Volume Title: Social Security Programs and Retirement Around the World: Disability Insurance Programs and Retirement

Volume Author/Editor: David A. Wise, editor

Volume Publisher: University of Chicago Press

Volume ISBNs: 0-226-26257-X, 978-0-226-26257-4 (cloth); 978-0-226-26260-4 (e-ISBN)

Volume URL: http://www.nber.org/books/wise14-1

Conference Date: September 26–28, 2013

Publication Date: January 2016

Chapter Title: Retirement, Early Retirement, and Disability: Explaining Labor Force Participation after Fifty-Five in France

Chapter Author(s): Luc Behaghel, Didier Blanchet, Muriel Roger

Chapter URL: http://www.nber.org/chapters/c13327

Chapter pages in book: (p. 251 – 284)

6

Retirement, Early Retirement, and Disability
Explaining Labor Force Participation after Fifty-Five in France

Luc Behaghel, Didier Blanchet, and Muriel Roger

6.1 Introduction

The link between health status and retirement has long been neglected in the French pension debate. The French system offers early retirement possibilities to people suffering from handicap or invalidity, but they never had the importance they have taken in some other countries. The reason is twofold: (a) an age at normal retirement that used to be low compared to international standards, and (b) the preeminence of two other pathways, unemployment insurance and public early retirement schemes, for exits at still lower ages. A large fraction of people wishing to retire early because of poor health conditions could do so without explicitly invoking this factor. It is at the most in ex post self-assessments of retirement motives that health considerations seemed to play a significant role (see Barnay and Jeger 2006), but with the well-known difficulty of correcting such assessments from justification biases.

This situation has started evolving over the last decade. Four reforms have been conducted that have or will strongly reduce possibilities to leave as early as age sixty, and specifically the 2010 reform that has shifted the minimum age to sixty-two, with only limited derogations for earlier exits. Simulta-

Luc Behaghel is a researcher at the French National Institute for Agricultural Research (INRA) and the Paris School of Economics. Didier Blanchet belongs to the French National Statistical Institute (INSEE). Muriel Roger is a researcher at the Banque de France, the French National Institute for Agricultural Research (INRA), and the Paris School of Economics.

This chapter presents the views of the authors and should not be interpreted as reflecting the views of the Banque de France or INSEE. For acknowledgments, sources of research support, and disclosure of the author's or authors' material financial relationships, if any, please see http://www.nber.org/chapters/c13327.ack.

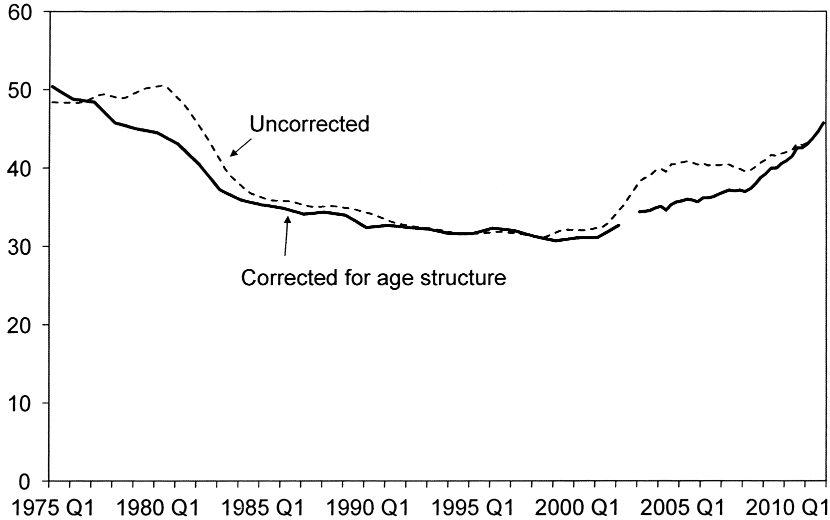

Fig. 6.1 Labor force participation for the fifty-five to sixty-four age group

Source: Labor Force Survey and Minni (2012).

Note: The thin line reports the gross labor force participation rate. The thick line reports a LFP rate corrected for changes in age structure within the fifty-five to sixty-four age bracket. For instance, starting in 2001–2002, the gross rate is pushed above its basic trend by the arrival of the first baby boom cohorts at age fifty-five. The corrected rate neutralizes this temporary phenomenon. The break in 2002–2003 corresponds to the shift from the annual to the continuous time Labor Force Survey.

neously, access to public early retirement schemes has been dramatically reduced: except for some very specific categories of workers, these schemes are currently under extinction. Some tightening of rules also took place within the unemployment route; until recently, recipients of unemployment allowances over a certain age were exempted from seeking employment, making their condition very close to the one of pre- or fully retired workers. This exemption was abolished in 2012.

All these changes have started producing significant results in terms of employment or labor force participation rates in the fifty-five to sixty-four age group (see figure 6.1). In this context, interest for the health/retirement connection has now emerged as a much more central issue. This issue can be considered from two opposite points of view.

- From the budgetary point of view of those who seek to maximize the impact of past reforms on actual retirement ages, one potential preoccupation is the risk of seeing the invalidity route to retirement progressively expand as an alternative to those other routes that are progressively shut down or made much less attractive. This substitution effect is well known: reducing opportunities offered by one route or a

subset of existing routes generally leads to a redirection of flows toward other pathways, limiting the ex post efficiency of the initial policy.
- From the opposite social point of view of individual well-being, one can conversely argue that bad health is a legitimate motive for benefiting from an early exit and that it should be more systematically taken into account in the design of retirement policies.

The second issue is closely related to two other ones: (a) the question of knowing how retirement schemes should take into account the hardness of past or current working conditions that very often constitute prominent determinants of health status, and (b) the question of knowing how these same pension rules should take into account differences in life expectancy that are generally tied to bad health conditions. France is a country that benefits from a relatively high average life expectancy, but where mortality differentials are quite large across social groups. Global policies that aim at uniform increases in retirement ages ignoring these penibility/health/mortality differentials raise obvious problems of fairness and this has probably contributed to part of the resistance encountered by some reforms. The 1993 and 2003 reforms have partially avoided this problem because they chose to postpone retirement ages by changing conditions on past contribution records, hence essentially affecting skilled and healthier workers having started working and contributing at older ages. Such is also the strategy followed by the new 2013 reform. The 2010 reform, on the other hand, by raising uniformly the minimum retirement age, affected more than proportionately less skilled workers (Blanchet and Le Minez 2012) that were, up to now, the main beneficiaries of the French low minimum age at retirement, and who could consider this as a fair compensation for their generally much shorter life horizons.

The two apparently opposite budgetary and social points of view concerning the health/retirement issue are not contradictory. An optimal design of retirement schemes requires adequate pathways for individuals that deserve specific treatments, be it for bad health or any other relevant motive, accompanied with some checking that such pathways are not used by individuals for whom they have not been targeted.

To help thinking about such optimal schemes, some positive knowledge of how health and retirement decisions currently interfere is an obvious intermediate step. It is to this question that the present chapter contributes, looking at how various exit routes have been used in the past by French senior workers according to their observed health status. The chapter will be organized in five sections. Section 6.2 will come back to the general description of the disability and sickness leave route to retirement in France and how its share in global transitions to retirement has changed over time. Section 6.3 presents the empirical method used to estimate the exit rate from the labor market of older workers according to their health status. Results are given in section 6.4 and section 6.5 is devoted to some simulations of how older workers' retirement behavior would change, for a given health status, when the relative generosity of the different retirement routes changes.

6.2 Background

The development of the French pension system took place in several steps throughout the twentieth century. The first large-scale system was developed in 1920, (*retraites ouvrières et paysannes*) then replaced in 1941 during World War II by the AVTS (*Allocation aux Vieux Travailleurs Salariés*) under the Vichy government. It provided early retirement for workers above age sixty excluded from the labor force either for health or economic reasons. But the real birth of the pension system we are still living in today occurred just after World War II, when a large welfare state started being developed with a specific part devoted to old age. The initial value for the normal retirement age had been set at sixty-five, considered as the typical average threshold at which individuals started being unable to maintain their standards of living through labor force participation, be it for health or other reasons, and thus had to become eligible for old-age benefits.

However, specific health conditions were also taken into account by the designers of the welfare system and still provide the basic structure of what will be called here the "invalidity" pathway to retirement. Before age sixty, people suffering from health troubles implying work limitations are eligible for disability insurance benefits (*pension d'invalidité*). Then, reaching sixty, these people already benefiting from invalidity insurance directly shift to old-age disability benefits (*retraite pour ex-invalides*). Individuals declared unable to work at age sixty, but who did not previously benefit from invalidity benefits, are also eligible for old-age disability benefits (*retraite pour inaptitude*). For quite a long time, however, this second category remained highly selective: it required a disability rate of 100 percent, was limited to people having worked for at least thirty years, and provided a benefit being, at the maximum, equal to 40 percent of the average of past wages.[1] This was higher than the rate of replacement for people claiming early retirement at age sixty without this invalidity motive, but remained little attractive.

For several years, the global generosity of the whole pension system remained limited. Until the end of the 1960s, poverty remained widespread among older age groups. A reaction took place during the 1970s, and several changes progressively increased the coverage and level of pension benefits. This period was also a relatively dynamic period for the development of the *pension d'inaptitude*, in a context marked by strong union pressure in favor of lowering the normal retirement age to sixty for the entire population. During the 1970s that demand remained unsatisfied, but the Boulin reform

1. The disability rate measures the intensity of limitations encountered by the disabled person.

Fig. 6.2 ***Pensions d'inaptitude*: Total flows**
Source: CNAV in Omnès (2006).

in 1971 opened several possibilities for earlier exits for various categories of the population, including a move toward less selective and more generous rules for the *pension d'inaptitude*: the threshold for the rate of invalidity was lowered to 50 percent, the condition of having worked thirty years or more was suppressed, and benefits were increased to 50 percent of the average wage, that is, in line with a normal full-rate pension.

This mechanically led to an increased importance of this route, but, as shown in figure 6.2, the incidence of this change was more pronounced for women because men, at the same period, had also started benefiting from the development of another early retirement route financially more attractive, that is, unemployment and early retirement initially developed to cope with severe reductions of activity that had taken place in some traditional industries such as the steel industry, but that progressively expanded as a major instrument offered to employers and employees for facilitating all forms of early exits from the labor force. This unemployment and early retirement route initially concerned workers in the sixty to sixty-four age group.

After 1983 access to a full pension at age sixty became possible for the large majority of the population, the only condition being to have contributed to the pension system for at least 37.5 years. In this context, claiming for a *pension d'inaptitude* became useless for a large share of people. Those who still had a reason to rely on this route were people reaching the age of sixty in bad health and with incomplete careers.

This situation has started to evolve again over the last decade. Four reforms have been conducted that have strongly reduced the possibilities to leave as early as age sixty, specifically the 2010 reform that has shifted the minimum age to sixty-two, with only limited derogations for earlier exits. It is in this new context that the health/invalidity/retirement link has started reemerging as an important topic, both from an academic and an operational viewpoint. On the operational side the pension reform that took place in 2003, while making general access to full-rate pensions at age sixty more difficult, introduced new possibilities for exits before age sixty for workers having started working very early, expected to suffer, on the average, from harder working conditions and lower health status than more skilled workers having started their careers at much later ages. This 2003 reform was also expected to be followed by negotiations between social partners specifically devoted to the situation of workers suffering from difficult working conditions affecting their health status. Although these negotiations remained unable to deliver tangible results, this shows how important the problem is now considered to be. The issue implicitly or explicitly reemerged with the 2010 reform. Opponents to the reform pointed at consequences of a uniform increase in the minimum retirement age for all workers including those with bad health, low life expectancies, or who have experienced bad working conditions. A partial answer to this concern has been to finally maintain the threshold of age sixty for people with a level of impairment of at least 50 percent.

6.3 Empirical Strategy

Stylized facts concerning the relative importance of the French disability and sickness leave route are already well known. Behaghel et al. (2012) have shown that, until now, alternative routes have exempted French workers from massively relying on disability motives for early exits over the past decades, but put forward that a decrease in the generosity of other routes may induce people in bad health to claim disability benefits. Results of these authors are mostly on substitution effects between the several retirement pathways available to old age workers. In the sequel, the objective is to go some steps further, by looking in more detail at how retirement behavior is affected by the availability of the various routes out of the labor force and how this availability interacts with actual health status. We shall consider incentives provided by disability insurance (DI) programs, but also by old-age specific unemployment or early retirement benefits, in addition to those provided by normal pension rules.

Some difficulties arise when one wants to estimate the causal links between retirement and health at old age. Labor force attachment, health, and relative gains associated with the different pathways may be driven by common unobservable factors like abilities, preferences, or family events. For instance, the disability and sickness leave route is advantageous for those with short careers. Following the choices made in previous waves of the International Social Security (ISS) program, we rely on an option value (OV) indicator (Stock and Wise 1990) of the incentives to leave the labor market to disentangle the effect of health versus incentives in the retirement behavior. The option value indicator measures the value to continue working compared to the value provided by other options in a dynamic framework. The OV indicator is labeled "inclusive" in the sense that it tries to provide a synthetic weighted summary of the option values associated with each possible path to retirement.

The inclusive OV summarizes the main characteristics of the French retirement system and alternative routes into a single indicator. Among the many difficulties of such an exercise, one stems from the intrinsic complexity of the French system and of the various routes offered to workers considering leaving the labor force. To keep things tractable, we restrict ourselves to "normal retirement" for wage earners or civil servants. Concerning access to old age unemployment support and preretirement, a one-by-one inclusion of all the possibilities that have existed over the period is beyond the scope of this chapter and would probably be of little interest, given the very aggregate nature of the index we are trying to build. Our approach is instead to proxy all these routes by the dominant one for each period, giving to this route a global weight equal to the total flow of early retirees or unemployed for each period.

The incentive indicator for the disability and sickness leave pathway has been simulated following assumptions that will be described later. Once this is made, we shall be able to compute an inclusive option value as:

$$\mathrm{OV}_t^{\mathrm{inc}}(t) = \alpha_{\mathrm{DI}}\mathrm{OV}_t^{\mathrm{DI}}(t) + \alpha_{\mathrm{UER}}\mathrm{OV}_t^{\mathrm{UER}}(t) + (1 - \alpha_{\mathrm{DI}} - \alpha_{\mathrm{UER}})\mathrm{OV}_t^{\mathrm{normal}}(t),$$

where $\mathrm{OV}_t^{\mathrm{inc}}$ is the inclusive option value, $\mathrm{OV}_t^{\mathrm{DI}}$ is the option value for the disability and sickness leave pathway, $\mathrm{OV}_t^{\mathrm{UER}}$ is the option value for the unemployment and early retirement pathway, $\mathrm{OV}_t^{\mathrm{normal}}$ is the option value for normal retirement and where α_{DI} and α_{UER} are the relative weights of the DI and unemployment and early retirement pathways.

Because the main objective of the chapter is to disentangle the impact of incentives and health status on labor force participation, we introduce simultaneously the OV and individual health indicators in regressions explaining employment status. The generic equation that is estimated is therefore:

$$\Pr(\mathrm{retire} = 1) = \Phi(\beta\mathrm{OV}^{\mathrm{inc}} + \gamma\mathrm{I}^{\mathrm{health}} + \delta X),$$

with retire equal to 1 for individuals not in employment, $\mathrm{OV}^{\mathrm{inc}}$ the inclusive option value, $\mathrm{I}^{\mathrm{health}}$ the individual health indicator, and X some individual characteristics. Regressions are also performed separately by health quintiles. The sample includes individuals still employed in the previous year. The estimations are conducted with probit specifications and standard errors clustered at the individual level.

The labor force participation and health indicators are taken from the French data of the Survey of Health, Ageing and Retirement in Europe. The SHARE survey is a multidisciplinary and cross-national panel database of microdata on health, socioeconomic status, and social and family networks of more than 85,000 individuals age fifty or older from nineteen European countries. The sample size for France is around 3,000 households interviewed every two years since 2004. Data collected include information on individual labor market status and numerous health variables: self-reported health, health conditions, physical and cognitive functioning, health behavior, and use of health care facilities. Data on labor force participation are issued from SHARELIFE, the third wave of data collection for SHARE. This wave provides some complementary information on people's life histories. The health indicator is based on waves 1 and 2 of the survey.

Before moving to the results, we detail the components of the regression model in the following subsections. The first subsection is devoted to the presentation of the pathways, the second to the weighting of these different pathways, the third to the computation of the option values, the fourth to the presentation of the health indicator, and the last to the presentation of the main characteristics of the employment data.

6.3.1 Pathways to Retirement and Participation in the Labor Force

We summarize the pathways to retirement in three categories: the normal retirement pathways (main route), the disability and sickness leave pathways (routes of interest), and the unemployment and early retirement pathway (others). Because the unemployment and early retirement pathway is not the focus of the chapter, we decided to aggregate these two retirement routes that actually display some common characteristics.

The main characteristics of the disability and sickness leave route have been already presented in section 6.2. We only recall here the main features of the system. Before age sixty, the *pension d'invalidité* is for individuals with a disability rate over two-thirds. Workers can also be on long-term sickness leaves. After age sixty, people may be eligible to the *pension d'inaptitude* for a disability rate over one-half if they did not get a *pension d'invalidité* before age sixty. These people are treated as full-rate pensioners even if they do not fulfill conditions for the full rate.

For the normal retirement route, we consider the first pillar to be basic pension and the second pillar to be complementary pensions for private-sector employees, and the one-pillar pension for civil servants. The basic pension is linked to age at retirement and to N, the number of years of contribution to the pension scheme. Until 2009, major changes have concerned the condition on N for getting the full rate before age sixty-five (now forty-one years instead of 37.5 in 1992), the replacement rate at this full rate, and the penalties and bonuses for retiring before or after this full rate. In 2009 the mandatory age was shifted to seventy and, in 2010, the minimum retirement age was shifted to sixty-two. Accordingly, the age for getting the full rate without the requested value of N was also increased by two

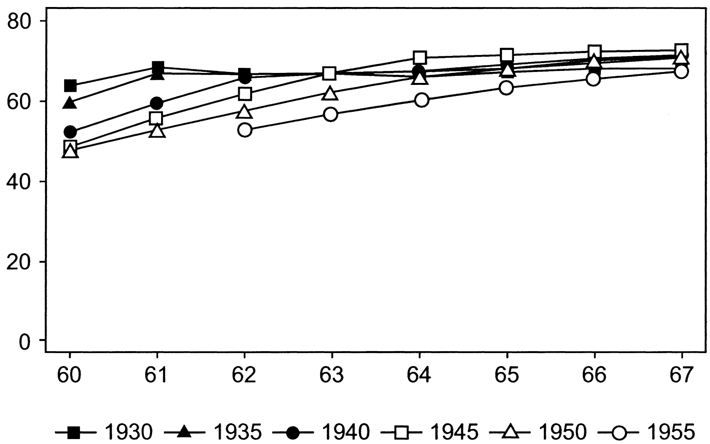

Fig. 6.3 Changes over cohorts for the normal retirement pathway

Source: Authors' computation based on the PENSIPP microsimulation model.

Note: The graph presents the relationship between replacement rates and age at retirement for one illustrative case of worker in six successive cohorts. These illustrative workers are supposed to have worked as wage earners in the private sector and paid at the current social security ceiling only since the age of twenty-four. This age has been chosen to illustrate how the initial rules penalized workers with careers too short to get a full-rate pension at age sixty. The last cohort is affected by the change in the minimum age at retirement, raised from age sixty to sixty-two by the 2010 reform.

years, shifting from sixty-five to sixty-seven. The 2013 reform has again affected the condition on N rather than the age bracket for access to retirement. Figure 6.3 provides a very synthetic view of the recent changes in the main parameters of the pension scheme illustrating how past reforms have changed the relationship between retirement age and the replacement rate for an individual that, under pre-1993 conditions, was already unable to get the full rate at age sixty.

The unemployment and early retirement pathway provides a given percentage of the reference wage at an age that, in the past, has varied between fifty-six and fifty-seven. Here, we have retained a stylized profile for this eligibility age and a fixed replacement rate of 60 percent. We consider a fixed replacement rate, which is the characteristic of most of these programs. The major differences concern eligibility ages, not fully homogenous across subroutes and not constant over the past decades. People in early retirement or on unemployment go on validating years of contribution when over fifty-five years of age until they are entitled to the full-rate pension.

Figure 6.4, from Behaghel et al. (2012), shows the pathways to retirement of men and women from 1983 to 2003.We see a decrease in the share of people still in employment just before their sixtieth birthday and an increase in the shares of people in early retirement or benefiting from unemployment

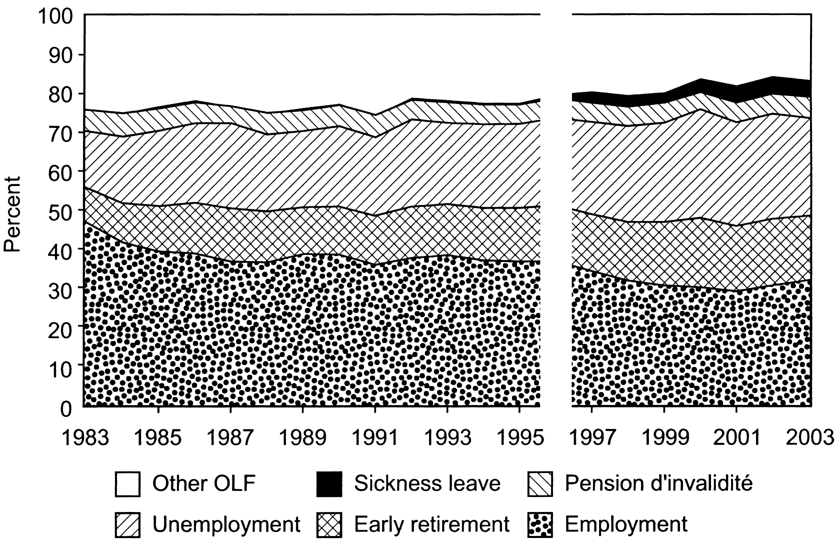

Fig. 6.4 Pathways to retirement, men and women

Source: Behaghel et al. (2012).

Note: Pathways are proxied by the situation at age fifty-nine (source: Enquête Emploi) corrected with administrative data on unemployment (source: Unédic), early retirement (source: Dares), and complemented with administrative data on sickness leave (source: CNAM) and inflows from *pension d'invalidité* to *pensions d'inaptitude* (source: CNAV). Break in the series: Data on sickness leave are missing before 1997; before that date, workers in sickness leave are recorded as employed.

insurance benefits. All over the period, the number of people going through disability insurance or sickness leave is not negligible, but remains small, amounting to between 5 percent and 8 percent of the population.

6.3.2 Weighting the Pathways to Retirement

The retrospective presentation of the pathways underlines the changes over the last decades. People from different cohorts experience different opportunities at the end of their working lives. Pathways in figure 6.4 are proxied by the situation at age fifty-nine in the French Labor Force Survey corrected with administrative data on unemployment and early retirement and complemented with administrative data on sickness leave and inflows from pension *d'invalidité* to pension *d'inaptitude*. We have the information at the population level. To disaggregate the pathways by gender or education, we use another French survey mixing information on disability and labor market histories to compute the relative weights of the retirement pathways, by cohorts, over the last decades.

The data are taken from the French survey *Santé et Itinéraire Profession-*

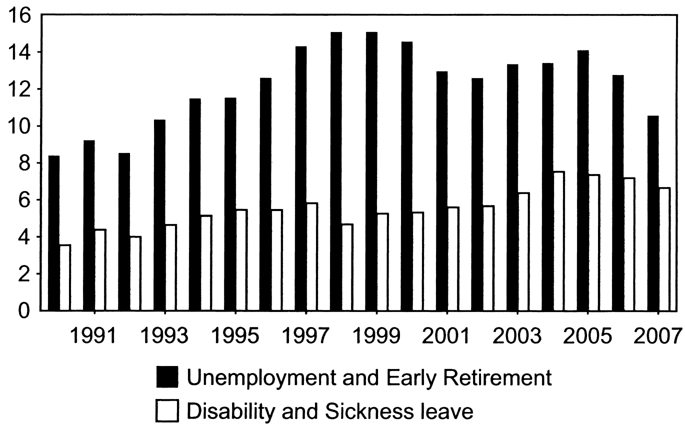

Fig. 6.5 Pathway probabilities by year

nel (Health and Labor Market history). The survey provides current and retrospective information on health and labor market status for 14,000 individuals aged twenty to seventy-four in 2006. All successive spells in labor market histories and all major health events in individuals' lives are reported.[2] Moreover, the survey provides general socioeconomic information on the characteristics of households and information pertaining to periods before entry in the labor market. We select a subsample of spells corresponding to the states experienced by the individuals of the sample from ages fifty-five to sixty. The states are classified in four categories: employment, disability or sickness leave, early retirement or unemployment (with unemployment benefits), and retired or out of the labor force.

We make several assumptions to compute the relative weights. We consider that the DI path is relevant for everybody and not only for those who seem to have ex ante some obvious (observed) reasons to consider the choice of applying for DI. The amount of information required to be able to know if the DI path is a realistic prospect for an individual may be very high and the assumptions we should have to make very strong. We thus impute to each individual, considering a few individuals' characteristics, the mean value of the cell, that is, the probability to experiment each pathway for all individuals having the same characteristics. The probabilities are calculated using the share of the population for the combined age groups fifty-five to sixty on each state at a given point in time.

Figure 6.5 provides the stock estimator of the pathway probabilities by

2. Due to the complexity of some labor market trajectories, unemployment and inactivity under one year are not sampled.

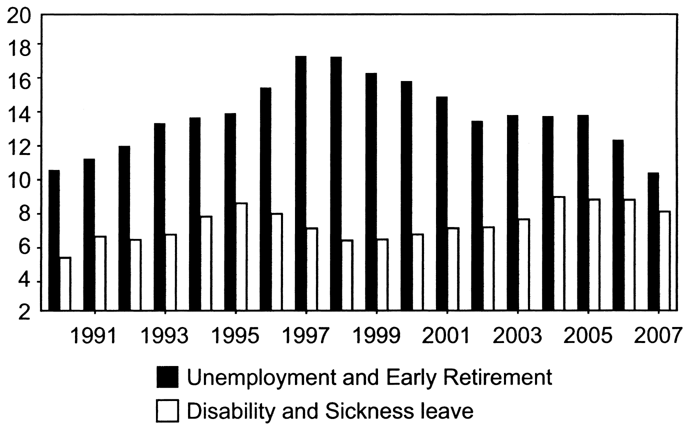

Fig. 6.6 Pathway probabilities by year (men)

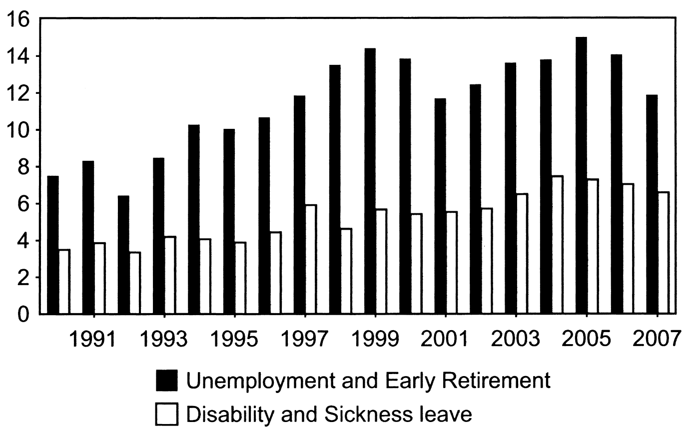

Fig. 6.7 Pathway probabilities by year (women)

year between 1990 and 2007. The share of the disability and sickness leave route increases from less than 4 to nearly 8 percent over the period. However, the level remains quite low. Also, the share of the unemployment and early retirement route nearly doubles during the period, but on a higher level. It goes from 8 to nearly 16 percent, being the highest around 1998 when the disability and sickness leave route exhibits a slight decrease after eight years of monotonous increase.

The decline in the disability and sickness leave route around 1998 is mostly due to men (figure 6.6). It occurs at the same time as an increase in the probability to leave the labor force through the unemployment and early retirement route. Trends for women (figure 6.7) are less clear. This is the case for

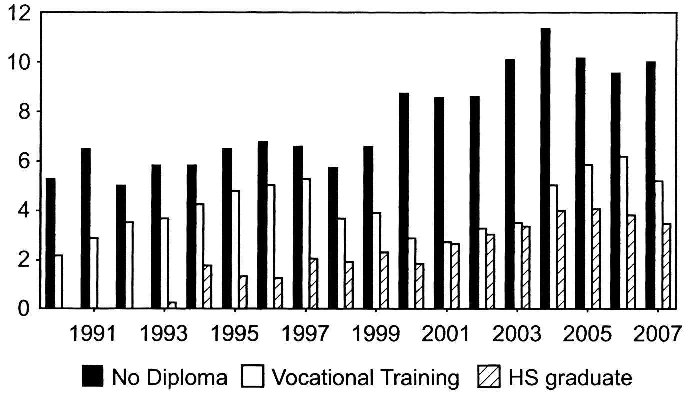

Fig. 6.8 Probability of DI path by education group

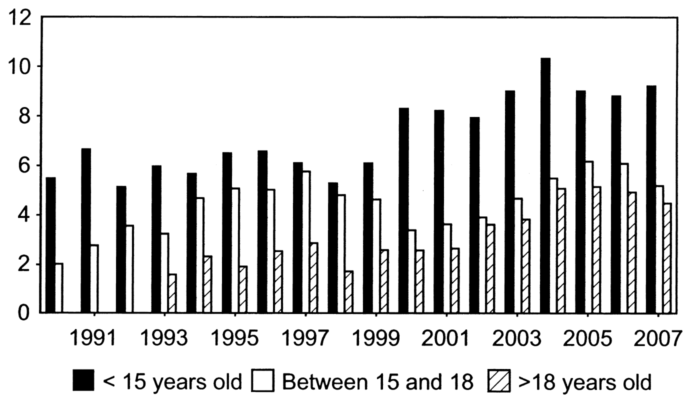

Fig. 6.9 Probability of DI by age at the end of school

most indicators on the labor market over the period, with two phenomena occurring at the same time: changes in the relative situation of older workers on the labor market on the one hand, and the increase in women's labor force participation over the past decades on the other hand.

Retirement routes are also distinct by education level. Figures 6.8 and 6.9 draw the pathway probabilities by education and age at leaving school. The probability to experiment DI is higher for the less educated. At the beginning of the period, the more educated (or those having left school later) did not use the disability or sickness leave route. Their propensity to claim disability pensions increased over the period. Around 2000, the use of DI for the most graduated workers nearly equals the one of individuals with vocational training. The difference by education is more relevant than by gender.

6.3.3 OV Computation

We will hereafter detail the specific assumptions made, for each pathway, to compute the OV indicators. The OV indicators are based on the net present values (NPV) of retiring at age r, computed at age t, and given by:

$$V_t(r) = \sum_{s=t}^{r-1} \pi_{s/t} \beta^{s-t} Y_s^{\gamma} + \sum_{s=r}^{\omega} \pi_{s/t} \beta^{s-t} (kB_s(r))^{\gamma}.$$

With parameters $\beta = 0.97$ (discount factor), $\gamma = 0.75$ and $\kappa = 1.5$ (preference for leisure), and with $\pi_{s/t}$ the probability of being still alive at age s conditional upon being alive at t, Y labor income and $B_s(r)$ the pension benefit that depends upon retirement age r.

The option value of not retiring at t is given by:

$$G_t = V_t(r^*) - V_t(t),$$

where r^* is the age that maximizes $V_t(r)$.

The normal retirement route consists of the normal basic pension (*régime général*) plus complementary pensions (ARRCO-AGIRC) for wage earners in the private sector, or the one-pillar pension applying to civil servants. For these pension schemes, the minimum eligibility age is sixty (the current shift to sixty-two is without any incidence for the population under review). For the calculation of the incentive, an individual retiring before the age of sixty is supposed to live without resources until the minimum age and then retire immediately even if he does not reach the additional condition required for the pension to be a full-rate pension. Hence, his NPV will include a zero component until age sixty, followed by a positive component from sixty to death, at a level that will depend upon whether this individual did or did not reach the full rate at sixty.

For the invalidity route that covers the two subcases of *pension d'invalidité* and *pension d'inaptitude*, an individual exiting through this route at any age before sixty is entitled to 50 percent of a reference wage truncated to the social security ceiling, without any condition concerning the length of his past career. The exact formula for this reference wage is the mean wage over the ten best years of this person's career, after truncation. Here, for simplicity, we retain the truncated value of this person's last wage. Then, when reaching the minimum retirement age of sixty, this person is reoriented toward the *inaptitude* subroute, that is, a computation of a full-rate normal pension (including complementary pensions) even if this person does not totalize the number of years of contribution required for the full rate under normal provisions.

The last route, the unemployment and early retirement route (hereafter UER), offers leaving at an age that, depending upon year of exit, has been alternatively equal to fifty-six or fifty-seven, with a level of benefit applying to one's last wage truncated to 200 percent of the social security ceiling, with two different rates applied to the share of this last wage below and over the social security ceiling. People exiting through this route then go on accumulating years of participation to normal social security and start getting their pensions as soon as they reach conditions for this pension to be a full rate one. This route only applies to wage earners in the private sector. Since it is not possible to voluntary quit the labor force at, for example, age fifty-five and wait until the eligibility age for this UER route, exits through the UER route are treated as equivalent to exits through the normal route, that is, full inactivity until the minimum retirement age.

Table 6.1 shows computations associated with the normal route for an individual considering different ages to leave the labor force when his current age is fifty-five.

This person is a private-sector worker born in 1930, having started working at age seventeen. If he had chosen to leave the labor force at fifty-five (in 1985), he would have had to wait until sixty to get a pension of only 10,948 equivalent euros per year. The "55" column shows the resulting sequence of discounted utility flows by year: zero utility until age fifty-nine included, then a utility at age sixty of $(\kappa * 10{,}498)^{\gamma}/\gamma$ that, with $\kappa = 1.5$ and $\gamma = 0.75$ is equal to 1,874, hence, after correction for survival and discounting, a contribution to intertemporal well-being of 1,510. The sum of all these contributions from age fifty-five to the maximum life span was 20,955. The same person still at age fifty-five, but contemplating leaving at sixty could expect at this age a much larger pension of 15,170, the gap being due to the five additional years of contributions to both the general regime and complementary schemes. In such a case, the discounted sum of utility flows includes nonzero values corresponding to net labor income between fifty-five and fifty-nine, followed by the flows resulting from the new benefit level, hence a much larger NPV of 37,828.

Considering retirement at still older ages did not lead to large additions to this person's pension benefits, given the rules that applied to this cohort. For this person, having started work in 1947 at age seventeen and continuing to work until age fifty-nine warranted a full-rate pension at sixty. Beyond this age, further increments due to postponing had only small consequences for the level of benefits: they were almost exclusively the result of the accumulation of additional points in complementary schemes. Nevertheless, in this example, retiring later always resulted in a higher NPV, despite the choice of a relatively high preference for leisure. The value κ equal to 1.5 means that, in the short run, the individual is better off once retired instead of working as soon as his replacement rate is higher than 66 percent, and such is the case here after age sixty. But the resulting short-run loss in well-being in case of postponement remains more than compensated by the fact of getting a slightly higher pension all over the retirement period. As a result, viewed

Table 6.1 **Computation of incentives, an illustration**

			Age of potential retirement										
			55	56	57	58	59	60	61	62	63	64	65
Permanent pension once fully retired			10,498	12,206	13,703	14,199	14,683	15,170	15,685	15,980	16,453	16,730	17,138
Net wage if working			19,079	19,497	19,748	20,147	20,191	20,786	21,068	21,191	21,293	21,230	21,256
Age	Life probs.	Disc. life probs.											
55	1	1	0	2,164	2,164	2,164	2,164	2,164	2,164	2,164	2,164	2,164	2,164
56	0.988	0.959	0	0	2,111	2,111	2,111	2,111	2,111	2,111	2,111	2,111	2,111
57	0.976	0.92	0	0	0	2,043	2,043	2,043	2,043	2,043	2,043	2,043	2,043
58	0.963	0.881	0	0	0	0	1,987	1,987	1,987	1,987	1,987	1,987	1,987
59	0.949	0.843	0	0	0	0	0	1,903	1,903	1,903	1,903	1,903	1,903
60	0.934	0.806	1,510	1,691	1,844	1,894	1,942	1,990	1,860	1,860	1,860	1,860	1,860
61	0.919	0.769	1,442	1,615	1,761	1,809	1,855	1,901	1,949	1,794	1,794	1,794	1,794
62	0.902	0.734	1,375	1,540	1,679	1,725	1,769	1,812	1,858	1,885	1,718	1,718	1,718
63	0.885	0.699	1,310	1,467	1,600	1,643	1,685	1,726	1,770	1,795	1,835	1,643	1,643
64	0.867	0.665	1,246	1,395	1,522	1,563	1,602	1,642	1,684	1,707	1,745	1,767	1,559
65	0.848	0.631	1,183	1,325	1,445	1,484	1,522	1,560	1,599	1,622	1,658	1,678	1,709
	. . .												
95	0.02	0.006	11	13	14	14	15	15	15	16	16	16	17
96	0.013	0.004	7	8	9	9	9	10	10	10	10	10	11
97	0.008	0.002	5	5	6	6	6	6	6	6	6	6	7
98	0.005	0.001	3	3	3	3	4	4	4	4	4	4	4
99	0.004	0.001	2	2	2	2	2	2	2	3	3	3	3
100	0.002	0.001	1	1	1	2	2	2	2	2	2	2	2
Sum of flows			20,955	25,629	29,866	32,601	35,257	37,828	38,347	38,534	38,872	38,951	39,106
Option value			18,151										

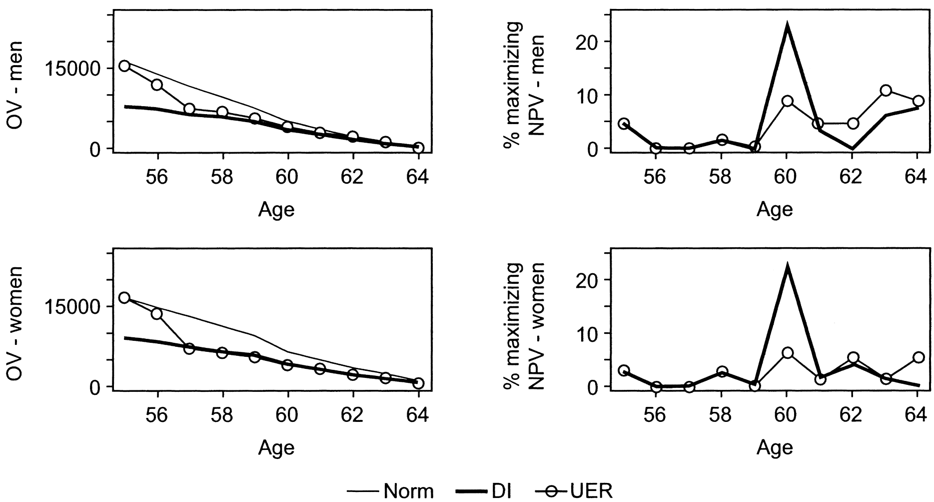

Fig. 6.10 Mean OVs and percent maximizing NPVs of retiring at each age

from age fifty-five, the age maximizing the NPV was sixty-five, and the option value of going on working at fifty-five was NPV(55,65) – NPV(55,55) = 39106 – 20955 = 18151, reported in the bottom cell of the table.

How are these incentive measures distributed among the whole population under review and for the three different routes considered in this study? The left-side panels of figure 6.10 show mean OVs associated to these three routes for men and women from our sample, respectively. By construction, OVs at age fifty-five are the same with the normal and the UER route, and then a break is observed for these OVs at fifty-six and fifty-seven for the UER route, while OVs for the normal route decline much more gradually.

The disability and sickness leave route, after age fifty-six or fifty-seven, has characteristics that are very similar to the UER route, replacement rates being roughly similar. Therefore, the main difference is the fact that this route does not entail any age condition, hence a much lower option value of going on working for people having access to this route as soon as age fifty-five.

Graphs in the right-side panels give the percentages of people for which OVs turn negative at each age, that is, those reaching an age where leaving the labor force provides a discounted utility flow higher than the one potentially derived from retiring at any later age. Despite the relative generosities of benefits offered through the invalidity and UER routes, these proportions remain low or even zero until the minimum retirement age. The reason is again that, for the specification of γ and κ, staying in the labor force is always preferable to exiting as long as the replacement ratio falls short of the inverse of the κ parameter that measures preference for leisure. Here, κ is equal to 1.5, meaning that net replacement rates higher than 66 percent are a necessary condition to make immediate exits welfare improving. Such replacement rates are almost never obtained before the age of sixty. It is only after the minimum retirement age that such replacement rates start occurring, yet only through the normal and invalidity routes. This explains the full superposition between profiles for the normal and unemployment and early retirement routes at all ages: those people that find it profitable to exit through the UER route are in fact those who could directly move from the UER to the normal route and leave the labor force with a sufficiently high level of their normal pension, with, as expected, one first spike at the minimum age of sixty. This spike is much more pronounced for the invalidity route, as this route amounts to systematically offering a full-rate normal pension at this age whatever the past record of social security contributions.

6.3.4 Measuring Health

The health index is computed using the SHARE data following the methodology developed by Poterba, Venti, and Wise (2010) on the American Health and Retirement Survey data. The authors assume that latent health is revealed by responses to the long list of questions asked in the survey relative to health status and changes in health status. The health index is then defined as the first principal component of these selected health measures. It is a weighted average of the health indicators with weights chosen to maximize the proportion of the variance of the individual health index that can be explained by this first principal component. This methodology has been replicated with twenty-five questions from the SHARE questionnaire. (Details on the selected questions and on the weights are provided in the appendix and in the introduction of this volume.)

The percentiles of health, by age and sex, are given in figures 6.11A and 6.11B.[3] Percentile 1 corresponds to the worst health and percentile 100 to the best. Unsurprisingly, the health index is decreasing with age and is higher for women than for men.

6.3.5 Employment Data

Data on labor market states are issued from SHARELIFE, the third wave of data collection for SHARE. This wave provides some complementary information on people's work histories. The data collection for SHARELIFE took place between the fall of 2008 and summer of 2009. Over a sample of 2,483 individuals for France, we consider 1,121 individuals employed at age fifty-four for whom we have information on past careers and on health indicators. Following them from age fifty-four until retirement provides information on 6,274 annual spells. For each observation we have additional information on gender, age at leaving school, occupation (executive or nonexecutive), degree, marital status, and assets of the household.

Regressions are made on the whole sample, but also on a subsample cor-

3. The figures are drawn using the lowess smoother of Stata.

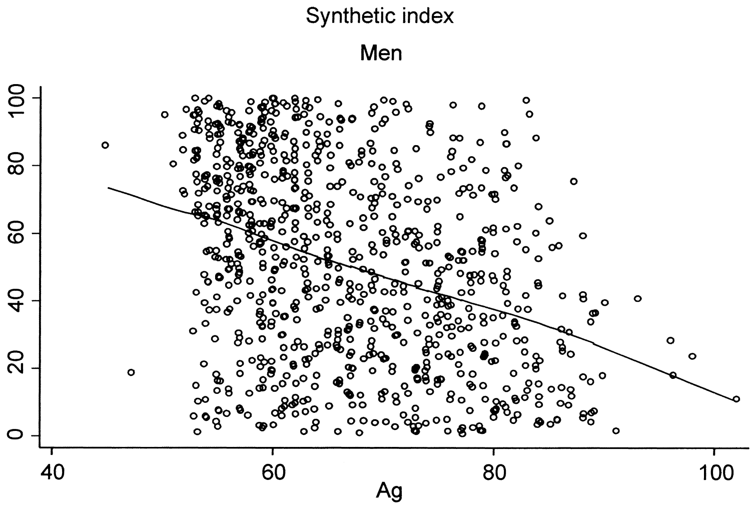

Fig. 6.11A Percentiles of health index by age, men

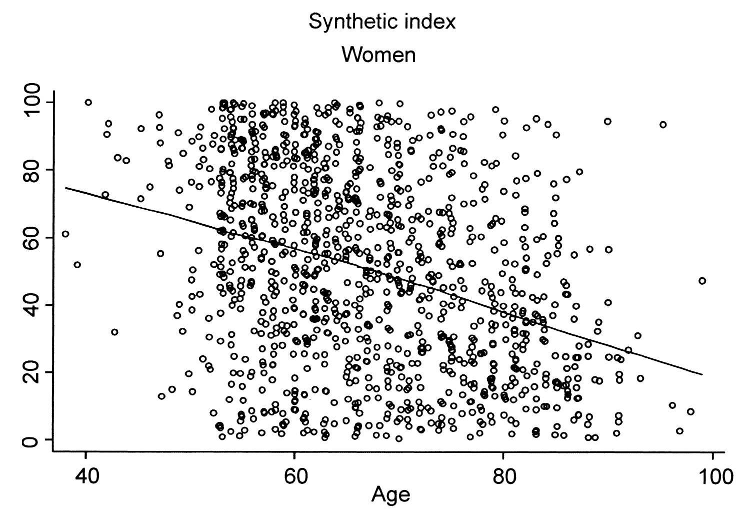

Fig. 6.11B Percentiles of health index by age, women

responding to health quintiles or education levels. The size of the subsample, the number of observations, and the mean retirement rates will be detailed in tables of results with the coefficients of the regressions.

6.4 Results

Table 6.2A displays the results of probit models of the transition to nonemployment between ages fifty-five and sixty-four. Transition to nonem-

Table 6.2A Effect of inclusive OV on retirement

	Retire							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
OV_inclusive	–0.047***	–0.046***	–0.047***	–0.046***	–0.047***	–0.046***	–0.048***	–0.046***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
	[–0.044]	[–0.042]	[–0.044]	[–0.042]	[–0.044]	[–0.042]	[–0.044]	[–0.042]
Health quintile 2	–0.041***	–0.041***	–0.041***	–0.042***				
(second lowest)	(0.010)	(0.010)	(0.010)	(0.010)				
Health quintile 3	–0.031***	–0.031***	–0.034***	–0.034***				
	(0.011)	(0.010)	(0.010)	(0.010)				
Health quintile 4	–0.029***	–0.030***	–0.028***	–0.029***				
	(0.011)	(0.011)	(0.011)	(0.011)				
Health quintile 5	–0.059***	–0.057***	–0.060***	–0.058***				
	(0.010)	(0.010)	(0.010)	(0.010)				
Health index					–0.010***	–0.010***	–0.010***	–0.010***
					(0.002)	(0.002)	(0.002)	(0.002)
Men			0.018**	0.017**			0.018**	0.017**
			(0.009)	(0.008)			(0.009)	(0.008)

Married			0.035***	0.034***			0.034***	0.034***
			(0.009)	(0.008)			(0.009)	(0.008)
Educ.: vocational			0.016	0.017			0.015	0.016
(ref. no diploma)			(0.011)	(0.011)			(0.011)	(0.011)
Educ.: HS graduate and above			–0.007	–0.006			–0.006	–0.005
			(0.010)	(0.010)			(0.010)	(0.010)
Total assets			0.049	0.043			0.044	0.039
(in million euros)			(0.043)	(0.042)			(0.044)	(0.043)
Age	Linear	Dummies	Linear	Dummies	Linear	Dummies	Linear	Dummies
No. of observations	6,274	6,274	6,274	6,274	6,274	6,274	6,274	6,274
No. of subjects	1,121	1,121	1,121	1,121	1,121	1,121	1,121	1,121
Mean retirement rate	0.124	0.124	0.124	0.124	0.124	0.124	0.124	0.124
Mean of OV	15,055	15,055	15,055	15,055	15,055	15,055	15,055	15,055
Std. dev. of OV	10,255	10,255	10,255	10,255	10,255	10,255	10,255	10,255

Note: Coefficients are marginal effects of a 10,000-euro change in OV from probit models. The effect of a one standard deviation change in OV is shown in brackets. Robust standard errors in parentheses.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

ployment is considered hereafter equivalent to retirement: the transition into employment from any other state of the labor market is rare in this age group, so we consider that leaving the labor market after fifty-five in France is an absorbing state. We include various sets of controls in models (1) to (8). The first four models are estimated using dummy variables for health quintiles. The last four replicate the same specifications, but include the health index under a linear assumption instead of health quintiles. The values of the inclusive OV in the regressions are in units of 10,000 euros.

Results on the inclusive OV are unchanged when we change the specification of the health indicator. The coefficient of the inclusive OV has the expected negative sign and is highly significant, that is, individuals with higher incentives to delay retirement will effectively do it. The results remain remarkably robust to the various sets of controls. Coefficients for the inclusive OV are between –0.046 and –0.048. The effect on the probability of retirement of a one standard deviation change in the OV is given within brackets in table 6.2A, under the estimated coefficient. Since this standard deviation is roughly equal to 10,000 euros, our unit for measuring OVs, these simulated effects have the same order of magnitude as estimated coefficients. They range between –0.042 and –0.044. Considering the mean level of probabilities to retire, that is, 0.124, this implies a decrease of nearly 30 percent for these probabilities: this impact is quite large, but it corresponds to a change in incentives that is itself quite large, amounting to two-thirds of the mean inclusive option value.

Estimates for control variables imply that people in better health tend to retire at older ages. All coefficients on health quintiles are negative and significant in specifications (1) to (4), that is, individuals in a health quintile higher than the first (worst health quintile) tend to remain longer in the labor market. However, there is no clear trend and a linear assumption on the health effect might be rejected. Coefficients of health quintiles 2 to 5 tend to exhibit an inverted U-shaped pattern.

Probabilities to retire are also higher for men and married people. The higher probabilities for men may result from higher pension entitlement due to longer careers not fully captured by incentive variables. Concerning married people, higher propensities to retire can be due to joint retirement decisions of spouses, especially for women (Sédillot and Walraet 2002). On the other hand, coefficients for wealth and education are not significant at the 5 percent level when these variables are introduced in the regressions. A higher education level decreases the probability to retire, as could be expected, but the results are hardly significant, probably because financial motivations to postpone for more skilled people are, here, appropriately captured by the OV indicator.

Figures 6.12A, 6.12B, 6.13A, and 6.13B display predicted versus actual retirement behavior by age. Predicted hazards and survivals are simulated by age using the estimated coefficients of specification (8) where age effects

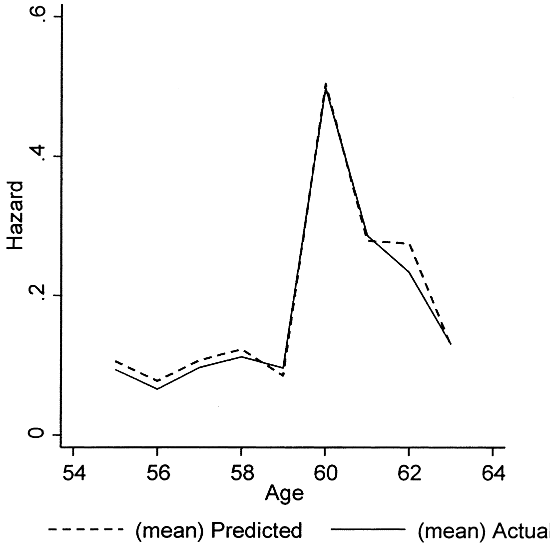

Fig. 6.12A Model fit hazard, men

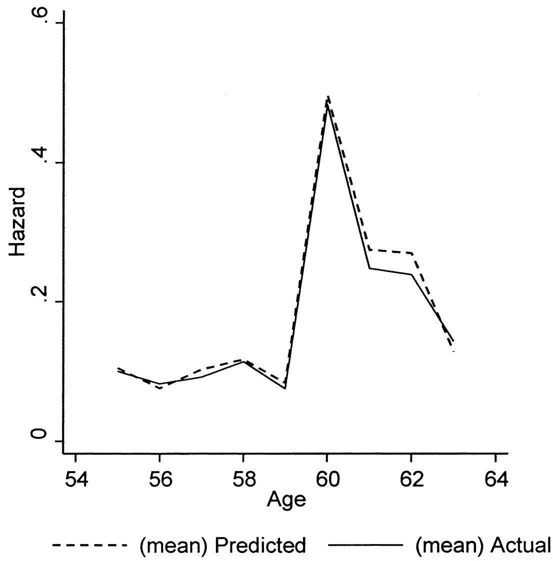

Fig. 6.12B Model fit hazard, women

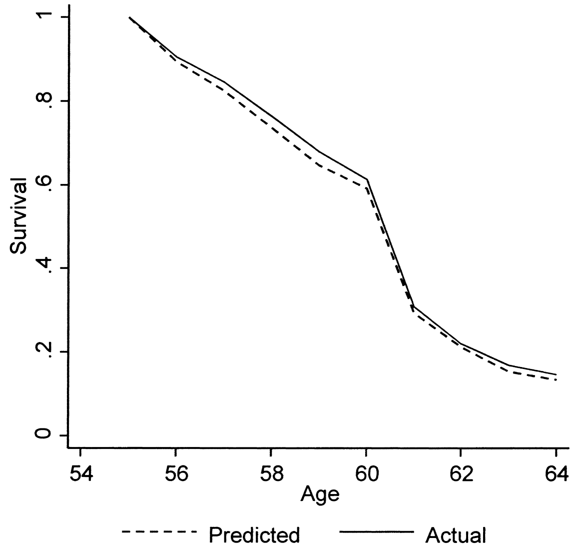

Fig. 6.13A Model fit survival, men

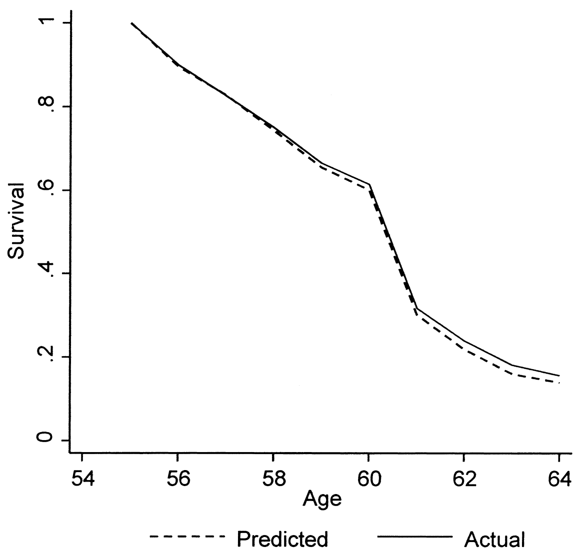

Fig. 6.13B Model fit survival, women

Table 6.2B — Effect of percent gains in inclusive OV on retirement

	Retire			
	(1)	(2)	(3)	(4)
Percent gain in OV	–0.039***	–0.037***	–0.040***	–0.038***
	(0.013)	(0.012)	(0.012)	(0.012)
Age	Linear	Dummies	Linear	Dummies
Health quintiles	X	X	X	X
Other Xs			X	X
No. of observations	6,274	6,274	6,274	6,274
No. of subjects	1,121	1,121	1,121	1,121
Mean retirement rate	0.124	0.124	0.124	0.124
Mean of % gain in OV	0.624	0.624	0.624	0.624
Std. dev. of % gain in OV	0.683	0.683	0.683	0.683

Note: Robust standard errors in parentheses.
***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

are captured by dummies rather than with a linear specification. Age effects are introduced to capture progressive changes in preferences for retirement when people get older, but also some possible attraction effects for some specific retirement ages: using dummies is better suited for capturing this second category of age effects. As a general rule, using dummies rather than a linear trend by age does not affect the estimated impact of the OV indicator, but leads, effectively, to a much better fit reflected on these figures 6.12A, 6.12B, 6.13A, and 6.13B. However, there remains a slight underestimation of survival rates and an overestimation of hazard rates around age sixty-two. Results are the same by gender.

Table 6.2B replicates the specifications (1) to (4) (health quintiles) of table 6.2A for a different OV indicator. This alternative indicator is computed by averaging, over the three potential routes, the percentage gains from delaying retirement measured by the corresponding OVs at this age a divided by net present values of retiring, through this route, at this age a. Averages are computed using the same relative weights as the ones used for the initial inclusive OV. This new set of estimations confirms that the estimated impact of financial indicators is almost the same whatever the set of control variables introduced in the model.

Tables 6.3A and 6.3B display estimates for the same models as in tables 6.2A and 6.2B, but separately for the five health quintiles. The mean retirement rate is decreasing with the level of health from 0.159 for the worst health quintile to 0.096 for the best health quintile. This means that individuals in better health retire at older ages. The effect of financial incentives provided by the pension system is higher in the middle of the health distribu-

Table 6.3A **Effect of inclusive OV on retirement by health quintile**

	No. of obs.	Mean ret. rate	Mean of OV	Std. dev. OV	Specification (1)	(2)	(3)	(4)
OV: Lowest quintile (worst health)	1,260	0.159	14,233	9,513	–0.040**	–0.041**	–0.040**	–0.041**
					(0.017)	(0.016)	(0.018)	(0.017)
					[–0.036]	[–0.033]	[–0.035]	[–0.034]
OV: 2nd quintile	1,253	0.122	13,872	9,370	–0.074***	–0.071***	–0.071***	–0.068***
					(0.014)	(0.013)	(0.014)	(0.013)
					[–0.061]	[–0.060]	[–0.060]	[–0.058]
OV: 3rd quintile	1,257	0.134	14,711	10,072	–0.049***	–0.043***	–0.049***	–0.042***
					(0.014)	(0.014)	(0.015)	(0.015)
					[–0.046]	[–0.042]	[–0.046]	[–0.041]
OV: 4th quintile	1,245	0.128	15,910	10,642	–0.047***	–0.049***	–0.053***	–0.054***
					(0.012)	(0.012)	(0.012)	(0.012)
					[–0.046]	[–0.045]	[–0.053]	[–0.051]
OV: Highest quintile (best health)	1,208	0.096	16,803	11,125	–0.019*	–0.017*	–0.017	–0.015
					(0.010)	(0.010)	(0.011)	(0.010)
					[–0.021]	[–0.020]	[–0.019]	[–0.018]
Linear age					X		X	
Age dummies						X		X
Other Xs							X	X

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 6.3B **Effect of percent gain in inclusive OV on retirement by health quintile**

	No. of obs.	Mean ret. rate	Mean of gain	Std. dev. gain	Specification (1)	(2)	(3)	(4)
OV: Lowest quintile (worst health)	1,260	0.159	0.721	0.904	–0.012	–0.014	–0.012	–0.014
					(0.019)	(0.018)	(0.019)	(0.018)
OV: 2nd quintile	1,253	0.122	0.611	0.584	–0.083***	–0.084***	–0.079***	–0.080***
					(0.026)	(0.025)	(0.026)	(0.025)
OV: 3rd quintile	1,257	0.134	0.569	0.537	–0.056*	–0.046*	–0.059**	–0.049*
					(0.029)	(0.027)	(0.030)	(0.027)
OV: 4th quintile	1,245	0.128	0.628	0.812	–0.034	–0.041	–0.040	–0.046
					(0.031)	(0.030)	(0.032)	(0.030)
OV: Highest quintile (best health)	1,208	0.096	0.623	0.605	–0.023	–0.017	–0.023	–0.016
					(0.019)	(0.018)	(0.019)	(0.018)
Linear age					X		X	
Age dummies						X		X
Other Xs							X	X

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

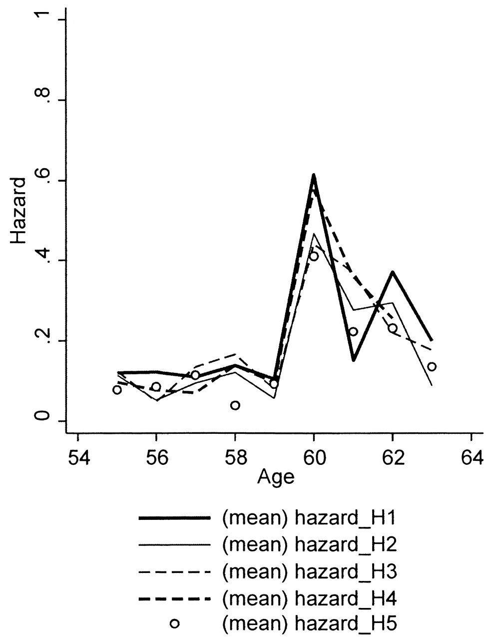

Fig. 6.14 Predicted hazard by health quintiles

tion (table 6.3A). Changes in the probability of retirement associated with a change of one standard deviation for incentives is –0.06 in the second quintile, between –0.04 and –0.05 in the third and fourth quintiles, and around only –0.02 in the fifth quintile. It is as if choices for individuals in very good health were less dependent on financial incentives, both because good health may be associated with better working conditions that reduce propensity to retire or, quite the opposite, because very good health offers opportunities for alternative projects or activities during the retirement period. The low coefficient for the lowest quintile is less counterintuitive as people in bad health may be constrained to retire whatever the financial conditions. The regressions with the gain variable confirm the results of the OV incentive indicator, but generally less significant. Coefficients are significant only for the second and third health quintiles, that is, in the middle of the health distribution. Predicted hazards by health quintile are given in figure 6.14.

Table 6.3C presents the results of models directly including the interaction between health status and the incentive variable, with a linear specification for the health variable. This specification is more constrained than the previous one and less informative: the negative interaction between health and inclusive OV is not statistically significant, but coefficients of the OV inclusive variable remain the same as in specifications (5) to (8) of table 6.2A.

Last, in tables 6.4A and 6.4B, we present estimations including interac-

Table 6.3C **Effect of inclusive OV on retirement with health index interaction**

	Retire			
	(1)	(2)	(3)	(4)
OV_inclusive	–0.047***	–0.046***	–0.048***	–0.046***
	(0.006)	(0.006)	(0.006)	(0.006)
	[–0.044]	[–0.041]	[–0.044]	[–0.042]
Health index	–0.018***	–0.018***	–0.021***	–0.020***
	(0.007)	(0.006)	(0.007)	(0.007)
OV*health index	–0.001	–0.001	0.000	0.000
	(0.005)	(0.004)	(0.005)	(0.005)
Age	Linear	Dummies	Linear	Dummies
Other Xs			X	X
No. of observations	6,274	6,274	6,274	6,274
No. of subjects	1,121	1,121	1,121	1,121
Mean retirement rate	0.124	0.124	0.124	0.124
Mean of OV	15,055	15,055	15,055	15,055
Std. dev. of OV	10,255	10,255	10,255	10,255

Note: Coefficients are marginal effects of a 10,000-unit change in OV from probit models. The effect of a one standard deviation change in OV is shown in brackets. Robust standard errors in parentheses.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

tions between education levels and the incentive variables, either the inclusive OV (table 6.4A) or the gain indicator (table 6.4B). Unsurprisingly, the more educated people are, the lower is the mean retirement rate and the higher is the mean of the OV incentive indicators. The effect of changes in the probability of retirement associated with a one standard deviation of the inclusive OV is nearly twice as large for high school graduates or above (nearly –0.06 for a mean retirement rate of 0.109) compared to high school dropouts (around –0.03 for a mean retirement rate of 0.138). Results are not very sensitive to the specification of the model. The general pattern is the same with the gain indicator, but with results that are generally less significant.

6.5 Simulations

Results of the previous section have shown that health and incentives provided by the pension system simultaneously impact on individual retirement behavior. We will now simulate changes in the retirement behavior, for a given level of health, for alternative scenarios concerning pension or disability and sickness leave entitlements.

Because the share of disability and sickness leave among the retirement pathways is quite low in France (figures 6.4 to 6.8), the part of this specific

Table 6.4A Effect of inclusive OV on retirement by education group

	No. of obs.	Mean ret. rate	Mean of OV	Std. dev. OV	Specification			
					(1)	(2)	(3)	(4)
OV: < High school	2,150	0.138	12,352	8,782	–0.033***	–0.030**	–0.035***	–0.031***
					(0.012)	(0.012)	(0.012)	(0.012)
					[–0.028]	[–0.024]	[–0.029]	[–0.025]
OV: Vocational	1,265	0.132	15,804	9,301	–0.041**	–0.045***	–0.040**	–0.044**
					(0.017)	(0.017)	(0.019)	(0.019)
					[–0.036]	[–0.038]	[–0.035]	[–0.037]
OV: High school graduate and above	1,932	0.109	18,010	11,964	–0.059***	–0.055***	–0.058***	–0.054***
					(0.007)	(0.007)	(0.007)	(0.007)
					[–0.060]	[–0.058]	[–0.061]	[–0.059]
Linear age					X		X	
Age dummies						X		X
Other Xs							X	X

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 6.4B Effect of percent gain in inclusive OV on retirement by education group

	No. of obs.	Mean ret. rate	Mean of OV	Std. dev. OV	Specification			
					(1)	(2)	(3)	(4)
OV: < High school	2,150	0.138	0.575	0.638	–0.010	–0.007	–0.011	–0.008
					(0.019)	(0.019)	(0.020)	(0.019)
OV: Vocational	1,265	0.132	0.610	0.513	–0.052*	–0.057*	–0.048	–0.053*
					(0.030)	(0.030)	(0.031)	(0.031)
OV: High school graduate and above	1,932	0.109	0.621	0.584	–0.104***	–0.095***	–0.100***	–0.092***
					(0.018)	(0.017)	(0.018)	(0.017)
Linear age					X		X	
Age dummies						X		X
Other Xs							X	X

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

path in the inclusive OV is quite slight. Thus, we have to simulate large changes in the availability of this subroute to observe some impact on the inclusive OV and on retirement behavior.

We first simulate retirement behaviors as if only one exit route were available, normal retirement, unemployment and early retirement, or DI. Then, we add two "mixed" scenarios. These two scenarios use unchanged probabilities to exit through the unemployment and early retirement pathway,

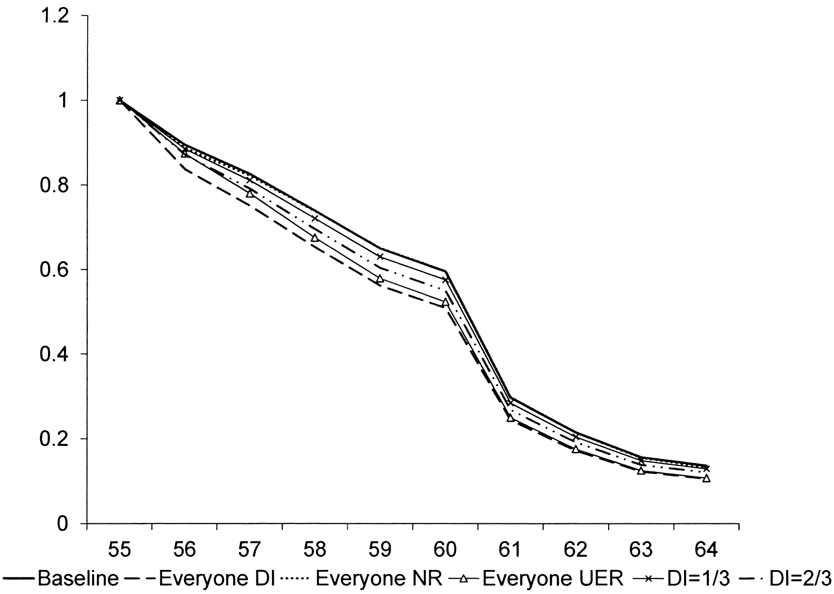

Fig. 6.15 Survival functions under alternative scenarios, full sample

but probabilities differ concerning exits through the DI pathway for the remaining people, one-third and two-thirds, respectively.

These scenarios are applied first to the whole population and then to the subsample of individuals more directly concerned by DI, that is, those for which the incentive to retire is higher through the DI route than through the normal route, hereafter the "DI" subsample. These are the people whose OVs are lower under DI than under normal retirement at the time of effective retirement.

Simulated results are provided in figures 6.15 (whole sample) and 6.16 (DI subsample), using survival functions. They are summarized in table 6.5 using average years spent at work under the various scenarios, compared both to actual numbers and to the simulated baseline scenario. More precisely, the indicators provide the mean cumulative number of years of work from age fifty-five to retirement, for each scenario. Column (1) provides results for the whole population and column (2) for the DI subsample.

Graphs of survival functions show that all alternative scenarios are bracketed within the two polar cases where only the normal route is accessible or where the DI route is available to 100 percent of the population.

When the whole sample is considered, average years of work computed under the baseline scenario are close to the actual figure, 5.509 and 5.652, respectively.

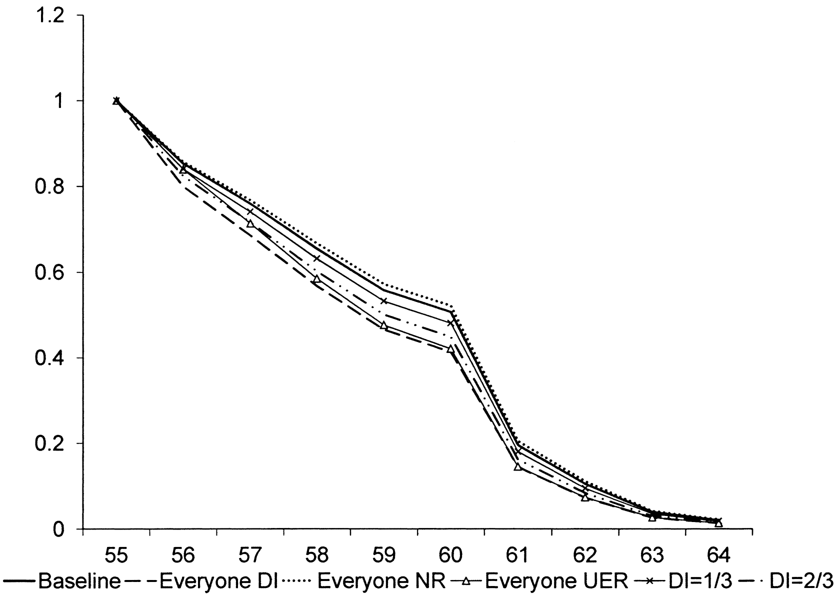

Fig. 6.16 Survival functions under alternative scenarios, DI sample

The average years of work over ages fifty-five to sixty-four if everyone retires through the normal retirement route is simulated equal to 5.495, which is almost the same as the baseline value. This result is explained by the predominant weight of the normal retirement route in the incentives OV indicator. It is lower than the observed average years of work in our sample, 5.652. The simulated average years of work drops to 4.957 if everyone retires through the DI route. Years of work are nearly 14 percent greater under the regular retirement incentives than under the DI incentives. Disability insurance is the route that implies the lowest number of years of work after age fifty-five. Even in the simulation where everyone would have access to unemployment and early retirement at the end of their careers, the mean number of years of work between fifty-five and sixty-four would be higher (equal to 5.089).

Moving to the DI subsample, average years of work are always lower. The difference in actual averages is quite high: 5.652 for the whole sample and 3.886 for the DI subsample. The estimated model predicts a higher number of years worked after age fifty-five, equal to 4.692. Simulations made on this subsample exhibit the same patterns of results as the ones made on the whole sample: the highest number or years of work for incentives of the direct retirement route (4.766), the lowest number of years of work for DI (4.188), and each situation between these brackets.

Table 6.5 **Simulations**

	Average years of work	
	Whole sample	DI
Actual	5.652	3.886
Baseline	5.509	4.692
Everyone in DI	4.957	4.188
DI = 1/3	5.387	4.554
DI = 2/3	5.231	4.384
Everyone normal retirement	5.495	4.766
Everyone in unemployment	5.089	4.293

Note: DI = 1/3 means DI = one-third of the observed sum of (DI + SS).

6.6 Conclusion

The main objective of this chapter was to estimate, for a given health status, which part of the labor force participation at old age is determined by the provisions of disability insurance programs. For that purpose, after a presentation of the main features of the DI and other retirement pathways for older workers in France we estimated the impact of the pension and DI schemes on exits from the labor market, controlling for health status and using a synthetic option value indicator. The OV and health indicators are introduced simultaneously in a probit equation, modeling the probability to make a transition from employment to nonemployment after age fifty-five. The model is estimated on the French data of the European SHARE survey. We conclude, unsurprisingly, that a decrease in the generosity of the pension and DI schemes (i.e., a higher value of the OV) induces people to stay on the labor market and that people in better health tend to retire at older ages.

In the OV approach, DI incentives enter as a component of a larger inclusive OV indicator. In order to isolate the impact of DI, we relied on simulations. First, we present extreme situations simulating what individuals' retirement behavior would have been if each of the three exit routes had applied to all individuals, then some mixed scenarios with various relative importance of the DI pathway. We show that average years of work between ages fifty-five and sixty-four are nearly 14 percent greater when regular retirement incentives are applied to the whole population than when DI rules are systematically applied. We then conduct the same analysis on a subsample of individuals considered as having higher probabilities to be eligible to DI, that is, a DI subsample. The average years of work are always lower for this subsample. The difference in the actual averages is quite high: 5.652 for the whole sample and 3.886 for this selected DI subsample. Simulations made on this subsample exhibit the same patterns as for the whole sample: the highest number or years of work for incentives of the direct retirement route, the lowest number of years of work for DI, and each situation between these brackets.

Of course, such simulations remain theoretical and somewhat disconnected from recent changes in retirement policies in France. As shown in figure 6.1, the French LFP rates for the fifty-five to sixty-four age group have started reincreasing significantly since the middle of the first decade of the twenty-first century, essentially due to successive reforms in the normal retirement route, accompanied by stricter rules for the unemployment and early retirement pathway. Less impact on retirement age could be awaited from reforming a disability and sickness leave pathway that, until now, has remained relatively well focused on those people whose health status really deserve specific dispositions: a tightening of these rules would have been socially problematic with low financial returns at the global level.

The main contribution of the chapter has been to illustrate how financial incentives and health status indeed interact to determine retirement behavior, using original SHARE data complemented with other statistical information. Improving our knowledge of both monetary and nonmonetary determinants of retirement behavior is of major importance for the ex post and ex ante evaluation of both past and future reforms.

Appendix

Table 6A.1 Coefficients of the health index

Difficulty walking several blocks	0.281	Ever experienced heart problems	0.162
Difficulty lift/carry	0.284	Hospital stay	0.126
Difficulty push/pull	0.289	Home care	0.211
Difficulty with an ADL	0.272	Doctor visit	0.200
Difficulty climbing stairs	0.296	Ever experienced psychological problems	0.067
Difficulty stoop/kneel/crouch	0.304	Ever experienced stroke	0.124
Difficulty getting up from chair	0.265	Ever experienced high blood pressure	0.110
Self-reported health fair or poor	0.279	Ever experienced lung disease	0.105
Difficulty reach/extend arms up	0.227	Ever experienced diabetes	0.091
Ever experienced arthritis	0.185	BMI at beginning of period	0.092
Difficulty sitting two hours	0.178	Nursing home stay	0.024
Difficulty pick up a dime	0.152	Ever experienced cancer	0.038
Back problems	0.161		

Note: Values are based on data from 2004 to 2006, 5,844 observations.

References

Barnay, T., and F. Jeger. 2006. "Quels dispositifs de cessation d'activité pour les personnes en mauvaise santé?" *Questions d'Economie de la Santé* n° 108. http://www.irdes.fr/Publications/Qes/Qes108.pdf.

Behaghel, L, D. Blanchet, T. Debrand, and M. Roger. 2012. "Disability and Social Security Reforms: The French Case." In *Social Security Programs and Retirement around the World: Historical Trends in Mortality and Health, Employment, and Disability Insurance Participation and Reforms*, edited by D. Wise. Chicago: University of Chicago Press.

Blanchet, D., and S. Le Minez. 2012. "Joint Macro/Micro Evaluations of Accrued-to-Date Pension Liabilities: An Application to French Reforms." DESE Working Paper no. g2012–14. Institut National de la Statistique et des Études Économiques. http://www.insee.fr/en/publications-et-services/docs_doc_travail/G2012-14.pdf.

Minni, C. 2012. "Emploi et chômage des 55–64 ans en 2011." *Dares-Analyses*, n° 049. http://travail-emploi.gouv.fr/IMG/pdf/2013-083.pdf.

Poterba, J. M., S. F. Venti, and D. A. Wise. 2010. "The Asset Cost of Poor Health." NBER Working Paper no. 16389, Cambridge, MA.

Sédillot, B., and E. Walraet. 2002. "La cessation d'activité au sein des couples: y-a-t-il interdependence des choix?" *Economie et Statistique* 357 (1): 79–102.

Stock, J. H., and D. A. Wise. 1990. "The Pension Inducement to Retire: An Option Value Analysis." In *Issues in the Economics of Aging*, edited by David A. Wise, 205–30. Chicago: University of Chicago Press.