PENSIONS AND SOCIAL JUSTICE
FROM STANDARD RETIREMENT TO REVERSE RETIREMENT[1]

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Recent debates about the pension reform in France emphasized the key role played by concerns for social justice. This paper argues that, from the perspective of social justice, both the existing pension system and the universal pension point system are missing the main target in terms of social injustice: the unfair situation faced by individuals who die prematurely, before reaching the retirement age. Those persons are victims of a double penalty. On the one hand, they suffer from a premature death, which prevents them from realizing their life-goals; on the other hand, those persons contribute to the pension system during their career, but are dead before enjoying the retirement period. We argue that this double penalty is not due to fatality: the structure of existing pension systems tends to exacerbate the undesirable consequences of a premature death. We show that social justice requires nothing less than to reverse pension systems, that is, to allow individuals to be retiree before starting their career. Such a reverse pension system, which amounts to provide a universal pension to all young adults – while leading to postpone the age of exit from the labor market – would contribute (at least partly) to free the unlucky short-lived from the double penalty faced under the standard or the reformed pension system.

Keywords: Pensions, social justice, mortality, life cycle.

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1. Introduction

Recent debates about the pension reform in France emphasized the key role played by concerns for social justice. On the one hand, defenders of the new pension regime based on a point system (*retraite par points*) argue that the existing system is unfair, since it is not universal, and allows individuals with close careers to be treated differently, which goes against intuitions of social justice (an equal treatment of equals). On the other hand, those who are against the pension reform argue that the reformed system would be even more unfair than the existing one, by eliminating differences in treatment that were not arbitrary advantages, but fair compensations for other, less favorable aspects of their jobs (typically the civil servants, whose pension used to compensate their lower wages *ceteris paribus*).

As John Rawls (1971) argued in *A Theory of Justice*, justice is the first virtue of social institutions, like truth is the first virtue of systems of thought.[2] It is thus not surprising that concerns about social justice play a key role in contemporary debates about pension reforms, which focused on problems raised by harshness of work, gender differences and life expectancy differentials (often related to risky jobs). More surprising is the fact that debates about the pension reform ignored a fundamental source of injustice among humans: inequalities in the *actual* duration of life (to be distinguished from inequalities in the *expected* duration of life). As a consequence, those debates also failed to correctly address the difficulties raised by the construction of a fair pension system.

In France, about 10 % of men and 4 % of women die before having reached the age of 60.[3] Those unlucky men and women who die prematurely do not benefit from a retirement period, and from the associated pensions. Worse: those persons did contribute, during their whole life, to the pension system, by paying contributions. But those contributions are transferred to other individuals, who benefit from a long life. Thus unlucky short-lived individuals face a *double penalty*: on the one hand, they have a short life, which is a major disadvantage (which prevents them from realizing their life-goals); on the other hand, they have to pay taxes and contributions to fund pensions that

2. See Rawls (1971), p. 29.
3. See the Human Mortality Database 2019.

they will never enjoy. This second feature is true whatever the pension system is a pay-as-you-go system organized at the sector level, or is a (reformed) universal pay-as-you-go system based on points.[4]

The regressivity of pension systems under unequal lifetime has been largely documented in the recent years, and, as such, does not constitute a new result. Using French administrative data from the *Echantillon interrégime des retraités*, Bommier *et al.* (2005) showed that the income elasticity of life expectancy at age 60 was as large as 0.18, with the consequence that the retirees who obtain the largest pension benefits are also those who, on average, have longer lives, and benefit from those pension benefits during longer periods. Those authors also showed that this lifetime/income correlation tends to partly annihilate the redistributive nature of the pay-as-you-go pension system with different replacement rates: between ¼ and ½ of the redistribution operated through different replacement rates is annihilated by inequalities in the duration of life. As far as the United States are concerned, Coronado *et al.* (2011) also underlined the existence of a strong income/mortality gradient: white men aged 25-34 in the lowest income class face a mortality rate that amounts to 168 % of the average mortality rate, whereas top income individuals face a mortality rate that represents only 61 % of average mortality. Once this mortality differential is taken into account, the social insurance system becomes far less progressive than it may look at first glance.[5]

While the problem raised by unequal lifetime for the fairness of social insurance systems in general – and of pension systems in particular – is well-known, the construction of alternative, less unfair, social insurance systems has attracted so far little attention among economists. Moreover, the double penalty paid by prematurely dead individuals under the existing – and the reformed – pension system was not evoked during the debates about the pension reform.

The ignorance of the double penalty paid by the unlucky short-lived under the existing – and the reformed – pension system is really damageable, since unequal lifetime is not a secondary or a tertiary

4. One way to make existing pension systems less unfair towards the short-lived would be to make the replacement rate *decrease* with the age of the retiree. Although such a policy reform would go in the right direction, this would not solve the problem entirely: this is only about reducing the size of monetary transfers towards the long-lived, whereas a reverse retirement system would also involve, *in addition*, transfers of leisure time towards the young, who include, potentially, the short-lived (see *infra*).
5. Other studies on the income/mortality gradient include Chetty *et al.* (2016) and Lefebvre *et al.* (2019).

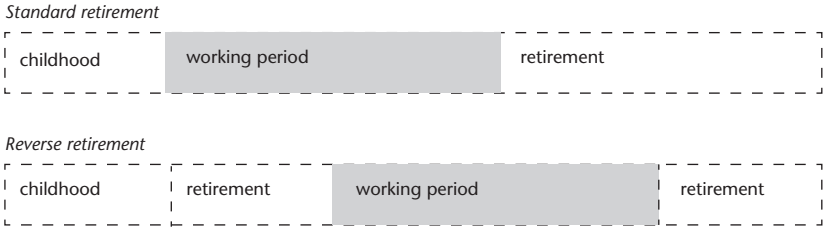
cause of social injustice: this is a major source of disadvantage. As Amartya Sen (1998) underlined, human lifetime is a fundamental resource: whatever the life-goals one pursues, some lifetime is needed in order to be able to achieve those goals. Hence a premature death is a major source of deprivation. Following that rationale, Martha Nussbaum (2000) included a "normal lifespan" in the list of the 10 "basic capabilities" that should be ideally provided to everyone. The importance of the scarcity of lifetime raises the following question: under unequal lifetime, what would be a fair pension system?

The goal of this paper is to reexamine the construction of a pension system under unequal lifetime, and to propose a pension reform that would tackle the problem raised by those inequalities. Actually, following recent developments in Ponthiere (2018, 2020), we propose to discuss here, in an informal – but accurate – way, the replacement of a standard retirement system by a system of *reverse retirement*, whose main feature is to allow individuals to be retiree in young adulthood *before* starting their career.

In a nutshell, a reverse retirement system is an inversion of standard retirement systems. Under standard retirement systems, individuals work during a long time period (usually over 30 to 40 years) and, then, once old, they enjoy a retirement period, during which they have consumption and leisure without working (thanks to pension benefits). On the contrary, under a reverse retirement system, individuals start their adult life as retirees, and enjoy consumption and leisure without working (thanks to pension allowances), until they reach some age, at which they start working (until the very old age is reached). Under reverse retirement, the entry on the labor market takes place later on than under standard retirement, while the exit from the labor market also occurs later on. Thus, in comparison with standard retirement, reverse retirement involves a postponement of the age of entry on the labor market, and of the age of exit from the labor market. As an illustration, Figure 1 compares the life cycle under standard retirement (top) and reverse retirement (bottom).[6]

6. Periods without labor – such as childhood and retirement periods – appear in white, whereas periods of labor appear in grey. For the simplicity of presentation, Figure 1 compares two lives of maximal length. However, in the rest of the paper, we will focus on short lives, i.e. lives that were shortened by a premature death (see below).

Figure 1. Standard *versus* reverse retirement



At this early stage of our explorations, it is useful to discuss the terminology "reverse retirement" further. First of all, it should be stressed that the term "reverse retirement" is used for the simplicity of exposition. As illustrated on Figure 1, there remains, under reverse retirement, a period of retirement at the end of life (when labor productivity becomes extremely low). The term "reverse" involves thus a simplification, but is used to emphasize the inversion of activity and non-activity at the beginning of the life cycle. Other possible terms could have been used instead, such as "two-part retirement", "mixed retirement", "sabbatical leaves", "early retirement" or "late entry age", but those terms already exist in the literature and capture only some *partial* aspects of the phenomenon studied in this paper.[7] Therefore, in order to avoid any confusion, we adopt the terminology "reverse retirement" (like in Ponthiere 2018, 2020).[8]

Whereas a formal theory of reverse retirement is developed, using a dynamic overlapping generations model (OLG) in Ponthiere (2020), we would like here to propose a less formal – but more intuitive – discussion of the virtues of reverse retirement concerning the problem of social justice under unequal lifetime. In particular, we would like to explore the reasons why, if the first virtue of a pension system is to be fair, then those fairness concerns point towards a retirement system that has necessarily the characteristics of being a reverse retirement system.

7. The terms "two-part retirement" and "mixed retirement" refer to systems where pensions have distinct components (usually funded in different ways). The term "sabbatical leaves" refers to temporary job leaves, which differs from the situation described in Figure 1. The term "early retirement" refers to individuals who stop working before age 60 (see Wolfe 1983), which differs from the inversion of the life cycle considered in this paper. Finally, the term "late entry age" captures one aspect of reverse retirement – the postponement of the age of entrance on the labor market – but does not capture the postponement of the age of exit from the labor market.

8. Another term could be "initial retirement", as in Blinder and Weiss (1976). However, that term refers to an initial retirement period followed by a working period during the remaining of life, unlike the system studied in our paper, which involves also retirement at the very end of life (unlike in Blinder and Weiss 1976).

Anticipating our results, this paper develops two distinct arguments in favor of the reverse retirement system. The first argument is based on social justice and, in particular, on the concept of *ex post* equity. We argue that, in a world of risky and unequal lifetime, the minimization of well-being inequalities between the long-lived and the short-lived requires, under general conditions, to reverse the retirement system, and to allow young adults to benefit from retirement before they start their career. The second argument supporting reverse retirement relies on the insurance motive for pension systems (see Barr and Diamond 2006, Cremer and Pestieau 2011). We argue that, whereas the standard retirement system serves as an insurance against old-age poverty, the reverse retirement system serves as an insurance against premature death, which leads to an even larger damage. One can thus defend reverse retirement by using the insurance motive, while acknowledging that suffering from a premature death is a major damage (and a more substantial one than being old and poor).[9]

This paper is organized as follows. Section 2 relies on past research in lifecycle theory to study an earlier argument supporting, on purely positive grounds, an extreme form of reverse retirement called "initial retirement". Section 3 presents the foundations underlying our first normative argument for reverse retirement, by introducing the concepts of *ex ante* equity and *ex post* equity. A defense of reverse retirement from the perspective of *ex post* equity is proposed in Section 4. Using the literature on the insurance motive for pensions, Section 5 argues that the reverse retirement system can be regarded as a social insurance system against premature death, unlike the standard retirement system, which is an insurance against old-age poverty. Sections 6, 7 and 8 examine difficulties raised by reverse retirement, such as the existence of a "free lunch" for the prematurely dead, incentive issues and obstacles during the transition from standard to reverse retirement. Conclusions are left to Section 9.

2. The existing literature : a positive argument for reverse retirement

While this paper develops two original arguments supporting reverse retirement, it should be stressed that there exists already, in the

9. Note that those two arguments are related to each other through some channels (see *infra*).

economics literature, an earlier argument supporting some extreme form of reverse retirement, called "initial retirement": an adult life starting with a period of retirement, and, then, followed, during the remaining of life, by a period of labor.[10] That argument, which is of *positive* nature, can be found in the seminal work of Blinder and Weiss (1976) on lifecycle theory.[11] Although the positive nature of Blinder and Weiss's argument differs from the normative nature of our own arguments, it is useful to present it, and the assumptions on which it relies.

Blinder and Weiss (1976) consider a model of the human life cycle in continuous time, where a representative agent, whose duration of life is known and exogenous, decides how to allocate consumption, work and investment in human capital over the life cycle. The agent derives utility from consumption and leisure time along his life cycle, and from the bequest left to his descendants at his death. He faces constraints relative to the accumulation of wealth (the capital market is supposed to be perfectly competitive), the accumulation of human capital (driven by schooling investment), and the (exogenous) time pattern of the wage rate.

The resolution of the optimization problem of the representative agent leads to four distinct phases that might occur in the individual's life cycle: (1) schooling (no work); (2) on the job training (OJT, i.e. the fraction of time dedicated to schooling diminishes over time); (3) work (no schooling); (4) retirement (neither work nor schooling). Blinder and Weiss examine the conditions on structural parameters (preferences, interest rate, human capital accumulation parameters) under which various kinds of life cycles can emerge, each of these being characterized by a particular succession of phases among phases (1)-(4).[12]

Blinder and Weiss show that, when the representative agent exhibits a low degree of impatience, the optimal life cycle takes the form of the succession of phases (1) to (4): life begins with schooling, then on the job training, then work and, finally, retirement.

However, under a high impatience, the optimal life cycle begins with an initial period of retirement (Blinder and Weiss, 1976, p. 460):

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10. To be accurate, "initial retirement" is an extreme form of "reverse retirement", where the length of the final period of retirement at the very old age is set to zero, unlike in the system studied in the present paper.

11. I am most grateful to an anonymous reviewer for this important reference.

12. Note that it is theoretically possible that some cycling arises, that is, the recurrence of a specific phase more than once in the optimal life cycle.

> Thus the typical life cycle for persons with high impatience, assuming most people find it optimal to take some schooling and some retirement, is roughly as follows: an initial period of retirement followed by schooling, then by OJT, and then by pure work until death.
>
> Of course, life cycles with early retirement are rarely observed in practice. But this is not because such programs are irrational. Individuals with very high impatience (or very high positive exogenous wage growth) will want to bunch their leisure early in life. To do so they will have to work very hard when they are old, since consumption depends on lifetime discounted earnings. We may surmise that it is the absence of perfect capital markets that precludes all but inheritors of large fortunes from pursuing such a program.

Blinder and Weiss propose here a purely positive argument supporting some extreme form of reverse retirement, which they call "initial retirement" (retirement early in life, followed by labor during the remaining of life). The argument goes as follows: under perfect capital markets, and under a high impatience, it is rational for agents to choose to begin their life with an initial period of retirement, and to leave work for older ages. Thus, under those two conditions, initial retirement is optimal, and would thus prevail in a laissez-faire economy. But if initial retirement is rational, why don't we observe it in real-world economies? Blinder and Weiss explain that, if this system is not observed in reality, this is because of the imperfection of capital markets (which prevents young adults from borrowing).

Quite interestingly, Blinder and Weiss's positive argument supporting some extreme form of reverse retirement has remained largely ignored in the literature on retirement and pensions. This is probably because they presented that result as a kind of theoretical *anomaly* relying on extreme assumptions: that argument requires not only perfect capital markets, but, also, a high impatience, which may not be observed in the real-world.

In the rest of this paper, we study two arguments supporting reverse retirement, which differ from Blinder and Weiss's positive result. Our two arguments are normative in nature – rather than positive – and these do *not* require assuming a high impatience, unlike in Blinder and Weiss. Our defense of reverse retirement requires introducing a dimension of life that is absent in Blinder and Weiss (1976): risk about the duration of life. In the present paper, we argue that, *under risky and unequal lifetime, there exist normative arguments justifying reverse retirement even if individuals do not exhibit high impatience.*

3. *Ex ante* equity *versus ex post* equity

Our first normative argument supporting reverse retirement relies on the ideal of fairness in the context of risky and unequal lifetime. In order to present that argument, it is important, at this early stage, to define what we mean by "fairness" in the context of unequal lifetime. Since risk about the duration of life is one type of risk among many others, one can rely on the literature on fairness in risky situations, and, in particular, on a key distinction introduced by Fleurbaey (2010): the distinction between *ex ante* equity and *ex post* equity.

The difference between *ex ante* equity and *ex post* equity concerns the moment at which individual situations are compared, that is, before or after the state of Nature that prevails is revealed. Under *ex ante* equity, the comparison of individual situations is made *before* the state of Nature that prevails is revealed. On the contrary, under *ex post* equity, the comparison of situations is made *after* the state of Nature is revealed. The distinction between *ex ante* and *ex post* equity thus concerns the informational basis relevant for social valuation.

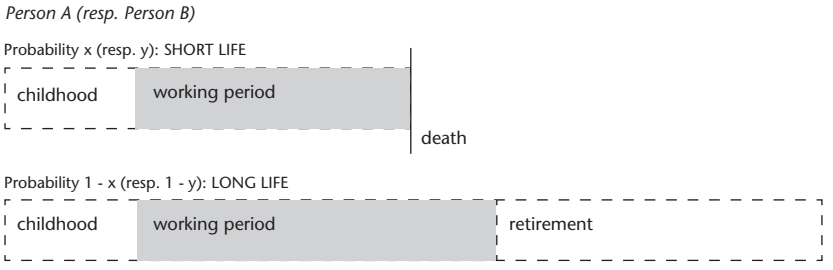
In our context of risky lifetime, individuals do not know how long they will live. *Ex ante*, individuals know their life expectancy – the mathematical expectation of their duration of life – but they ignore their realized longevity, that is, the age at which they will die.[13] To put it in economic terms, *ex ante*, individuals face lotteries of life, specifying different scenarios relative to the duration of life, as well as the probability of occurrence of those scenarios. However, *ex post*, the duration of life is revealed. Thus it is then clear that the individual has a life of a particular length (i.e. the lottery is degenerated).

As an illustration, Figure 2 shows the lotteries of life faced by two persons A and B, lotteries that are exactly identical, except that person A has a lower probability x of early death ($0 < x < 1$) in comparison to person B, for which the probability of early death y is larger (i.e. $x < y < 1$).[14] For the sake of simplicity, those lotteries are presented under a standard retirement system. In those two examples, it is only under the "long life" scenario that the two individuals can enjoy retirement.[15]

13. On the measurement of risk about the duration of life, see Meyer and Ponthiere (2020).
14. For simplicity, we use, throughout this paper, simple examples with binary longevity (either a short life or a long life). But the same arguments could be extended to $n > 2$ possible durations of life.
15. In the diagrams of Figure 2 (and also of the following figures), we represent a shorter life by means of a rectangular of smaller length, which represents a truncated life (because of premature death).

Whereas individual decisions take place under risk, and, hence, *ex ante* (i.e. before the duration of life is revealed), individuals A and B will, *ex post*, enjoy a life of a particular length. *Ex post*, it will be the case either that person A has a short life, or that person A has a long life. In a similar way, it will also be the case, *ex post*, that either person B has a long life, or that he has a short life. Figure 3 illustrates an example of realizations, where person A has a short life, whereas person B has a long life.[16]

Figure 2. Lotteries of life faced ex ante by persons A and B (under standard retirement)



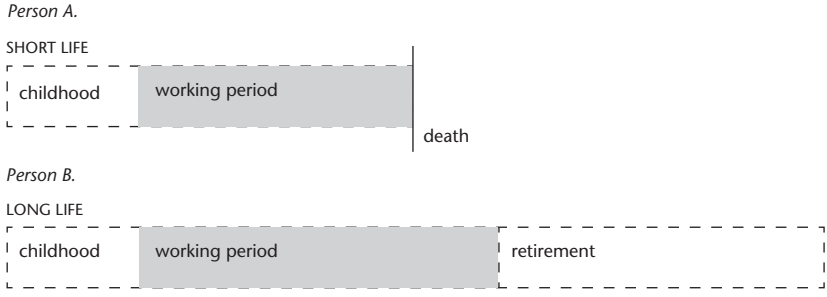
Ex ante equity requires that the expected lifetime well-being of individuals under comparison is, *ex ante*, equal across individuals.[17] Person B facing worse survival prospects than person A (while the lottery is the same on other dimensions), the situation is not equitable *ex ante*. Person A is, *ex ante*, better-off than person B. To achieve the equalization of expected lifetime well-being across persons A and B, one needs to find a way to compensate individual B for a lower life expectancy. This could be done, for instance, by providing a higher wage to individual B, or by a more generous pension system (e.g. an earlier retirement age) for person B. Some difference in the treatment is thus needed to compensate the fact that person B faces worse survival prospects, and, hence, a lower expected lifetime well-being *ceteris paribus*.

Let us now turn to *ex post* equity. From that perspective, individual prospects do not matter for social evaluation. What matters is only the *outcome* of lotteries, that is, what individuals actually live. Taking Figure

16. Other realizations could have taken place instead. We only take that realization for illustrative purposes.
17. For simplicity, we assume in this section that individuals have the same preferences. We discuss below what would happen if that assumption were relaxed.

3 as an illustration, we can see, in that case, that, under general conditions (i.e. a life worth being lived), person B is, in terms of realized lifetime well-being, better-off than person A, since he enjoys a long life, whereas person A died prematurely. Thus, from an *ex post* perspective, person A is worse-off than person B.

Figure 3. Realized lives ex post for persons A and B (under standard retirement)



This example suffices to illustrate a general result: nothing guarantees that *ex ante* equity and *ex post* equity lead to consistent social valuations of the situations under comparison. From an *ex ante* perspective, person A is regarded as better-off than person B (because of better survival prospects), whereas *ex post* it is the opposite: person A is regarded as worse-off than person B (because of a lower realized lifetime).

The fact that the comparisons of individual situations can yield contradictory results under *ex ante* and *ex post* equity requires the social evaluator to choose between those two ethical perspectives. Under general conditions, a social evaluation based on *ex ante* equity may yield rankings that are not compatible with the rankings obtained under *ex post* equity. Which ethical perspective should the social evaluator adopt?

Adopting an *ex ante* concept of equity is standard in economic analysis, but it is not clear that it is the most adequate perspective. Indeed, it can be argued that, from a normative perspective, the only thing that matters is *what individuals realize and achieve in their lives*, and not what they *expected* to achieve. From that perspective, focusing on realizations is quite intuitive, and focusing on expectations or prospects seems to miss the point. There is a strong ethical intuition supporting the *ex post* concept of equity.

As Fleurbaey (2010) argued, what matters for well-being measurement is not what individuals expect to achieve, but what they really achieve in their life. The underlying intuition is the following. *Ex ante*, individuals have preferences defined on lotteries. But *ex post*, what individuals enjoy is not a lottery, but what prevails under a particular state of Nature that realized under the chosen lottery. Fleurbaey (2010) distinguishes between *informed* preferences and *uninformed* preferences. According to Fleurbaey (2010), *ex ante* equity is based on individuals' uninformed preferences, that is, preferences formed while the state of the world that will turn out to emerge is not known. On the contrary, *ex post* equity is based on informed preferences (i.e. preferences if individuals knew the state of the world that would turn out to arise). Fleurbaey considers that a social evaluator should give priority to informed preferences over uninformed preferences. Hence, from a fairness perspective, priority should be given to the informed preferences of the worst-off (*ex post* equity).

When considering issues of life and death, social scientists are used to think in *ex ante* terms, that is, in terms of period life expectancy.[18] But while relying on period life expectancy makes a lot of sense for measurement or prospective purposes, adopting an *ex ante* view for social valuation involves serious limitations. From that perspective, realized outcomes – short lives or long lives – do not matter, only survival prospects – high or low life expectancies – matter. This tendency to think in *ex ante* terms is quite problematic. Back to the example of Figure 3, this is hard to see on which ground person A, who dies before reaching retirement, is better-off than person B, who enjoys a long life. For sure person A is worse-off than person B, and should receive priority when thinking about designing policies. From a fairness perspective, the fact that person A had a higher life expectancy than person B matters *less* than the fact that person B enjoyed, at the end, a longer life than person A.[19]

18. This tendency is due to the fact that period life expectancy figures are easily available, and can be computed every year, whereas statistics on realized longevities are available only when the last member of a cohort is dead.

19. Note that the example of Figures 2 and 3 concerns individuals who are not equal *ex ante*, person A enjoying a higher life expectancy than person B. But one could easily extend our argument to the case of *ex ante* identical individuals, by assuming $x = y$ instead of $x < y$. In that alternative example, the fact that person A dies early is a serious disadvantage for her in comparison to person B. Hence it makes sense to consider that person A is worse-off than person B, even though they enjoyed, in that alternative example, the same lotteries *ex ante*.

For those who remain unconvinced by our argument for *ex post* equity, let us make a further move towards less abstraction, and consider that person A is a woman and person B is a man.

As it is well-known, women benefit nowadays, in advanced economies, from a higher life expectancy in comparison to men.[20] We thus have, as in our example, that the probability of a short life is lower for the woman (person A) than for the man (person B), that is, $x < y$. But can this piece of information – an advantage for women *ex ante* – be used to deduce that any woman is necessarily better-off than any man? No, for sure. Among the group of women, some women will turn out to die prematurely (like person A), whereas other women will have a long life. Things are the same for men: some men will turn out to die early, whereas other men will have longer lives (like person B). Here again, judgments in terms of equity differ depending on whether one adopts an *ex ante* or an *ex post* equity view. But who would defend that a short-lived woman is better-off than a long-lived man just because she enjoyed a higher life expectancy (*ex ante*)? Probably no one would.

This dilemma between *ex ante* equity and *ex post* equity has a direct relevance for the current debate on the pension reform in France. When defending or, on the contrary, attacking the pension reform, it is often argued that the existing or the reformed pension system should better take into account issues of harshness of work (*compte pénibilité*), leading to differences in life expectancies across jobs. By doing so, those pension systems would definitely go closer to the objective of *ex ante* equity, that is, equity in terms of life prospects. The above discussion suggests, on the contrary, that the most relevant ethical goal should be not *ex ante* equity, but *ex post* equity. From the perspective of *ex post* equity, differentials in life expectancy are irrelevant: the piece of information that matters is the actual length of life, the realized longevity. Thus it is that particular piece of information that should be taken into account when constructing a fair retirement system, and not gaps in life expectancies. If, on the contrary, one constructs a pension system based on differentials in life expectancies, this will not improve the situation of the worst-off *ex post*, and will thus not satisfy the goal of *ex post* equity. As we will show below, shifting from an *ex ante* to an *ex post* conception of equity would have a major impact on the design of a fair retirement system.

20. Recent data suggest that this gender gap is equal to about 5.5 years in terms of life expectancy at birth.

4. Reverse retirement and the compensation of the prematurely dead

Inequalities in realized longevity being largely due to luck, there is a strong case for applying the Principle of Compensation to that particular context.[21] As presented in Fleurbaey and Maniquet (2004) and Fleurbaey (2008), the Principle of Compensation states that inequalities in well-being that are due to circumstances (i.e. variables that are outside individual control) should be abolished by governments. As discussed elsewhere (see Fleurbaey et al 2014, 2016), a simple way to apply the Principle of Compensation in the context of unequal realized lifetime is to use a social welfare function that has the *ex post* egalitarian form, i.e. that takes the form of a *maximin* on *ex post* (realized) lifetime well-being.[22] That social welfare criterion gives absolute priority to the worst-off in realized terms. Note that, although that social criterion looks extreme, this does justice to the idea that what matters most are the interests of the most disadvantaged individual once the lottery of life has revealed its outcome.[23]

Adopting an *ex post* equity view has strong implications for the design of retirement systems. No one knows, *ex ante*, who will have a long life or who will turn out to die prematurely. Information exists only at the statistical level, and not at a personal level. However, it is possible to anticipate, *ex ante*, that some proportion of the population will be unlucky, and will turn out to die prematurely. The fact that one cannot precisely identify *who* will be short-lived is not so problematic for planning purposes: the mere fact of knowing that *someone* will be in that situation is already an important piece of information.

The lack of identification of those who will turn out to be short-lived or long-lived is often regarded as a source of pessimism for those who want to achieve social justice. That problem seems to be without solu-

21. For instance, Christensen et al (2006) showed that between 25 % and 33 % of longevity inequalities within a cohort are due to the genetic background.

22. The index for well-being measurement may be adapted in such a way to take into account heterogeneity in preferences (see Fleurbaey et al 2014 on consumption equivalents). For the sake of simplicity, we assume, throughout this paper, that individuals have the same preferences. But relaxing that assumption would not strongly affect our conclusions concerning the social desirability of a reverse retirement system, as long as short-lived individuals are – whatever their preferences are – the most disadvantaged, which is a weak assumption.

23. One may criticize that social criterion by arguing that this involves excess paternalism, since this is equivalent to assuming infinite risk aversion from individuals *ex ante*. The defense of that social criterion is based on the fact that individual *ex ante* preferences are uninformed, and that these cannot be properly used as a normative basis for determining who is the most disadvantaged (unlike informed preferences). See Fleurbaey (2010).

tion. *Ex ante* (that is, before the duration of individual life is revealed), one cannot identify individuals who will turn out to be short-lived. But *ex post*, once durations of life are revealed, it is too late to reduce the damage associated to a short life. But if no one – including the State – can know *ex ante* who will die prematurely, and if it is too late to intervene once the short-lived is identified, how can a State build institutions that minimize the size of the damage for the short-lived? Can we compensate individuals for a short life even if we cannot identify the short-lived *ex ante*?

Quite surprisingly, the answer to that question is: yes. Fleurbaey et al (2014, 2016) showed that the impossibility to identify short-lived individuals *ex ante* is not an obstacle to social justice *ex post*. Actually, it is possible to reduce the damage faced by the prematurely dead, by merely transferring the "good things" of life early in life, and the "bad things" of life later on, and by doing so for *all* individuals. By proceeding in that way, the State is sure to improve the situation of unlucky individuals who will turn out to be short-lived, *even if* no one can identify these individuals *ex ante*. The intuition behind that result is that the young include necessarily the (few) individuals who will die prematurely. Hence, since the young include the short-lived, improving the situation of all young individuals must necessarily improve the situation of the unlucky short-lived as well.

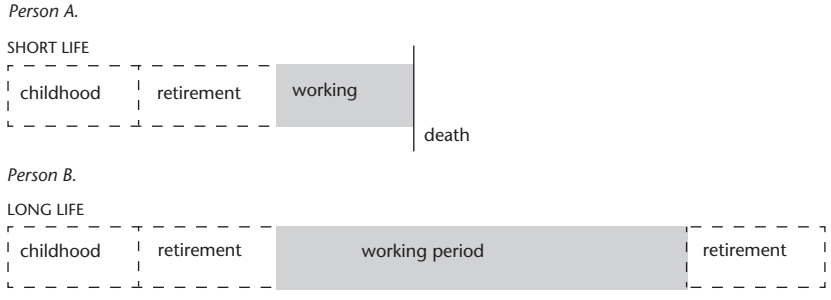
This rationale has a major corollary for the design of pension systems. From the perspective of minimizing welfare losses for short-lived individuals, a fair retirement system should try to concentrate the "good things" of life – the retirement period – early in life, and the "bad things" of life – working efforts and disutility – later on in life. *Standard retirement systems do the exact opposite*. Standard pension systems require individuals to work during a long career before allowing them to enjoy some retirement period. This leads to situations like the one presented on Figure 3, where, *ex post*, some individuals enjoy a long life with retirement, whereas other individuals are unlucky and die before retirement. By doing so, standard retirement systems tend to *exacerbate* welfare losses associated to a short life. Thus standard retirement clearly violates *ex post* equity.

On the contrary, a reverse retirement system is more in line with minimizing the losses due to a premature death: by allowing individuals to be retirees before working, those systems put the "good things" of life first, and, then, leave the "bad things" for the end of life. Under

general conditions, this alternative pension system tends to improve the situation of the unlucky short-lived, in line with *ex post* equity. To show this, Figure 4 shows the situations of persons A and B under a reverse retirement system.

When comparing the situations of persons A and B under reverse retirement, it is still the case that person B, who enjoys a longer life, is better-off, from an *ex post* perspective, than person A. However, when comparing the situation of person A (the unlucky short-lived) under reverse retirement (Figure 4) with its corresponding situation under standard retirement (Figure 3), it appears that the situation of that short-lived person is better under reverse retirement, since that system allows that unlucky short-lived persons enjoy a retirement period before dying, unlike what was the case under standard retirement.

Figure 4. Realized lives ex post for persons A and B (under reverse retirement)



Under reverse retirement, the situation of unlucky individuals who turn out to die prematurely is improved, and the situation of lucky long-lived individuals is likely, under general conditions, to be worsened. Under standard retirement, achieving a long life brings lots of advantages for the long-lived: they can live several decades of consumption and leisure without working. On the contrary, under reverse retirement, things are less nice for them: the extra period lived includes a long period of labor, whereas retirement comes at a higher age.[24]

24. Whether or not the lifetime well-being of the long-lived is reduced under reverse retirement (in comparison to standard retirement) depends on several dimensions of preferences, such as the disutility from old-age labor and time preferences. If the disutility of labor is increasing with age, then it is the case, in general, that reverse retirement makes the long-lived worse-off in comparison to standard retirement (see Ponthiere 2020).

Thus, in comparison to standard retirement, reverse retirement does not only improve the situation of the few unlucky individuals who turn out to die prematurely, but it does also reduce the size of well-being inequalities between the short-lived and the long-lived. As such, the reverse retirement system makes a major step towards *ex post* equity. This step is achieved by transferring "good things" of life earlier in life, and "bad things" of life later on in life.

Quite importantly, this transfer of "goods things" of life towards the beginning of life requires State intervention. Clearly, in a laissez-faire world, nothing guarantees that "goods things" are transferred early in life. As we discussed in Section 2 by using Blinder and Weiss (1976), reverse retirement could spontaneously emerge at the laissez-faire only provided individuals exhibit high impatience, and provided there exists a perfect capital market. In real-world economies, those conditions are unlikely to be satisfied, and individuals would spontaneously postpone retirement until the end of life. If so, the laissez-faire would be characterized by quite large well-being inequalities between the long-lived and the short-lived, against *ex post* equity. On the contrary, a Welfare State that organizes a reverse retirement system contributes to both improve the situation of the most disadvantaged (the unlucky short-lived) and to reduce well-being inequalities within the population. For the sake of achieving *ex post* equity, such a Welfare State could collect contributions from workers and distribute these towards the young (young retirees pension benefits) and towards the very old (old-age pension benefits).[25]

The precise extent to which a reverse retirement system can make the society neutralize the effects of lifetime inequalities on realized well-being depends on how the system is parametrized. Clearly, if the reverse retirement system involves a very short period of retirement and a low age of entry on the labor market, let us say 20 years, then this modification would be minor with respect to the standard retirement system, and there would be little change in the situation of the unlucky short-lived. On the contrary, if the initial retirement period lasts longer, and is spread, for instance, between age 18 and age 30, then this would really change the life of unlucky short-lived individuals.

25. By acting in that way, the Welfare State would go against individual *ex ante* lifetime planning decisions. Hence, pursuing *ex post* equity goes against *ex ante* efficiency (defined in terms of preferences over lotteries of life). But this is not problematic, since, in the logics of Fleurbaey (2010), social valuations should give priority to informed preferences, so that it is *ex post* efficiency (i.e. defined in terms of preferences over degenerate lotteries of life) that matters. The maximin on *ex post* well-being satisfies both *ex post* efficiency and *ex post* equity (see Fleurbaey et al 2014).

The economic feasibility of the reverse pension system imposes constraints on how long the initial retirement period can be. In the example of Figure 4, the total period of labor is exactly the same for a long-lived person, but the total working period for persons A and B taken together is longer on Figure 3 than on Figure 4. This feature does not need to be the case: one can parametrize the ages of entry and exit from labor to maintain the total working time constant. Reverse retirement does not necessarily involve a reduction or an extension of the total amount of hours worked; it is a *reallocation* of labor time along the life cycle, in such a way as to minimize the welfare losses faced by individuals who turn out to be short-lived.

It is useful to notice, at this stage, that the above graphical representation of reverse retirement presupposed that an economy with reverse retirement can produce a sufficiently high output, so as to sustain high standards of living for the entire population. That assumption is fundamental: without it, reverse retirement would only lead to a deterioration of living standards for all – inclusive for the young, who include the individuals who will turn out to be short-lived – and, as such, would not be desirable even from the perspective of *ex post* equity. As examined in Ponthiere (2020), whether the reverse retirement system dominates the standard retirement system from an *ex post* equity perspective depends on the structural parameters of the economy: technology, preferences and demography.

The feasibility of reverse retirement requires that the labor productivity profile is not too decreasing with age.[26] If individuals are not able to work and become unproductive at some high age, this imposes limits on the extent to which one can reallocate labor along the life cycle. For instance, if labor is highly physical and cannot be carried out by the old, a reverse retirement system cannot improve the situation of the worst-off, since in that case total production would be low, leading to low consumption at the young age (and, hence, low consumption for the unlucky short-lived). Furthermore, if old-age labor generates a high disutility, a reverse retirement system with a high age of exit from labor could lead to the paradoxical result of making the long-lived worse off than the prematurely dead, against *ex post* equity. Thus the

26. Empirical studies on the age/productivity relationship provide mixed results. Haegeland and Klette (1999) show that productivity grows with age, while Aubert and Crepon (2007) and Gobel and Zwick (2009) find that productivity grows with age until age 45, then stabilizes. Crepon et al (2003) find that labor productivity exhibits an inverted U shape with age.

reverse retirement system cannot be designed independently from knowing key structural parameters on the side of technology and preferences.

Concerning demography, the reallocation of labor along the life cycle can only be beneficial for the short-lived provided survival conditions are sufficiently good, allowing for a large number of old workers. If survival conditions are extremely bad, leading to a population age structure with a small proportion of old individuals, it will not be possible, by reallocating labor to old ages, to produce a sufficiently large amount of resources. Hence, in that case, even if one adopts an *ex post* conception of fairness, it is still the case that standard retirement dominates reverse retirement, since the latter leads to too low consumption possibilities for the young (and, hence, for individuals who turn out to be short-lived).

In sum, this section showed that, from the perspective of *ex post* equity, a reverse retirement system organized by the Welfare State can, under some conditions on technology, preferences and demography, improve the situation of those who turn out to die prematurely in comparison to the standard retirement system, by allowing them to enjoy some period of retirement in young adulthood. This improvement of the situation of the unlucky short-lived has nonetheless a cost: the age of exit from the labor market must, like the age of entry, be increased, in such a way as to maintain enough resources in the economy. Reverse retirement is not reducing total labor, but is only a way to reallocate labor along the life cycle in a way that is more fair, or less unfair, for the unlucky prematurely dead. Finally, note that feasibility constraints relative to technology (age-productivity gradient) and demography (age structure) are important, and, depending on these, the reverse retirement system may involve a more or less long initial period of retirement.

5. Reverse retirement as an insurance against premature death

The previous section showed that, from the perspective of *ex post* equity, the reverse retirement system can improve the situation of the short-lived, and reduce well-being inequalities between short-lived and long-lived individuals. One can thus advocate in favor of a shift from standard to reverse retirement on the grounds of fairness.

Although intuitive, that defense of the reverse retirement system is not the only possible one. Actually, it is possible to provide some support for reverse retirement by relying on an argument that is often used to justify standard retirement systems: the *insurance motive* developed by Barr and Diamond (2006) and Cremer and Pestieau (2011).

The insurance motive for retirement goes as follows. Individuals, being myopic, have difficulties to plan their life. They tend to give less weight to the future, and, hence, to save little for their old days. As a consequence, individuals turn out to be poor at the old age. A pension system is then a solution to that myopic behavior: it forces individuals to save at the young age (i.e. by means of mandatory contributions), and, then, once old, individuals are happy to enjoy pension benefits, which give them a higher consumption than what they would have had on the basis of their personal saving behavior.[27]

By transferring resources from young adulthood (during which individuals work) to old adulthood (when they do not work), the standard pension system provides an insurance against old-age poverty. This insurance device protects individuals against being poor at the old age. That story is quite appealing, and recent advances in behavioral economics and cognitive limitations in economic decisions can only reinforce its point.

In the absence of standard retirement, individuals would enjoy a high welfare when being active (thanks to no forced savings), but would then have a much lower welfare at the old age (because of low consumption due to insufficient savings). Consider now what happens under standard pensions. The standard pension system reduces welfare during the active life (due to forced savings), but raises welfare during the retirement period. As such, the standard pension system consists of a useful insurance device, since it smoothes welfare across the different periods of life.

Note that this argument works well when adopting the perspective of a long-lived person. However, if one considers a person who turns out to die prematurely, that person is clearly better-off *without* the standard pension system, since forced savings is a pure loss for individuals who turn out to be short-lived. Thus the insurance argument holds if one adopts the perspective of a long-lived person, or, equivalently, if

27. That theory supposes that the pension system does not crowd out individual savings, which is a plausible assumption under individual myopia (see Cremer and Pestieau 2011).

one believes that the largest welfare loss is associated to the prevalence of poverty at the old age.

While the insurance motive may be taken as supporting the standard retirement system, it is useful to notice that this argument can also be used to justify reverse retirement. Actually, it turns out to be more powerful in supporting a reverse retirement system than a standard retirement system.

To see this, note that, if insurance aims at transferring resources from good states of Nature to bad states of Nature *in general*, then this argument must also apply when considering the particular case where the good state of Nature corresponds to a long life, while the bad state of Nature corresponds to a short life. In the case where either a short life or a long life can emerge, the insurance motive recommends to transfer resources from the good state (the long life) to the bad state (the short life). Such an insurance device exists, and it takes the form of transferring "good things" early in life, and "bad things" towards higher ages, so that prematurely dead individuals benefit from the "good things" (before their early death). This is exactly what reverse retirement does. This consists of an insurance not against old-age poverty, but against something that is even worse: a premature death.

To illustrate this, let us compare lives under standard and reverse retirement. Reverse retirement allows young individuals to enjoy consumption and leisure without working. Hence, this system definitely improves the situation of the young in comparison to a standard retirement system. But given that prematurely dead individuals only enjoy the young age (but are dead afterwards), the situation of the prematurely dead is also improved under reverse retirement (see above). Thus reverse retirement improves the situation of individuals in the worst state of Nature (that is, the occurrence of a premature death), with respect to what would prevail under standard retirement. Reverse retirement thus contributes to transfer resources – and welfare – towards bad states of Nature (i.e. a short life).

In the light of this, the reverse retirement system can be defended on the grounds of insurance. To be precise, whereas the standard retirement system is an insurance against a *long* life, the reverse retirement system is an insurance against a *short* life, in the sense that this device transfers resources towards the worst state of Nature (dying prematurely).

Death being a taboo, individuals tend, in everyday life decisions, to forget about the risks of dying prematurely. Thus, if a key mission of the Welfare State is to insure individuals against serious damages that they tend to ignore due to their limited cognitive skills, then the Welfare State should provide an insurance against a short life. A reverse retirement system could be part of such an extended social insurance scheme.

To sum up, we are in presence of two risks: on the one hand, the risk of having a long life, and of not saving enough for old age; on the other hand, the risk of having a short life, and of saving too much for an old age that is not reached. The standard pension system is an insurance against the first risk, but makes things even worse when a premature death occurs. The reverse retirement system is an insurance against a short life, which improves the situation in case of a short life, but deteriorates it in case of a long life.

When comparing those two risks, it should be stressed that the largest damage is, in advanced economies, associated to *having a short life*.[28] Hence, if what justifies the construction of a social insurance system is to protect individuals against the largest damages, then there is an advantage for the reverse retirement system over the standard retirement system.

Note that, when considering poor economies, with very low standards of living, it might be the case, in those economies, that the largest damage does not consist of a short life, but of a long life with extreme misery. In that case, the insurance motive would definitely justify the standard retirement system. However, in rich economies, the largest damage is not to be poor at the old age, but to die prematurely and have no old age at all.

Here again, a more detailed theoretical framework would be needed to fully compare those two insurance devices, i.e. the conditions on preferences and other fundamentals determining the size of damages under a short or a long life. But the main point of this discussion can be made without developing a full model: *while standard*

28. Actually, it is only under quite extreme poverty that it is better for a person to die prematurely than to survive. But in our advanced societies, the worst-off is unambiguously the person who dies prematurely. On this, see the calculations in Becker et al (2005). Well-being comparisons across individuals having unequal durations of life are also discussed in Fleurbaey et al (2014) while allowing for heterogeneous preferences.

retirement is an insurance against old-age poverty, reverse retirement is an insurance against premature death.

To conclude, it should be stressed that this second argument supporting reverse retirement is not entirely unrelated to the first argument (*ex post* equity). That point is quite general, and goes far beyond the issue of reverse retirement: an insurance system has, necessarily, distributive implications. Hence the defenses of an insurance system as insurance *per se* or in terms of its distributive effects are often related. An insurance system protects individuals against their cognitive limitations, by transferring resources from good states of Nature to bad states of Nature. By doing so, the insurance device often reduces inequalities *ex post*, and, hence, as a by-product, contributes to more *ex post* equity. Back to the context of unequal lifetime, an insurance against premature death has also, in general, the effect of reducing well-being inequalities between the long-lived and the short-lived, in line with *ex post* equity. Having stressed this convergence, it should be underlined that the two arguments supporting insurance are nonetheless distinct. One may defend reverse retirement *either* as a redistributive device favoring *ex post* equity, *or* as a pure insurance against premature death, and the precise form of the reverse retirement system may vary with the dominant justification.[29] Similarly, one may defend an unemployment insurance system *either* on the grounds of insuring the population against the risk of unemployment (independently from its distributive effects), *or* on purely distributive grounds.

6. Criticism (1): a free lunch for the prematurely dead

Having presented justifications for the reverse retirement system either on the grounds of *ex post* equity or on the grounds of insurance, let us now examine some criticisms against reverse retirement. A first,

29. Those two arguments imply insurance systems that may have quite different forms. In the field of standard pension systems, there is the well-known opposition between Bismarckian insurance systems (driven by the ideal of replacing past earnings) and Beveridgean insurance systems (driven by distributive concerns). In the same vein, reverse retirement systems could, in theory, be more « Bismarckian » (related to potential future – rather than past – earnings) or more « Beveridgean », depending on the dominant justification: insurance or *ex post* equity. Note that Bismarkian reverse retirement systems would face extra difficulties: pensions given to young adults would depend on expected future earnings, which would raise commitment problems not present under Bismarkian standard pension systems. Hence, in practice, the simplest form for reverse pension systems would be Beveridgean (a uniform pension to all young adults, independent from future earnings).

major criticism, concerns the existence of a "free lunch" for individuals who die prematurely under a reverse retirement system. Clearly, if a premature death arises at low ages, it is possible that *some individuals die before having worked*. Thus those individuals would enjoy consumption and leisure at the expense of the rest of the society, without contributing to the social product in any way. Such a "free lunch" arises when a person who dies prematurely did not work during his entire life, an anomaly.

The occurrence of such a "free lunch" is counter-intuitive when one regards a retirement period as a kind of "reward" for efforts carried out during the working career. If one regards retirement as a reward, then it is hard to see why a society should reward individuals who did not produce anything. From that perspective, such a "free lunch" is clearly unfair.

It should be stressed that the occurrence of such a "free lunch" takes place only if the premature death arises sufficiently early in life, and leads to the disappearance of the person before he can enter the labor market. As such, this situation is quite specific, and arises only in extreme cases. Having stressed this, it remains that one cannot exclude *a priori* the occurrence of a "free lunch" under reverse retirement. Note that this kind of anomaly cannot arise under standard retirement, since retirement then necessarily comes after labor, and, hence, if someone dies early, this will be after some labor, and before being retired.[30]

Let us now examine whether that "free lunch" is really unfair. Although that "free lunch" may seem quite unfair at first glance, it should be reminded that this is enjoyed by a person who has the disadvantage of dying prematurely. Thus, this "free lunch" is not enjoyed by lucky long-lived individuals, but only by the unlucky short-lived. Given that those short-lived individuals are, in general, the worst-off in the society, this makes this "free lunch" a kind of compensation for the disadvantage of dying early. From that perspective, the "free lunch" is not so problematic, and does not really seem to be unfair.

In some sense, the occurrence of a "free lunch" for the prematurely dead under reverse retirement is the inevitable price to pay for the minimization of welfare losses due to a short life. This minimization can only be done by transferring "good things" of life early in life, and "bad things" of life later on in life. This reallocation of labor along the life

30. We abstract here from infant/childhood mortality.

cycle has the consequence of giving rise to a "free lunch" for the prematurely dead.

One may nonetheless regard this "free lunch" as unfair. However, from the perspective of comparing standard and reverse retirement systems, the unfairness of that outcome must be compared with the unfairness of the situation of the short-lived under standard retirement. In that case, a person has spent the major part of his life working for the society, but turns out to die before enjoying any reward. That situation is more unfair than the one where a prematurely dead person enjoys a "free lunch". Thus the occurrence of a "free lunch" for the short-lived under reverse retirement is not a decisive argument against that system.[31]

7. Criticism (2): incentives and behavioral responses

A second criticism against reverse retirement concerns its economic feasibility. In particular, one may question the capacity of a reverse retirement system to provide the right *incentives* to individuals. In some sense, standard retirement systems, by requiring individuals to work during an entire career *before* being retired, provide incentives to work hard, to the extent that there is a relation between the pension benefit and the effort at work.

One may argue that the reverse retirement system, on the contrary, does not provide such incentives. Given that working people have already enjoyed a retirement period, retirement cannot be used as a "carrot" for encouraging hard work, unlike what prevails under standard retirement. According to that criticism, reverse retirement would thus be hard to sustain, individuals loosing incentives to work after their retirement period.[32]

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31. One may also be worried that the reverse retirement system may incentivize individuals to leave the country once they have enjoyed reverse retirement, to enjoy the "free lunch" while avoiding to work later on. Note, however, that this "*opting out*" behavior cannot be an equilibrium phenomenon. Once we allow for perfect labor mobility, young individuals from all countries would, following the same logics, move towards the country with reverse retirement, hence forcing all other countries to adopt reverse retirement as well (because of a lack of young workers). This would then make any "opting out" strategy unfeasible.

32. It is hard to know how plausible that criticism is. As stressed in Meda (1995), the attitude of individuals towards labor has largely varied across centuries and cultures. The issue of incentives to work – and how these would react to reverse retirement – is quite complex, and goes far beyond the realm of economic analysis.

An incentive-based argument against assigning more work to the old was derived by Cremer (1986), in a quite different theoretical context.[33] Cremer (1986) studied a repeated cooperation game between agents having different ages, and where there is no risk about the duration of life. In that "overlapping game", cooperation can be sustained through the threat of no cooperation in the next period. Cremer analyzed the conditions under which sustainable cooperation can emerge as a stationary equilibrium among finitely-lived individuals working within infinitely-lived organizations.

According to Cremer (1986), it is optimal, from the perspective of incentives, to assign harder tasks (i.e. the ones that require the most efforts, and which are also the most productive tasks) to *younger* workers, and easier tasks to older workers. The underlying intuition is that young agents are less likely to cheat (i.e. not cooperate) than older agents when they are asked to work harder, so that cooperation is sustainable in a larger number of cases when arduous tasks are assigned to the young, in comparison to when these are assigned to older workers.[34] Thus, if one regards reverse retirement as a case where the hardest tasks are assigned to old workers, Cremer's analysis of cooperation within repeated overlapping games may be used to question, on the grounds of incentives, the social desirability of reverse retirement.[35]

Beyond the specific issue of incentives to work, one may also question the economic feasibility of reverse retirement more generally, on the grounds of all behavioral responses this system would generate in the economy. In particular, one may argue that the perspective of a retirement period later on in life encourages savings, and, hence, capital accumulation, which is a key driver of economic growth. On the contrary, under reverse retirement, the incentive to save for old days is reduced, which may threaten capital accumulation and growth. That argument is examined in Ponthiere (2020), while using a four-period dynamic overlapping generations model with physical capital accumu-

33. The author is grateful to a reviewer for this reference.

34. That result is based on the comparison of incentive-compatibility constraints when harder tasks are assigned either to the young or to the old.

35. Note that Cremer's (1986) model assumes that the length of life is certain and known. Introducing risky lifetime would complicate the comparison of incentive constraints under distinct tasks allocations. The effect of introducing risky lifetime on the results is hard to know, since whatever the distribution of tasks is, the possibility of dying in the future reduces the incentives to cooperate now, since cooperation is always made possible by the threat of no cooperation in the future (which becomes less effective when there is a risk of death).

lation. That paper shows that shifting from standard to reverse retirement affects savings behaviors, but does not prevent physical capital accumulation. The reason is that, even under reverse retirement, there exists, at the end of life, a period of inactivity. Actually, at a very old age, labor productivity becomes quite low – and the disutility of labor becomes very high – so that working is no longer desirable. This motivates individual savings during the working time. Thus shifting from standard to reverse retirement does not make incentives to save disappear. Having stressed this, it is true that the law of capital accumulation is affected by the shift from standard to reverse retirement, and that reverse retirement may be less favorable to capital accumulation than standard retirement.[36]

While the above rationale suggests that reverse retirement may weaken the accumulation of physical capital, it should be stressed that this may have opposite effects on the accumulation of human capital. Indeed, pension benefits given to young adults may encourage them to invest more time and resources in higher education. Higher education investments would then favor human capital accumulation, with positive effects on labor productivity, technological progress, and, *in fine*, long-run economic growth. It should be stressed, however, that such a virtuous mechanism depends crucially on behavioral assumptions about how young adults would adapt their education investment to the new pension system.

In the light of all this, it appears that the design of a fair retirement system should also take incentives and behavioral responses into account, and that those aspects may limit the scope of the argument for the reverse retirement system in real-world economies. It should be stressed, however, that those issues – incentives to work, behavioral responses in terms of physical and human capital accumulation – do not provide a decisive argument against reverse retirement. Those concerns only illustrate a standard dilemma in public economics between equity/insurance and incentives. That dilemma arises quite often when considering distributive or insurance issues; reverse retirement is not an exception to that dilemma.

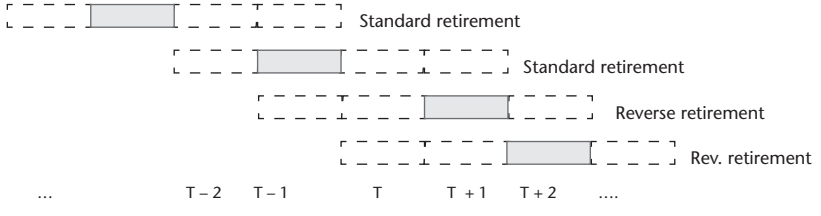
36. Note also that both kinds of social insurance systems – standard retirement and reverse retirement systems – can potentially crowd out private savings.

8. Criticism (3): the transition

Besides incentive/behavioral issues, one may also question the possibility to make a transition from a system of standard retirement – where individuals are first workers, then retirees – to a system of reverse retirement – where individuals are first retirees, then workers.

Actually, a decentralized transition from standard to reverse retirement could be, in some cases, problematic. The problem is the following. If, at a given point in time, the children of some individuals decide to retire early, whereas their parents worked when being young, and want to retire at the old age, the economy is, during the transition period, in a situation where no one works: neither the old (who are retired under a standard retirement system), neither the young (who enjoy reverse retirement).[37] That problem is illustrated on Figure 5, which shows the example of a transition between standard and reverse retirement that takes place at time T, for the case where there are only two (potentially) active cohorts.[38] At the period of the transition (period T), no one is working, so that the economy collapses. The intuition behind that paradoxical result goes as follows. The reverse retirement system amounts to reallocate labor later on in life. However, for cohorts before the transition, labor was concentrated at the beginning of life. Therefore, at the period of transition from one retirement regime to another, there has to be a time without labor, since the old are retirees of the former standard retirement system, while the young are retirees of the new, reverse retirement system.

Figure 5. A transition problem



37. That transition is studied in Ponthiere (2020) by means of a 4-period dynamic overlapping generations model.
38. For the sake of simplicity, the figures of this section include only 4 ages of life. As above, periods of labor are in grey, whereas periods without labor (childhood and retirement) are in white.

Thus the transition from standard to reverse retirement cannot take place in a decentralized way. This does not imply, however, that such a transition is impossible. This only states that a transition requires coordination among cohorts, and cannot be left to individual decisions only. Actually, a proper transition from standard to reverse retirement can be done – without any collapse – by imposing, for a number of transition cohorts (to be determined), to postpone retirement, in such a way as to avoid the occurrence of a period without production. The smaller the number of transition cohorts is, the more concentrated the burden of transition is.

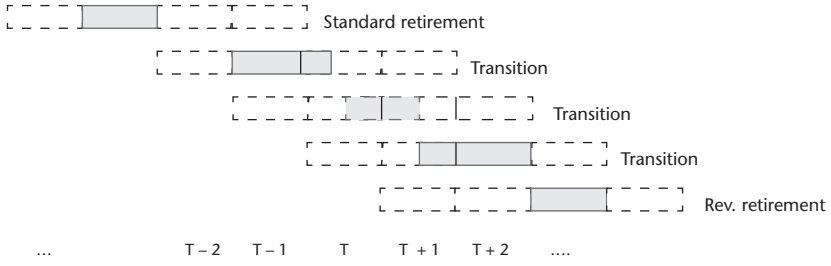
Figure 6 provides an example of a smooth transition, which takes place not on a single, but on three successive time periods, so as to divide the burden of the transition across a larger number of cohorts, and, hence, to reduce the size of the burden for each transition cohort.[39] As shown on Figure 6, the transition from standard to reverse retirement can be smoothed by requiring that a large number of cohorts postpone their retirement age slightly (and thus work more than pre-transition cohorts), so that the ages of entry and exit from the labor market are progressively increased. This insures a smooth transition from standard to reverse retirement.

Regarding the transition issue, it should be stressed that there is another important dimension, which does not appear on Figure 6: the age structure of the population. Indeed, Figure 6 shows several successive cohorts without indicating their relative sizes. Obviously, the transition is easier if there is a higher number of seniors (whose retirement age is postponed) in comparison to the number of juniors (whose age of entry on the labor market is postponed).

The presence, in the early 21st century, of large cohorts of baby-boomers at the top of the age structure could facilitate that transition. Indeed, large cohorts of baby-boomers could serve as transition cohorts. After WWII, Welfare States took advantage of the age structure with a large basis of baby-boomers to fund pensions to the (less numerous) old. In the early 21st century, it is possible to take also advantage of the age structure (with large cohorts of baby-boomers at the top) to organize a smooth transition towards reverse retirement.

39. Obviously, one could go further than on Figure 6, and make the transition over a longer time interval, of, let us say, x periods, which would allow each of the x transition cohorts to take $1/x$ of the burden of the transition.

Figure 6. A (smooth) solution to the transition problem



9. Conclusion: one more social utopia?

Recent debates about the pension reform in France revealed that a large majority of individuals – whatever these are supporting the pension reform or not – are worried about issues of fairness and equity in the design of the pension system. This suggests that fairness is a major requirement to be satisfied by a pension system in the 21st century.

This paper argued that both the existing sector-based pay-as-you-go pension system and the universal pay-as-you-go pension point system miss the target of fairness. The reason is that both pension systems have little concern for individuals who are the most disadvantaged: unlucky individuals who turn out to die prematurely before reaching the retirement age.

By taking into account differences across jobs in terms of harshness of work leading to life expectancy differentials, both the existing and the reformed pension systems can only try to approach *ex ante* equity, whereas, as we have argued, there are good reasons to believe that the main goal to be pursued should be *ex post* equity, that is, equity in terms of realized well-being outcomes (and not in terms of well-being prospects). From the perspective of *ex post* equity, differentials in life expectancy are irrelevant; only realized longevity matters. Thus constructing a (reformed) pension system using differentials in life expectancy will not help reaching the goal of *ex post* equity, and, hence, will not contribute to social justice.

The minimization of inequalities in realized outcomes leads, under general conditions, to a reverse retirement system, where individuals are allowed to enjoy some period of retirement before entering the

labor market, which leads to a postponement of the age of entry and of the age of exit from labor. Such a reverse retirement system, by transferring the "good things" of life (consumption and leisure) early in life, and the "bad things" (labor) later on in life, reduces welfare losses due to a premature death, in line with *ex post* equity.

The reverse retirement system involves a large departure from the existing pension system, and, hence, the transition from standard to reverse retirement is likely to generate hostility.[40] In the light of this, what could be the future of reverse retirement? Is this going to become one more social utopia? What is the point, for economists, to think about large social reforms, when smaller reforms are already hard to implement? Three answers can be proposed.

First, reverse retirement looks like a social utopia, but this was also the case, in the past, of standard pension systems, which appeared relatively recently at the scale of human history.[41] Thus being regarded as a utopia at one point in history does not make the policy proposal less relevant for the policy debate from a long-run perspective. Moreover, one could argue that some existing trends – such as the postponement of the entrance on the labor market thanks to the rise of higher education – are going in the same direction as reverse retirement.[42]

Second, reverse retirement can be regarded as a variant of social policies *already existing* in some countries, such as the system of social drawing rights in Denmark, which allows young adults to benefit from a period of financial independence used for personal development (Van de Velde 2008). Reverse retirement could also be related to Supiot's (1999) extended social insurance, which allows workers to enjoy sabbatical leaves. However, the reverse retirement system is not, unlike Supiot (1999), providing flexibility to choose the structure of the career.[43] One could consider reverse retirement as a basic income

40. From a political economy perspective, the older segment of the population is likely to be against the introduction of reverse retirement, on the grounds that this would postpone the age of exit from the labor market. But it is far from clear to see how other segments of the population would vote on such a reform.

41. As for France, Lavigne (2013) mentions an édit royal in 1604 requiring the exploitants of a mine to dedicate 1/30th of their output to miners in need, which is an ancestor of modern (more universal) pension systems.

42. In the light of this, reverse retirement would institutionalize and generalize that existing trend and, also, would organize the associated postponement of the age of exit from labor market.

43. Allowing for a full flexibility of labor decisions along the life cycle could lead, in theory, to the risk of collapse of the economy due to a penury of labor at some period (see Section 8). Some coordination of individual labor decisions must be made at the State level to avoid such a coordination failure.

system, but conditional on age restrictions, unlike universal basic income proposals (Vanderborght and Van Parijs 2005).

Third, beyond the policy proposal in itself – and its links with existing policies –, what matters most are the underlying *arguments* or *foundations*, in particular the relevancy of *ex post* equity for the design of a fair retirement system. As we argued, *ex post* equity recommends to allocate the "good things" of life early in life, and the "bad things" later on in life. Standard retirement systems do the exact opposite, and thus violate *ex post* equity. That negative result should receive more attention in policy debates about the pension reform.

In real-world economies, it is likely that there would be resistance against reverse retirement. In such a constrained world, one may try to combine some features of standard and reverse retirement systems, as a kind of "political compromise". True, the two retirement systems rely on different normative foundations (the former violates *ex post* equity, unlike the latter), but the practice of social reform may require to depart from pure theoretical forms, to achieve a compromise. One could thus, in practice, use the arguments developed in this paper to bring modifications to *existing* pension systems, by introducing some "dose" of reverse retirement in these. For instance, the point pension reform would gain in social support if the young were assigned a given number of points at age 18, points that would give them right to early retirement, between, let us say, ages 18 and 21 (as a starting point). Those points could be used for formal education or for other life experiences favoring personal development (e.g. benevolent work for NGOs). When joined with such an initial retirement, the postponement of the age of exit from the labor market would become more acceptable among the population.[44]

In sum, from the perspective of social justice, there would be an obvious gain from adding some dose of insurance against premature death in addition to the existing insurance against old-age poverty. Finding a balance between those two insurance goals is a major challenge for the Welfare State in the 21st century. Such a challenge could not have arisen in earlier times, where mortality was so strong that the

44. Alternatively, one could regard the introduction of some dose of reverse retirement as part of a new intergenerational compromise. The story would go as follows: younger cohorts face problems (e.g. climate change) that were produced by older cohorts. Hence introducing some dose of reverse retirement – at the expense of older cohorts involved in the transition – would bring a more fair intergenerational equilibrium.

associated age-structure – a too low proportion of old people in the population – could not allow for reverse retirement. Things are different nowadays, where a new Welfare State could emerge, and offer a – more fair – compromise between an insurance against premature death and an insurance against old-age poverty.

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