counterfactual of this type would also actually depend on the ability of individuals taking their pension with a discount to continue working beyond the age at which they actually retired.

7. Furthermore, according to Briard & Mahfouz (2011), although the amendment of the discount and bonus scales during the 2003 pension reform made it possible to come very close to a situation of actuarial neutrality at the margin, these scales remained slightly below the values that would fully guarantee such neutrality, meaning that retirement at the full rate remains a priori optimal from the point of view of return.

men, between large families and those with few or no children, etc. The theoretical differences in life expectancy to be taken into consideration in order to judge the full rate scale on the basis of the characteristics of the individuals in question therefore do not fully balance out the differences between contributions and the amounts paid out, which would be measured by *total* return indicators, such as the internal rate of return or the recovery rate. This would actually amount to removing these other redistributions (which concern characteristics that may themselves be correlated with differences in life expectancy), whereas they are explicitly targeted and assumed as objectives of the pension system. For the purposes of the analysis, we will take advantage of the fact that the formula used to calculate pensions in the general pension scheme is the product of three independent terms (pension rate, prorating coefficient,[8] and reference wage). We assume that these three terms each independently express the various redistribution objectives of the pension system. We will therefore assume that the redistribution in accordance with potential differences in mortality is only targeted via the pension rate, in other words, that the system only seeks to correct these differences at a given reference wage and prorating coefficient. Under these conditions, the differences in life expectancy that are implicitly consistent with the full rate scale correspond to the exact opposite of the differences in the age at which the full rate is obtained.

It should be noted that this also disregards the fundamental question as to whether the pension system is indeed justified in correcting disparities in life expectancy or not. Although these disparities have been explicitly cited in order to justify certain changes to the full rate scale (see Box 1), the general principle of pooling of individual longevity risk[9] is still used as the benchmark and still serves to justify the failure to take account of other differences in life expectancy, in particular those observed between men and women. A fundamental ambiguity, philosophical in nature, therefore still remains, which we will not seek to discuss here.

2. Taking Early Retirement at the Full Rate: What Changes Have Occurred Over the Generations?

Almost one third of those born in 1906 who retired before the "Boulin" Act came into force in 1971 benefited from the full pension rate before the normal retirement age of 65 years (Figure I). Around two-thirds of these retired due to incapacity for work, while the remaining third retired under a primary scheme that did not apply a pension penalty (civil service or special schemes). The proportion of pensioners benefiting from the full rate before reaching 65 years of age then increased sharply among the generations born during the 1910s as a result of the reforms implemented during the 1970s. Almost six in ten pensioners born in 1918, who retired just before the 1983 reform, were able to take early retirement at the full rate: four in ten as a result of incapacity for work – with this scheme having been expanded through the removal of the full career condition and its extension to former war deportees – and three in twenty under special or civil service schemes. A further one in twenty retired at the full rate before the age of 65 by virtue of their long career, thanks to new schemes introduced by the reforms in 1975 (careers in excess of 41 years for manual labourers) and 1977 (women having worked a full career). By extending the possibility of retiring at the full rate having worked a full career to men, the 1983 pension reform brought about a 20-point increase in the proportion of pensioners obtaining the full rate before reaching the age of 65, from around 60% to almost 80% of all pensioners with a direct pension entitlement. This proportion then remained relatively unchanged up until the 1950 generation, with the exception of a slight rise linked to the increase in the length of women's careers. The figure stands at around 85% for pensioners born in 1950.

It should be noted that the 1983 reform was not followed by an immediate increase in the proportion of individuals retiring at the full rate before the age of 65, rather by a very gradual increase up until the generation born in 1930. This can be explained by the fact that, on the one hand, in 1983, many seniors benefited from the "*Garantie de ressources*" pre-retirement scheme, which was more advantageous than retirement in terms of the amount received and in which the beneficiaries preferred to remain until such time as they were no longer entitled to it, rather than taking early retirement; and, on the other hand, that the reduction in the age at which individuals who had worked a full career could retire at the full rate to 60 was not expanded to include the scheme for farmers, which, for these generations, still represented a large proportion of pensioners, until 1986, and was not fully implemented until 1990.

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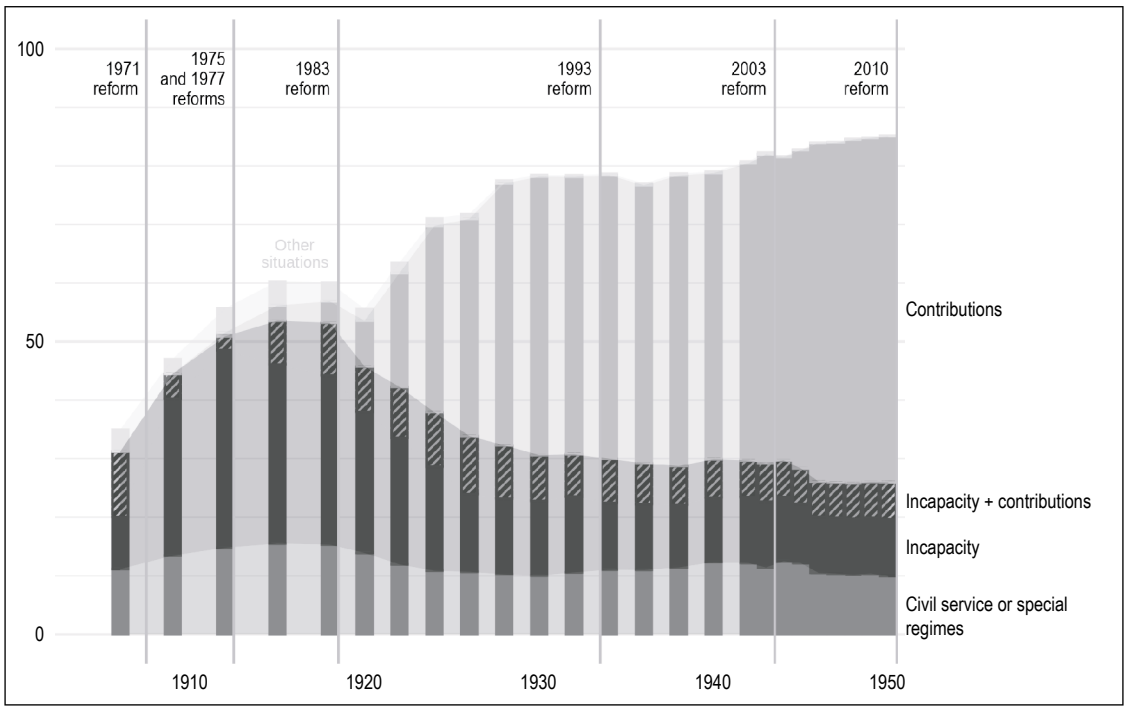
8. The prorating coefficient expresses the proportion of the actual career length against the statutory career length defined as that of a full career. This coefficient is limited to 100%.

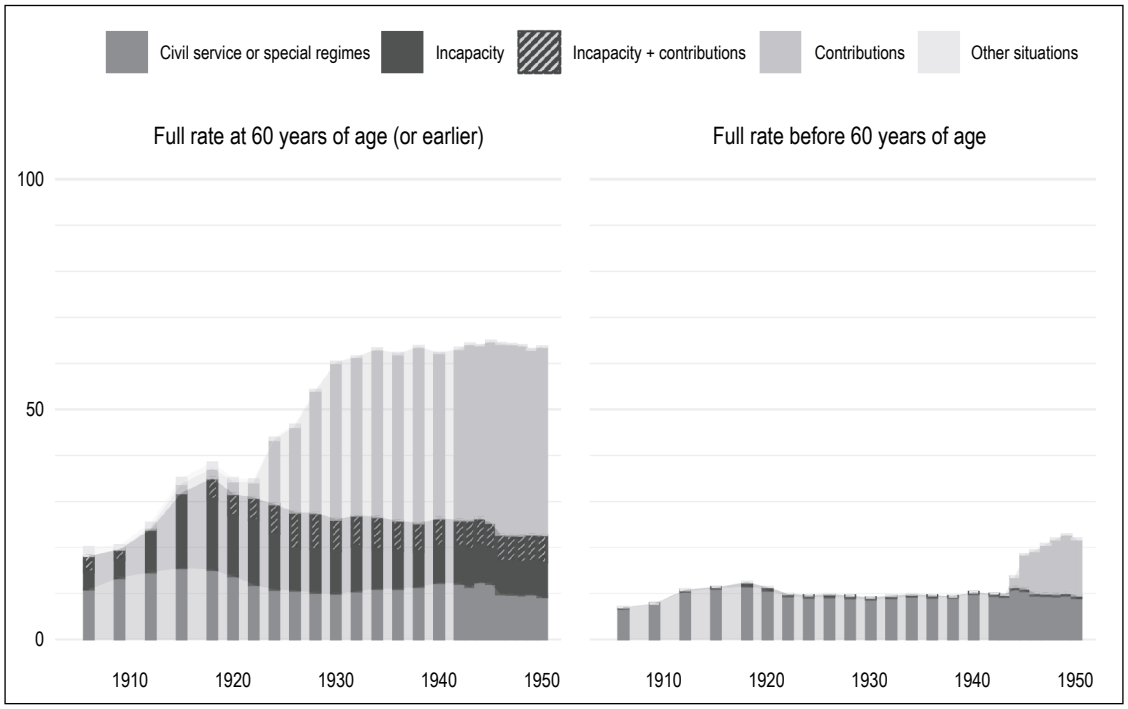
9. In other words, the financial risk associated with the payment of a lifetime annuity (paid throughout the life of the pensioner benefiting from said annuity) taking into account the uncertainty surrounding the beneficiary's date of death.

Figure I – **Proportion of pensioners belonging to each generation obtaining the full rate within their primary pension regime before reaching at age 65 (as a %)**



Notes: The bars in the lightest shade of grey (Other situations) represent cases of early retirement at the full rate, the reason for which cannot be precisely identified due to incomplete data in the EIR. In addition, retirement purely on the basis of incapacity for work (not combined with working a full career) is completely impossible for the generation born in 1906; the fact that it appears in this graph may be the result of errors in the EIR data for this very old generation.
Coverage: All persons resident in France who have availed themselves of a direct pension entitlement (regardless of their date of death, provided that they died after having retired).
Sources: *Échantillon interrégimes de retraités* (EIR), DREES.

Figure II – **Proportion of pensioners belonging to each generation obtaining the full rate within their primary pension regime at or before at age 60 (as a %)**

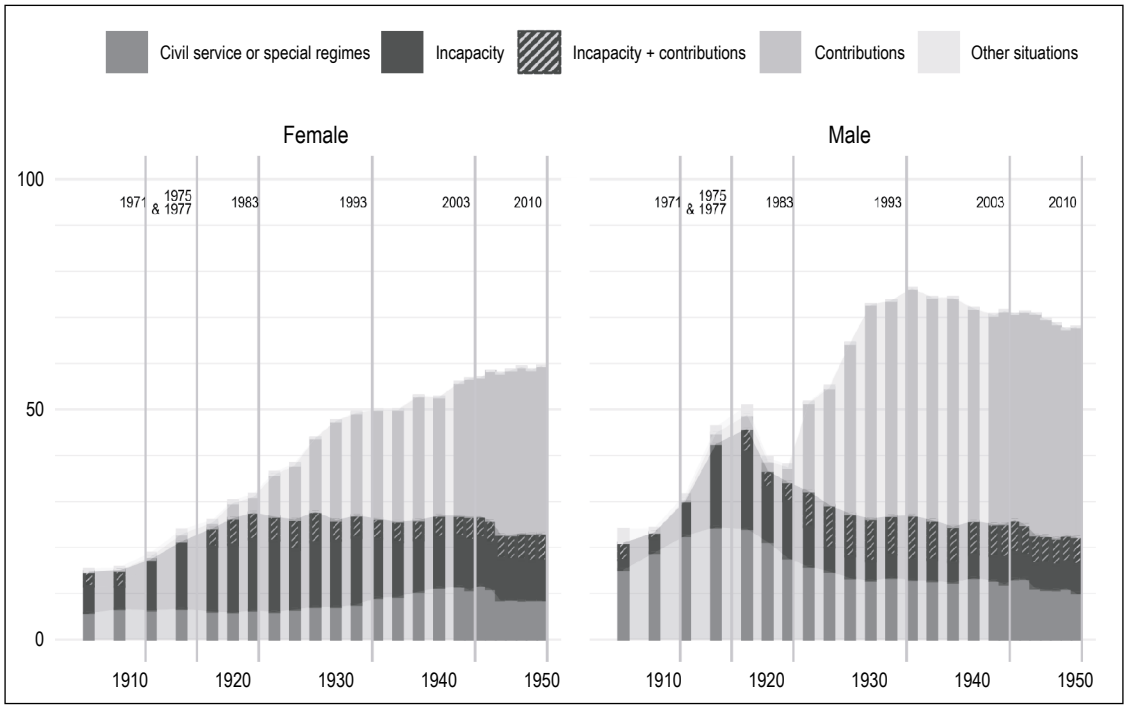


Notes: The "other situations" modality (bars in the lightest shade of grey) denotes cases of early retirement at the full rate, the reason for which cannot be precisely identified due to incomplete data in the EIR.
Coverage: All persons resident in France who have availed themselves of a direct pension entitlement.
Sources: *Échantillon interrégimes de retraités* (EIR), DREES.

The changes appear to be similar – albeit for smaller proportions – if we consider the proportion of pensioners obtaining the full rate from 60 years of age, or even earlier (Figure II). Around one in five pensioners belonging to the generation born in 1906 obtained the full rate at 60 years of age. The proportion is lower than those obtaining the full rate at 65 years of age since, although the majority of disabled persons retired at the full rate at the age of 60, for older generations, incapacity for work was often recognised at an older age. The proportion of pensioners receiving the full rate from 60 years of age was slightly less than 40% just before the 1983 reform, and a little over 60% following the full implementation of said reform, up until the 1950 generation. Early retirement at the full rate before the minimum age under common law (i.e. before reaching 60 years of age) was less common. Up until the generations born in the early 1940s, it represented around one in ten pensioners and exclusively involved special and civil service schemes. It then expanded after 2003 following the establishment of early retirement for individuals having worked a long career, and applied to a little over 20% of pensioners born in 1950.

Across almost every generation, men are more likely to benefit from the full-rate pension from the age of 60 than women (Figure III). Among the older generations, they are more likely to benefit from the incapacity for work scheme and are more likely to retire under a special or civil service scheme; men belonging to younger generations are more likely to benefit from the possibility of retiring at the full rate having worked a full career. In this respect, the 1983 reform served to widen the gap between women and men, partly due to the fact that, in reality, women already had the opportunity, prior to 1983, to retire at the full rate having worked a full career (a possibility introduced by the 1977 reform), but in particular as a result of men having longer careers with fewer interruptions than women on average. While the gender gap was around 10 percentage points among the oldest generations, it was around 25 points just after the 1983 reform came fully into effect, in other words, for the generations born in the early 1930s. However, the gap has been closing steadily since then: while the proportion of women retiring at 60 years of age at the full rate continued to trend upwards due to the gradual increase in the length of their careers, a steady decrease was observed among men with effect from the generations born in the mid-1930s due in particular to the increase in the amount of time required in order to qualify for the full rate, introduced by the reforms in 1993 and 2003.

Figure III – **Proportion of pensioners obtaining the full rate within their primary pension regime at age 60, by gender (as a %)**



Notes: The "other situations" modality (bars in the lightest shade of grey) denotes cases of early retirement at the full rate, the reason for which cannot be precisely identified due to incomplete data in the EIR.
Coverage: All persons resident in France who have availed themselves of a direct pension entitlement.
Sources: *Échantillon interrégimes de retraités* (EIR), DREES.

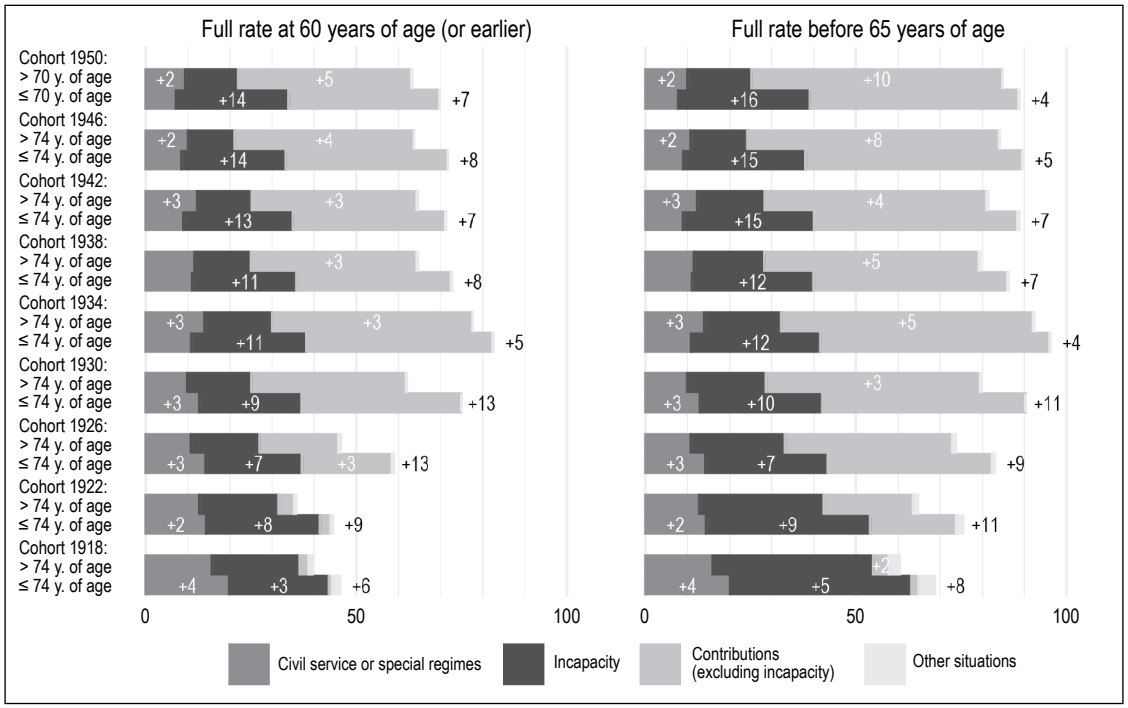
We stop our analysis at the generation born in 1950, as this is the last generation to have fully retired – and for which the distribution of ages at which individuals obtained the full rate can therefore be described – in the most recent wave of the *échantillon interrégimes de retraités* (Inter-Scheme Sample of Retirees – EIR) available at the time of writing this article. We will therefore not illustrate the early retirements under the new schemes created by the reforms in 2010 (for example, early retirement due to permanent disability) and 2014 (professional prevention account aimed at preventing hardship); however, there are very few of these in practice.

Does the existence of opportunities to take early retirement at the full rate ultimately allow those who die younger to retire earlier? Among the oldest generations, for which we now have an adequate time lag, a larger proportion of the pensioners who died the earliest[10] actually benefited from the possibility of retiring at the full rate at 60 years of age or earlier than those who died later, regardless of which generation they belonged to (Figure IV). However, the difference is fairly modest, with the largest difference being recorded for the generation born in 1930 at 13 percentage points, followed by 7 points for the generation born in 1950 and 6 points for the generation born in 1906.

The fact that the pensioners who died the earliest are more likely to retire at the full rate at 60 years of age can be explained primarily by the incapacity for work scheme. The proportion of pensioners belonging to the most recent generations who benefited from this is 14 percentage points higher among those who died early than for those who died at an older age. The difference is less marked among the older generations, undoubtedly due to the fact that certain beneficiaries were automatically recognised as being unfit for work by virtue of their status

10. The analysis was conducted among people still alive at 66 years of age (the youngest age at which a generation can be considered as almost entirely retired) and those who reached this age during a four-year EIR wave. The EIR sampling plan does not allow the same exercise to be carried out for pensioners from all generations and for those who died before the age of 66, as the sample does not include all of these pensioners owing to its four-yearly intervals. The analysis also groups pensioners according to whether they died early (under 74) or later (74 and over). The age of 74 was arbitrarily chosen as the limit for grouping pensioners according to the age at which they died as it falls more or less in the middle of the average retirement period. For the generation born in 1950, for which there are no death observations until 2021, we used 70 as the threshold age.

Figure IV – **Proportion of pensioners obtaining the full rate within their primary pension regime before reaching age 65, according to the age at which they died (as a %)**



Reading note: Among those pensioners born in 1950, the proportion of individuals obtaining the full rate at age 60 (or earlier) is 7 percentage points higher among those who died at or before the age of 70 than among those who died after the age of 70. The proportion of those who obtained the full rate at age 60 owing to their incapacity for work is in particular 14 percentage points higher among those who died at a younger age. Conversely, the proportion of pensioners who obtained the full rate at age 60 or earlier under a special or civil service regime is 2 points higher among pensioners who died after the age of 70.
Coverage: All persons who have availed themselves of a direct pension entitlement, residing in France, still alive at age 66 (or at age 67 for the 1926 and 1930 generations, and at age 70 for the generation born in 1918, due to the limitations associated with the composition of the EIR).
Sources: *Échantillon interrégimes de retraités* (EIR), DREES.

as former war deportees, a characteristic that is less well correlated with the state of health than the fact of being disabled or declared unfit for work by a medical professional. The difference here works in the opposite way with regard to obtaining the full rate based on career length, particularly among the generations born after 1930. Pensioners who died at an earlier age are therefore *less likely* to have obtained the full rate at 60 years of age or earlier on the basis of having worked a full career than those who lived longer. This finding is in itself a first indication of the very imprecise targeting of the career length criterion aimed at persons with a lower life expectancy – we will look at this in more depth in the next section. Lastly, early retirement at the full rate as provided for by certain schemes (civil service or special schemes) have a more marginal impact, which has evolved over time. Pensioners covered by these schemes who belong to the oldest generations are more likely to have died earlier, whereas the opposite is true among the most recent generations.

3. Does Adjusting the Number of Quarters Required in Order to Obtain the Full Rate Help to Correct Inequalities in Life Expectancy?

The findings presented at the end of the previous section do not provide a direct answer as to whether the pension rate scale helps, on the whole, to reduce the inequalities in retired life expectancy. Indeed, the existence of a *qualitative* link between age of death and probability of benefiting from early retirement is not sufficient: any such link must also be *quantitative* in nature, in other words, the extent to which the full rate is obtained early should be proportional to the reduction in the number of years of retirement.

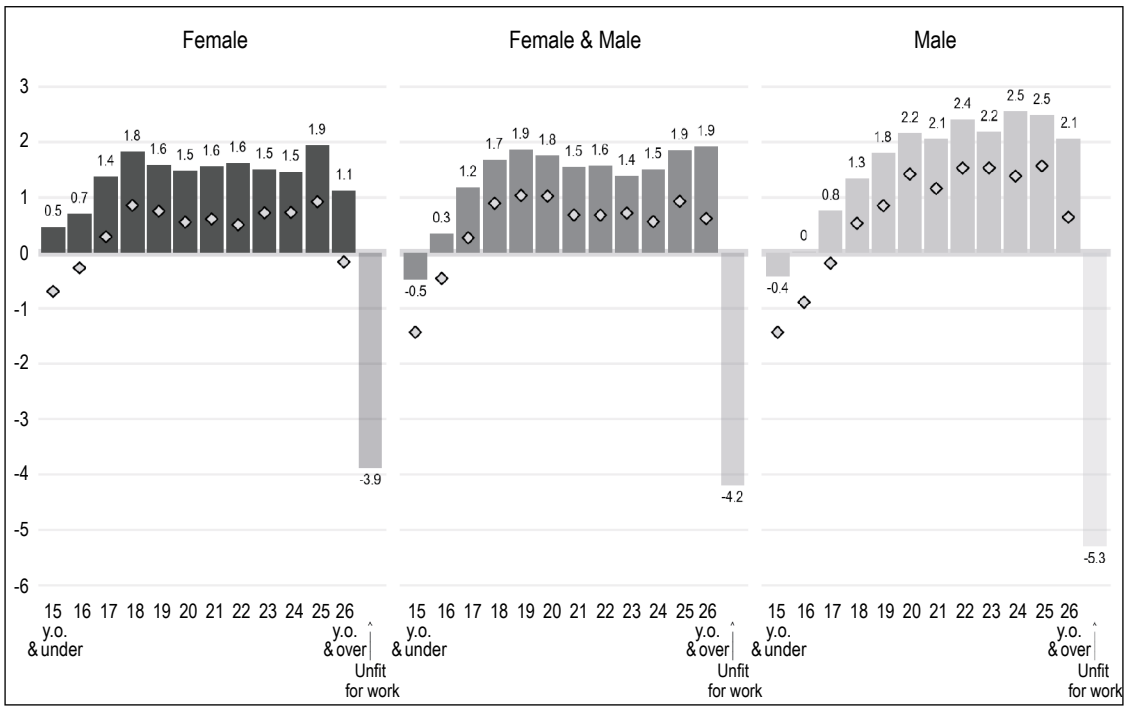
3.1. Shorter Life Expectancy Among Individuals Who Started Working at the Youngest Age

With mortality measured during the period from 2012 to 2021, according to the data from the *échantillon interrégimes de retraités* (Inter-Scheme Sample of Retirees – EIR), individuals who started contributing towards their pension at 16 years of age or earlier for women, or 17 years of age or earlier for men, had a lower than average life expectancy, while those who contributed their first pension quarter after these ages had a higher than average life expectancy (Figure V). Life expectancy at 60 years of age increases in a near linear manner in relation to the age at which an individual started work up to the age of 18 for women and 20 for men, and then remains more or less constant after these ages. However, it is a little lower for individuals who contributed their first pension quarter after the age of 25: this category includes individuals who experienced significant difficulties in inserting themselves into the labour market, as well as immigrants who arrived in France at an older age.

However, from the point of view of pension scales, differences in life expectancy according to the age at which an individual started work are only of relevance for those who have not been declared unfit for work at the time of their retirement, since those declared unfit for work are awarded the full rate as soon as they reach the minimum age, regardless of the length of their career. Among individuals who have not been declared unfit for work, only men who began their career at the age of 15 or younger have a life expectancy that falls below the average for their generation by 0.4 years, or around five months. Women who have not been declared unfit for work who made their first contribution between the ages of 18 and 25 have a life expectancy around 1.5 years higher than the average for women, while men who have not been declared unfit for work who started their career between the ages of 19 and 26 have a life expectancy between 2 and 2.5 years higher than the average for men. Differences in life expectancy depending on the age at which an individual starts work appear less diffuse than the ages at which an individual obtains the full-rate pension: they are at most three years for individuals who have not been declared unfit for work (between men who started their career at the age of 15 or earlier and those who started their career at the age of 24), while the ages at which individuals retire at full rate sit within a range of five years up until 2003 (from 60 to 65 years) and nine years after 2003, following the introduction of early retirement following a long career.

Conversely, pensioners declared unfit for work, including those who were disabled prior to their retirement, have a life expectancy that falls well below the average: a difference of four years for women and five years for men. It is important to note that this difference roughly corresponds to the possibilities for early retirement defined for each category at the time of the introduction of the pension system in 1945, with persons declared unfit for work granted a pension rate at 60 years of age that would normally be granted at 65 years of age, in other words, five years later.

Figure V – **Difference in life expectancy at age 60 compared with the average for the generation, according to the age at which individuals started work**



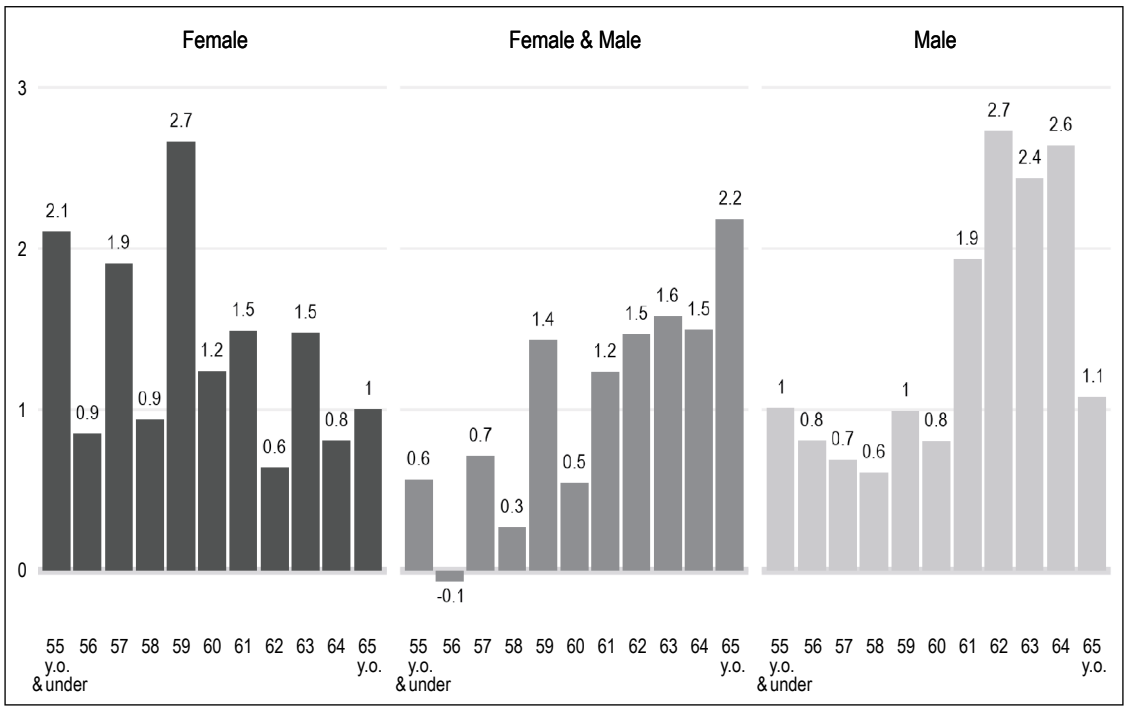
Notes: The estimates broken down by the age at which individuals started work are calculated for pensioners, excluding those who have been declared unfit for work or who are disabled, since the life expectancy of those groups has been estimated separately. The grey diamonds indicate life expectancy according to the age of starting work with those who have been declared unfit for work or who are disabled having been reintegrated into each age category. The age at which an individual starts work is defined as the age at which they recorded their first pension quarter following a period of employment. We have assumed that the generations born between 1946 and 1950 have the same differences in mortality according to the age at which they started work throughout their retirement period as were observed between 2012 and 2021.
Coverage: Pensioners born between 1946 and 1950; differences in mortality estimated on the basis of the period from 2012 to 2021.
Sources: *Échantillon interrégimes de retraités* (EIR), DREES; INSEE; demographic assessments and population projections for 2021-2070 (central mortality scenario).

3.2. A Less Clear Correlation between Life Expectancy and the Age at Which the Full Rate Is Obtained

Nevertheless, the age at which an individual starts work only partially determines the age at which each individual will obtain the full rate, since, among other factors, this also depends on any career gaps, as well as on the interaction between the time at which the required duration is reached and the age limits (minimum age of entitlement, referred to as the "legal age" in the French public debate, and the age at which the pension penalty is cancelled). The deviations in life expectancy from the average are therefore shown directly in Figure VI, according to the age at which the full rate is obtained. We have limited this to those pensioners who have not been declared unfit for work, since the life expectancy of pensioners declared unfit for work is shown in Figure V.

There is no clear link between life expectancy at 60 years of age and the age at which the full rate is obtained. In addition, as was seen with the disparities associated with the age at which an individual starts work, the differences appear to be much narrower (a maximum of around 2 to 2.5 years) than the actual ages at which the full rate is obtained. Among men, it is clear that pensioners who obtained the full rate between the ages of 61 and 64 have a higher life expectancy than those who obtained the full rate at 60 years of age (between +1.9 and +2.7 years compared with the average for the generation, against +0.8 years); however, pensioners who were not able to retire at the full rate until they reached the age at which the pension penalty was cancelled, i.e. 65 years of age, have almost the same life expectancy as those who received the full rate from the minimum age (+1.1 years compared with the average for the generation). Men who took early retirement, i.e. before the age of 60, have a similar life expectancy to those who obtained the full rate at 60 years of age. Among women, the link between life expectancy and the age at which the full rate is obtained is even less clear. Those who were able to retire at the full rate at 60 years of age have a higher life expectancy than certain categories of pensioners who received the full rate at a later stage, and the highest life expectancies at 60 years of age are observed among categories of pensioners taking early retirement.

Figure VI – **Difference in life expectancy at age 60 compared with the average for the generation, according to the age at which individuals obtained the full rate**



Coverage: Pensioners born between 1946 and 1950, excluding those declared unfit for work and the disabled; differences in mortality estimated on the basis of the period from 2012 to 2021.
Sources: *Échantillon interrégimes de retraités* (EIR), DREES; INSEE; demographic assessments and population projections for 2021-2070 (central mortality scenario).

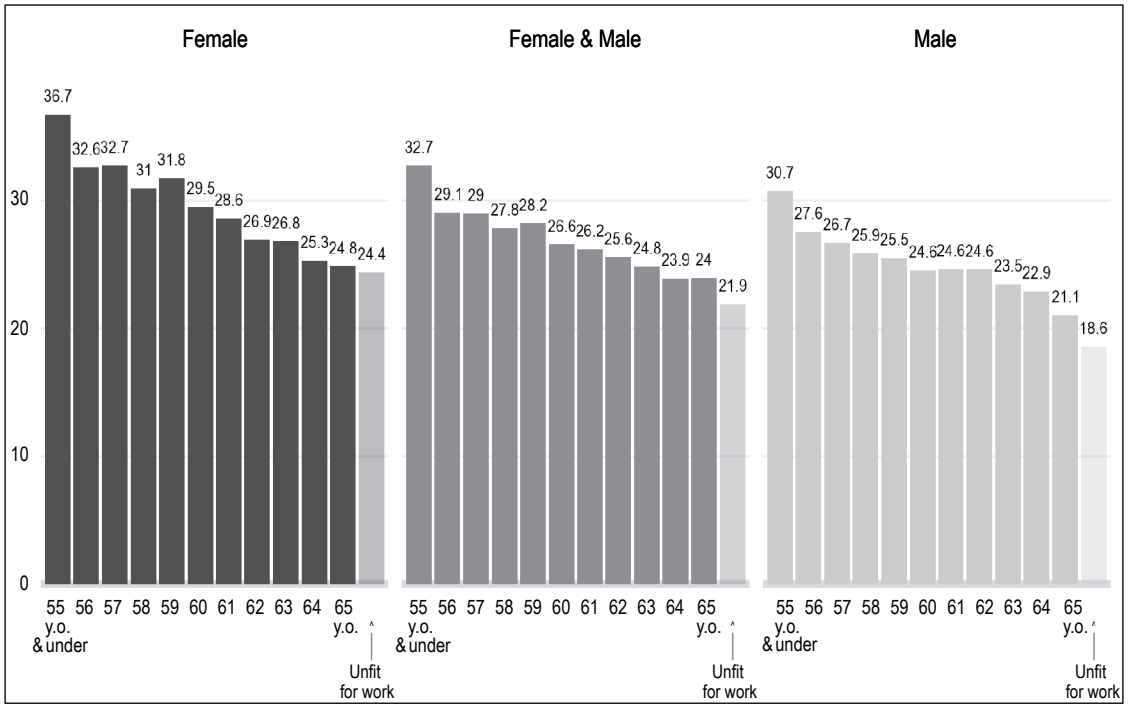
For the cohorts studied here, no pension penalty was applied by civil service and special schemes and the full rate was therefore obtained by individuals covered by these schemes from the minimum age of eligibility, regardless of the number of quarters they had contributed. Nevertheless, the findings are similar if we limit the coverage to just those individuals covered by schemes for private-sector or self-employed workers (see Online Appendix S3) – the main difference here is that the life expectancy of men who obtained the full rate before the statutory minimum age of 60 appears to be a little more than half a year lower than when the coverage is extended to include all schemes.

There does not therefore appear to be any clear link between obtaining the full rate at an earlier age and a lower life expectancy. As a result, the full rate scale provided for in the pension rules does not offset social differences in mortality.

Estimated over the period from 2012 to 2021, the differences in the ages at which individuals obtain the full rate only actually correspond to the differences in life expectancy among men obtaining the full rate between 60 and 62 years of age. Within this narrow window, retired life expectancy appears to be the same, regardless of the age at which the full rate was obtained: 24.6 years (Figure VII). Otherwise, the early granting of the full rate provided for by the pension rules is always greater than the actual disparities observed with regard to life expectancy, such that retired life expectancy[11] generally decreases in accordance with the age at which individuals are able to obtain the full rate. The only exception is persons who have been declared unfit for work (including disabled persons): they obtain the full rate from 60 years of age, but their retired life expectancy is the lowest of all categories owing to their shorter life expectancy. Among pensioners who were not declared unfit for work, it is those who did not obtain the full rate until they reached 65 years of age, in other words, those whose careers were considered incomplete, who have the shortest average length of retirement. When compared with those pensioners who were not declared unfit for work and were able to obtain the full rate from 60 years of age, this expected length of retirement is 3.5 years shorter for men and 4.7 years shorter for women.

11. Figure VII shows the life expectancy calculated at the average age at which the full rate is obtained for each category. It does not take into account the probability of dying prior to obtaining the full rate. If we were to take account of this probability, the length of retirement would become shorter the later the full rate is obtained, thereby leading to significantly more marked differences than those seen in the Figure.

Figure VII – **Life expectancy at the age at which the full rate is obtained (in years)**



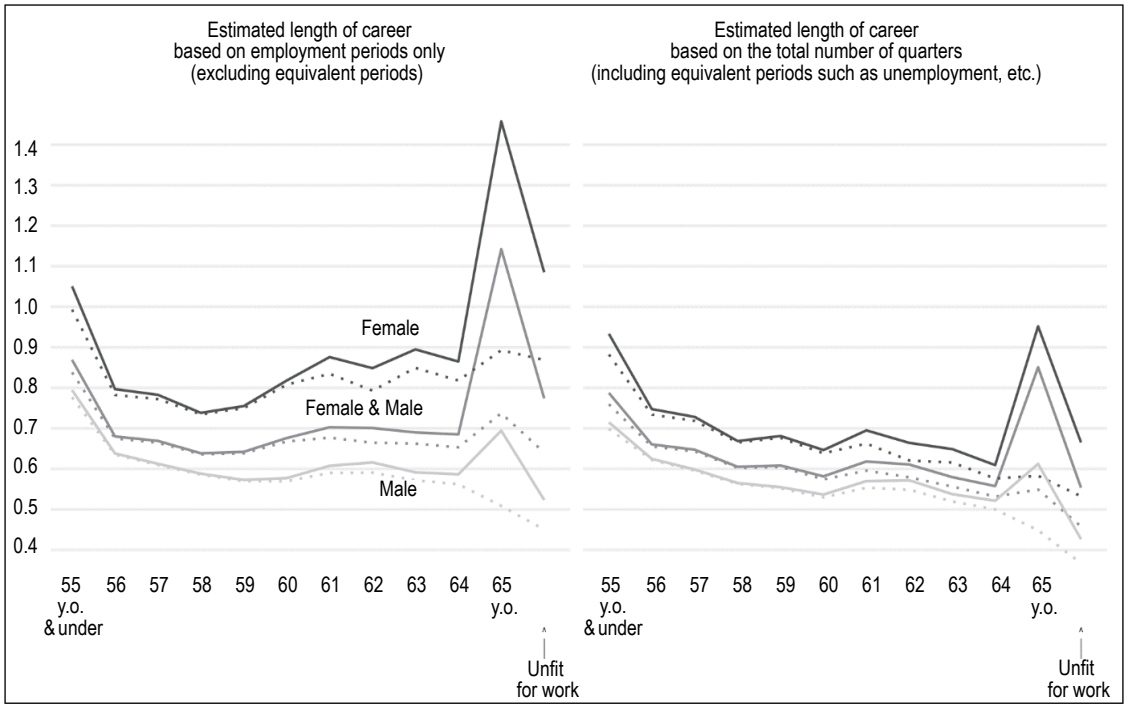
Coverage: Pensioners born between 1946 and 1950; differences in mortality estimated on the basis of the period from 2012 to 2021.
Sources: *Échantillon interrégimes de retraités* (EIR), DREES.

Inequalities in retired life expectancy are less significant when looked at in the context of the age at which persons started work, but the mismatch between the full rate scale and actual life expectancies gives rise to differences of up to 2.5 years. Among men, the highest retired life expectancy is seen among those who started working between the ages of 19 and 20 (26.3 years for the generations born between 1946 and 1950). It is slightly shorter for those who started working at a younger age (24.6 years for men who contributed their first quarter at the age of 15 or younger and 24.5 years for those who started working at the age of 16) and for those who started working at an older age (24.8 years for men who made their first contribution between the ages of 23 and 24 years, and 24.5 years for those who started work at 25 years of age). The shortest retired life expectancy is observed among men who contributed their first quarter after the age of 25 (retired life expectancy of 23.7 years). These durations are less diffuse among women, but they are still the highest among those who started work at an intermediate age (retired life expectancy of between 29 and 29.5 years for those starting work between 18 and 25 years of age) and a little lower for women who started working at a younger age (28.1 years) and for those who started contributing after reaching 25 years of age (27.5 years).

More than the length of retirement itself, it is actually the link between that length and the length of career that has come to the fore, particularly since the 2003 reform, for the purposes of assessing equity in terms of the length of retirement. This approach looks at the balance between the contributions made by each individual and the benefits they receive, which is limited to just these "physical" aspects, i.e. to just the aspects relating to duration and disregarding any monetary dimension (amount of contributions made and benefits received). The use of this equity indicator does not change the conclusion concerning the benefit that the pension system offers to those persons who are able to retire at the full rate at an earlier age. Relative to the overall social security period, in other words, all of the validated pension quarters, including equivalent periods (quarters accrued during unemployment or sick leave, etc.) and including additional credited quarters for those who have had children, the younger individuals can retire at the full rate, the longer the relative length of retirement at that rate (Figure VIII).

Pensioners obtaining the full rate at the age at which the discount is cancelled (65 years), generally following an incomplete career, are an exception to this. Due to the fact that they have accrued fewer quarters, the ratio between the length of their retirement at the full rate and the

Figure VIII – **Ratio of the life expectancy at the age at which the full rate is obtained to the length of career**



Notes: The dotted lines represent the indicator that has been corrected taking account of the fact that the pension is only paid on a pro rata basis to the number of quarters contributed in the case of an incomplete career. The retired life expectancy is therefore corrected by prorating it in the same manner (see the body of the text).
Coverage: Pensioners born between 1946 and 1950; differences in mortality estimated on the basis of the period from 2012 to 2021.
Sources: *Échantillon interrégimes de retraités* (EIR), DREES.

length of their career appears to be significantly higher than that observed among all other categories of pensioners. However, this "advantage" is relative, since they go through retirement with only a partial pension, prorated to the number of quarters they have accrued. This effect can be neutralised by applying the correction described in Aubert & Colin (2017), which involves the use of an indicator that accounts only for the length of retirement prorated to the amount of pension paid, compared with a full pension.[12] By applying this correction, the apparent advantage enjoyed by pensioners obtaining the full rate at 65 years of age following an incomplete career disappears, with these pensioners instead having a ratio between corrected length of retirement and length of career that falls below all other categories of pensioners who have not been declared unfit for work.

Conversely, if we compare the retired life expectancy at the full rate age with the total number of quarters accrued for periods of employment alone, the situation appears far more balanced between the various categories of pensioners. Only those pensioners who obtained the full rate at 55 years of age or earlier[13] have a ratio between length of retirement and length of career that is significantly higher than that seen in other categories, and only men declared unfit for work or who are disabled have a ratio that falls significantly below that of other male pensioners. In view of this specific indicator, the full rate scale applied according to the characteristics of the individuals concerned can therefore be considered to be "fair" in the sense that it allows for the stabilisation of the equity indicator put forward. However, it is important to emphasise what this notion of fairness implies. It actually amounts to considering that the early retirement at the full rate granted to certain individuals is justified by the fact that they have spent a larger proportion of their career in employment, in other words, they have experienced fewer career setbacks, such as unemployment or sickness. It is unlikely that this philosophical option actually reflects the intention of the legislator, since it is at odds with the purpose of compensating individuals for occupational accidents, which is included in the objectives of the pension system.[14] In

12. This correction leads us, for example, to consider that a length of retirement of 25 years with a pension prorated at 50% (in the event that the pensioner has only accrued half of the necessary quarters) is equivalent to a length of retirement "for an equivalent full pension" of just half of those 25 years, so 12.5 years.
13. This concerns very specific career profiles, in particular military personnel.
14. These objectives are listed in Article L. 111-2-1 of the French Social Security Code, which states in particular that "The Nation also assigns to the pay-as-you-go pension system an objective of solidarity between generations and within each generation, in particular by [...] taking into consideration any total or partial periods of involuntary unemployment".

practice, it would also be inconsistent with the inclusion of equivalent periods and additional credited quarters, which have been used to determine whether an individual can be granted the full rate since 1983.

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The effects of the pension reforms enacted since the 1970s have included the creation or extension of schemes allowing individuals to take early retirement at the full rate with the aim of allowing those considered to have suffered the most "wear and tear" as a result of their work or who have the shortest life expectancy to retire at a younger age. These reforms served to significantly increase the proportion of individuals able to retire at the full rate at 60 years of age, or even earlier. This proportion increases from around 20% for the generation born in 1906 to a little over 60% for the generations born between 1930 and 1950.

Although this increase is significant, it is primarily linked to the possibility of taking retirement from the minimum age at the full rate based on the number of quarters accrued, and more specifically, the fact of having worked a full career. However, the purported link between this criterion and a lower life expectancy has proven to be at least partly incorrect: the life expectancy at 60 years of age of the persons who started working at the youngest age is actually lower than that of individuals who started working later in life; however, this link can only be observed among those who started working at the youngest age, in other words, before reaching the age of 20 for men and the age of 18 for women. Life expectancy then remains more or less the same, regardless of the age at which individuals started work. Furthermore, differences in life expectancy according to age are at most two to three years; they are therefore narrower than the differences in age at which the full rate is obtained that are introduced by the pension rules, namely five years before the 2003 reform and nine years after. In addition, the age at which an individual starts working is only partially correlated with meeting the conditions for retirement at the full rate. As a result, no linear, positive relationship can be observed between life expectancy at 60 years of age and the age at which a person is entitled to retire with a full-rate pension. Indeed, a negative relationship can even be observed among women: as a general rule, women who can retire at the full rate at an earlier age tend to have a higher life expectancy. Looking at both genders together, the life expectancy of persons who have been declared unfit for work falls four to five years below the average. The retired life expectancy of the various individuals who have not been declared unfit for work therefore falls continually as a function of the age at which the pension system allows said individuals to retire at the full rate, while still remaining above that of individuals who have been declared unfit for work.

It is important to remember at this point that our analysis is purely descriptive. We are simply illustrating the *correlation* between the age at which the full rate is obtained and life expectancy at that age. The underlying interpretation is that certain characteristics are linked to both a lower life expectancy and the fact of obtaining the full rate at an older age, thereby producing this correlation. For example, an individual experiencing health issues during their career may have an increased long-term mortality risk as well as difficulty in remaining in work, hence them accruing pension quarters at a slower rate and therefore achieving a complete career at an older age. Periods of job insecurity will likely slow down the pace at which pension quarters are accrued, while also having a lasting impact on health. However, there may also be a specific causal impact of retirement on mortality, since early or late retirement may have an impact on mortality during the first few years of retirement or in the longer term. In this respect, the theoretical effect is unclear: retirement could have a positive effect on health, thereby reducing mortality risk due to reduced exposure to occupational hazards and stress, but it may also have a negative impact as a result of a reduction in social interactions and a possible fall in income. This question concerning the mechanism behind the correlation between the age at which the full rate is obtained and life expectancy is, of course, important from a normative perspective. Indeed, if this is largely down to external factors, it is reasonable to seek to define the full rate scale based on observed differences in life expectancy. If, however, these differences are themselves, at least in part, a consequence of the disparities in the ages at which individuals obtain the full rate, the exercise becomes more difficult, since any adjustment of the scales would directly impact the differences in life expectancy. Nevertheless, the most recent and foremost French study on this subject pushes to eliminate the assumption of a causal impact of retirement age on mortality: it concludes, on the basis of the comprehensive database provided by the general scheme, and by

looking at the changes made by the 1993 pension reform, that the increase in the retirement age linked to that reform did not have any significant impact on mortality between the ages of 61 and 79 (Bozio *et al*., 2021).

The findings presented in this study therefore indicate that, even if it is considered relevant from the point of view of inequalities in life expectancy to allow those individuals who started working at the youngest age to retire at the full rate at the youngest age, the pension scales introduced by various past reforms do not allow for the correction of these inequalities and, in some cases, actually serve to amplify them. This finding relates to the fact that the instrument on which these scales are based, namely the number of pension quarters accrued, is rather a blunt tool when it comes to taking account of disparities in the ages at which individuals started work. Although this is not the place to put forward proposals for a reform of the pension rate scales, the findings detailed in this study suggest that such a reform is warranted in order to implement the legislator's stated objective of correcting inequalities in lengths of retirement. □

Link to the Online Appendix:
www.insee.fr/en/statistiques/fichier/8642187/ES546_Aubert_Online-Appendix.pdf

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