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ABSTRACT

Among numerous retirement schemes in France, the Social Security general regime covers all wage earners from the private sector, about 65% of workers. In this regime, retirees are eligible for a full pension at 65, or between 60 and 65 if they contributed to the regime for at least 37.5 years. For people between 60 and 65 who do not fulfill this condition, retirement is still possible but with a downward adjustment of benefits. Our computations show that early retirement adjustment rules give strong incentives to go on working until being eligible for a full pension, even if mandatory complementary schemes soften incentives, especially for executives. These results are consistent with empirical hazard rates, showing two spikes at 60 and 65, and with the change in the retirement age induced by the 1983 reform.

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Very few studies exist concerning the economic determinants of retirement age in France. Three main reasons may account for this situation :
- First a common idea is that the French pension system offers little flexibility concerning choice of retirement age, so that little room is left for estimating economic models of retirement behaviour
- A second explanation is the complexity of the pension system, which renders data collection extremely heavy and discourage efforts to build systematic behavioural models
- Last, the age at exit from the labour force is not only determined by individual preferences and the structure of the pension system itself, but more and more often by parallel systems such as preretirement schemes or specific dispositions of unemployment insurance targeted toward older workers, and the development of these schemes reflects both supply and demand side effects on the labour market, so that it may appear meaningless to develop behavioural models which remain generally limited to supply-side considerations.

All these explanations are valid, but only partially. Flexibility in the choice of retirement age is not large, but still exists: in fact, the basic general regime offers possibilities to leave between 60 and 65. The problems raised by the complexity of the system can then be by-passed, in a first attempt, by concentrating on this general regime and associated complementary schemes. Last, if it is indisputable that interactions between supply and demand factors in a context of low employment complicates the analysis of retirement behaviour, it implies at the same time that this analysis is particularly worthwhile. The extension of preretirement schemes in France is probably one of the major aspect of our current pension problems, it may limit the feasibility of policies aiming at raising the average retirement age, so that the question of the structure of incentives generated by this system is of particular importance, whatever the channels through which these incentives finally affect behaviour, i.e. directly through individuals or indirectly through employers.

It is with these elements in mind that we will present here some results concerning labour force participation of older workers in France, and their link with the organization of the pension system. We shall proceed in three steps: (1) a general description of trends in labour force participation, pension levels and pension coverage; (2) a precise description of the way pensions are computed in the basic general regime and the two most important complementary schemes and (3) the simulation of incentives implied by these computation rules. This latter section will illustrate how simple computations of future benefits help clarify the properties of pension rules. But it will also show the importance of what remains to be done to give a full explanation of labour force participation at old age and the way it could be affected by future or ongoing reforms of retirement or preretirement schemes.

Part I : The labour market behaviour of older persons in France

This section is devoted to the analysis of labour force participation trends around retirement age. We shall first place recent evolution in a long term perspective. Then, concentrating on what happened since 1968, we shall see how this period has been characterized by an acceleration of the long-run decline of the average retirement age, and at the same time by the increasing complexity of the pattern of transition from activity to retirement.

Long-term trends in labour force participation

Concerning the long term evolution, and focusing first on male workers to avoid the offsetting trends resulting, for women, from increased activity at median ages, we can provide figures for labour force participation since the twenties. Figure 1 shows that the decline of labour force participation at older ages has been a long term trend. It must be noted that this trend has been observed despite the fact that the French population has been already aging over most of the century. But this apparent paradox can be easily explained by general economic growth. Economic progress resulted in a collective income/leisure tradeoff in favor of a longer retirement period which had no difficulty in outweighing the consequences of a moderate aging process, and this tradeoff was largely mediated by the development of pension schemes.

Actually, this decline of labour force participation at older ages occurred in a context of increased coverage and generosity of the pension system. Direct measures of coverage ratios are rather difficult to obtain: due to the fragmentation of the pension system in France, there are no systematic series giving numbers of beneficiaries or contributors in the whole population. Adding up series which exist for the major schemes, we nevertheless get the overall upward trend displayed on Figure 2. In fact, since 1974, where affiliation to a pension system became mandatory for the whole population, we can consider that coverage is complete and that fluctuations observed on Figure 2 only reflect the changing shares between regimes taken into account or not for this graph.

Similar evolution can be observed on the pensioners' side, and are displayed on Figure 3, although the interpretation of this figure is complicated by the fact that one individual may have been, over his career, successively covered by more than one basic regime[1].

Evidence of this increased generosity is also given by the very crude computation of the ratio of total old age expenditures, divided by the number of inactive persons above 60, to the average net wage in the labour force, which is displayed on Figure 4. The ratio of average benefits to average wages increased by about 60 % between 1950 and 1974, and still went on increasing after the complete generalization of coverage after 1974, for various reasons: maturing of the systems, changes in computation rules for the main regimes, active policy of revaluation for benefits.

Yet these general and progressive changes do not account for the evolution of labour force participation rates since the 80s, which must be more narrowly linked to changes in the legal retirement age, and to the extension of other forms of exit from the occupied labour force, i.e. the development of preretirement schemes.

Detailed trends since 1960

During this period, the participation rate among workers over 55 decreased by more than 50%, from 31.5% to 15%. Among workers over 60, it fell from 22.5% to 4.8%. Such dramatic decreases in the participation rates of older workers had never been observed previously.

- Their first consequence is that there are nearly no more workers over 70. For instance, the participation rate of men between 70 and 74 was divided by 10 between 1970 and 1995 (from 15.2% to 1.5%). The 65-69 group also disappeared almost completely : rates amount

[1] In 1993, the average French pensioner received benefits from 1.4 different basic schemes, plus an average number of 1.1 benefits derived from complementary schemes. Figure 3 only gives beneficiaries from the first category of regimes.

to 3.7% for men and 2.5% for women while they attained respectively 30.6% and 15% in 1968.
- Then the 60-64 group experienced the most substantial decrease in the participation rate over the same period, falling from 65.7% to 16.5% among men (Figure 5) and from 32.4 % to 14.6 % among women (Figure 8).
- Last, the participation rate for men between 55 and 59 decreased from 82.5% to 68.9%.

Rates for women have long been fluctuating, with continuous increase in female activity at median ages counteracting the impact of earlier exit form the labour force. The second effect dominated in the age group 60-64 until recently, while the first one dominated constantly in the 55-59 group (Figure 8).

On the whole, the average age of people withdrawing from the labour force fell by 4.5 years between 1969 and 1993, from 62 to 58.5. Figure 6 and Figure 7 also show the specific role played by preretirement schemes or unemployment insurance in explaining the drop of employment rates (not only labour force participation rates) in these age groups, for men. They played the major role in the decline of employment between 60 and 64 years until the mid-eighties, after what they have been progressively taken over by the progressive application of retirement at age 60. It is at the same period that preretirement before 60 developed, until concerning about 20% of the age group. It has remained at this level since the end of the eighties.

The current situation

The current situation which results from these past or recent trends is summarized on the four next figures.

Detailed profiles of occupation or labour force participation by age are given by Figure 9 and Figure 10. Activity and employment both start declining around age 55, in a quasi linear fashion until age 60, where their values are between 30 and 40 %. They then drop rapidly, only a small portion of the population remaining at work after age 62, which then quits the labour force very progressively until ages 65-70.

Figure 11 and Figure 12 give more details concerning the link between age and status between 50 and 75. Inactive people are broken down between retired and other inactive, who, for men, include a large fraction of preretired people between 55 and 60. Active people are broken down between employed and unemployed, the latter category peaking at age 56, then declining progressively until 60, with transfers from this category to the categories of retired or preretired. Parallel patterns exist for women, with the difference that a larger share of 'other inactive' exist at all ages, even after the normal retirement age. It must be noted, however, that the data for these two graphs results from self-declarations to the Employment Survey, which do not perfectly coincide with administrative definitions of unemployment, preretirement or retirement.

If we move to measurement of income resources for households whose head is retired, Table 1 gives their distribution between work income, pension benefits, minimum old age benefits and capital income, according to previous activity. Various pension income or other public

subsidies constitute the major part of total income for households whose head was previously wage-earner. Capital income plays a larger role for former independent workers or workers from the agricultural sector, the latter ones relying also heavily on minimum old age benefits. In all cases, by construction (household head is retired), work income plays a minor role.

On the whole, the result of these various income sources is an average standard of living for retired households which is roughly at parity with the average standard of living of active households. This contrasts with the situation which prevailed up to the 1970s, and which led to the strong policy in favor of pension revaluation illustrated by Figure 4.

Part II : Structure and rules of retirement schemes

Describing the French pension system raises two difficulties. The first one is due to its complexity, i.e. the coexistence of many different regimes covering various segments of the population. We shall give a brief overview of this complexity, but we shall then concentrate on the system which concerns the majority of the population, which is the combination of the basic general regime, and of mandatory complementary schemes organized on a professional basis (ARRCO and AGIRC), all of them being pay-as-you-go systems.

The second difficulty comes from the fact that the rules of these systems are not fixed but are changing over time. We shall here concentrate on the rules which prevailed at the beginning of the nineties. Concerning the general regime, they essentially resulted from a reform introduced in 1983 which opened access to retirement at a full rate at age 60.

We shall then complete this presentation by providing information on (a) the system of preretirement which, beside the rules governing normal pensions, plays a large role in shaping labour force participation rates between 55 and 59 and (b) the reforms introduced since 1993, starting with a reform of the general regime whose consequences should progressively affect new cohorts of retirees until the first decade of the next century.

II.1 - The different regimes

The French system is often considered as complex, but its structure can nevertheless be summed up simply in the following way :

• For most of the population (wage earners from the private sector), the pension relies on two pillars :

- The basic general regime, which offers benefits corresponding to the share of wages below a Social Security ceiling[2]. We shall hereafter use the term 'Social Security' to describe this segment of the system, even if it does not exactly correspond the French

[2] In 1994, the gross value of the Social Security ceiling was 12760 FF while the average gross wage was 12280 FF.

conventions[3]. In 1992, 70.5 % of people over 60 received a social security pension. On the contributors' side, the same year, the general regime regrouped 64.8 % of the labour force.

- Complementary schemes, organized on a socio-professional basis. These schemes developed between 1946 and the mid 60s. They consist in a large number (about 180) of specific regimes but these regimes are federated in two main organisms ensuring inter-regime demographic compensation : AGIRC for executive workers and only for the fraction of their wages over the social security ceiling, and ARRCO for other workers and executives' wages below the ceiling. In 1972, contributing to a complementary scheme became compulsory. Today, complementary schemes provide 40 % of retirement pensions for wage earners of the private sector (Join-Lambert et al., 1994, p.366).

• Beside this simple two-pillar structure, the complexity of the French system, in fact, is principally due to the existence of a large number of exceptions to this general rule of organization. These exceptions are the result of two factors. When Social Security was created, in 1945, people who already benefited from more generous dispositions refused to join the new system (for instance people belonging to public or parapublic sectors). Some categories preferred, on the opposite, to adopt cheaper systems offering lower protection because they thought that a large part of their retirement needs was likely to be covered by other sources, such as professional capital for the self employed. Beside the two pillar system constituted by the general regime and ARRCO/AGIRC, we therefore have a multiplicity of special regimes and regimes for independent workers applying specific rules. For instance, there are about 120 first-pillar retirement schemes other than the general regime. In particular, it must be observed that civil servants are not really covered by an autonomous pension system, since their pensions are directly paid on the state budget.

For all categories of people, there is, at last, a system of minimum pension (*minimum vieillesse*), which is a means tested allowance. The population benefiting form this minimum pension has regularly declined in the past, due to the increasing maturity of normal pensions. It is now a little over 1 million, against 2.55 million in 1959 (CGP, 1995).

II.2 - Benefits and contributions : general regime and complementary schemes

We now give more details about the calculation of pensions for the general regime and complementary schemes.

II.2.a. Benefits from the general regime

The regime general offers contributory benefits corresponding to the share of wages below the Social Security ceiling. We consider the rules which prevailed between 1983 and the beginning of the 1990's, and which, until now, have been only little affected by changes introduced in 1993, whose application will be very progressive. Under these rules, the pension was computed on the basis of several criteria. It was proportional to the number of years

[3] In the French system, the term Social Security (*sécurité sociale*) is used to characterize all the basic social insurance schemes which were set up in 1945 : health insurance, family allowances, work injuries, and basic pensions. It does not limit itself, as in the US, to the public pension scheme. We use it here to describe the intersection of the pension field and the field of *sécurité sociale* in the French sense of the word.

contributed (truncated to 37.5 years), and to a reference wage, which used to be the average wage of the ten best years of the pensioners' career (past nominal wages being reevaluated at time of liquidation according to a set of retrospective coefficients). The formula was therefore:

$$\text{Pension} = \alpha \times \left(\frac{\text{N.of years, truncated to 37.5}}{37.5} \right) \times (\text{average wage of the 10 best years}) \quad [1],$$

the proportionality coefficient α being itself modulated. It was maximal when the pensioner left, at age 60, with 37.5 years of contributions or more : in that case its value was set at 50%, and this exactly ensured a replacement rate of the reference wage (not necessarily the last wage) equal to 50%. The same value of α also applied whatever the number of contributed years, when the individual left at age 65. In all other cases, the coefficient was reduced :
- either by 1.25 percentage point for each term missing to reach the value of 150 terms
- either by 1.25 percentage point for each term missing to reach age 65
the formula to be retained being the one which lead to the most favorable outcome.

This system means that the number of years of contribution affects the pension levels in two ways, which may imply, in some cases, a very strong dependency between age at retirement and the level of the pension. To provide a full understanding of this interaction, Table 2 shows the consequences of this system for three reference cases with individuals arriving at age 60 with, respectively, 25, 30 and 35 years of contribution.

- The first person must wait until age 65 to get retirement at a full rate α (50 %). Even like this, however, his pension will be reduced by the fact that he only totalizes 30 years of contribution at this age. His replacement ratio will therefore be only equal to 30/37,5 of the maximum replacement ratio which is equal to 50 %. Note that, at each age lower than sixty, the downward adjustment of α is computed on the basis of the number of years missing to reach age 65, rather than the number of years missing to reach a value of N equal to 37,5, since the rule consists in applying the most favourable of the two adjustments.
- The second individual must also wait age 65 to get the full rate α, but will benefit at this age of a higher replacement rate, equal to 35/37,5 times the maximum replacement ratio of 50 %. In this case again the downward adjustment before age 65 is based on the number of years missing to reach this age of 65.
- The third individual will not have to wait until age 65. He will benefit from the maximum replacement rate as soon as he reaches a cumulated number of years of contributions equal to 37.5, i.e. at age 62.5. If he decided to leave between age 60 and this age of 62.5, the downward adjustment would now be computed according to the number of years missing to reach the total of 37.5 contributed years, rather than the number of years missing to reach age 65, since the first rule is now the most generous. Note also that, for this individual, working past the age of 62.5 does not bring any further advantage in terms of pension level.

Some additional observations must be added to this presentation of the general regime:

- Some people have been successively affiliated to different schemes, especially in older cohorts : for instance, people transiting from agriculture or self-employment to the status of wage-earner in the industry or in services. These people will cumulate two basic pensions, one from their initial regime, and one from the general regime. The latter one will be proportional to the number of years spent in this regime, according to formula [1], yet

coefficient α will be evaluated taking into account the *total* number of years contributed, whatever the regime. Reductions of α, furthermore, do not apply in a certain number of cases : veterans, disabled workers, female workers with 24 contributed years and having raised three children.

- Formula [1] also implies that pensions, at the time they are claimed, are computed in current nominal French Francs. They are then reevaluated each year on a discretionary basis. During the 1970s and early 1980s, the general policy was to over-index these pensions, in order to make up for the initial gap between standards of living of workers and pensioners. Since the mid 1980s, the practice has rather consisted in an indexation on prices.

II.2.b - Benefits from complementary schemes : ARRCO and AGIRC

These schemes are almost fully contributive. Pensions are computed according to a system of 'points' :
- Points are accumulated during workers' career in proportion to their contributions : the contribution rate is fixed, and 1 Franc contributed in year t is considered as equivalent to the formal buying of 1/RW points, where RW, in the system terminology, constitutes the 'reference wage' (*salaire de référence*, which is in fact the price of 1 point).
- The pension is then equal to the total number of points accumulated over the pensioner's career, multiplied by a coefficient V (*valeur du point*), which is fixed every year.

The formula for pension at time t can therefore be written as, for a pensioner who started working at time t_0 and stopped at time t_1:

$$\text{pension} = V(t).\sum_{t'=t_0}^{t_1}\frac{\tau(t')w(t')}{RW(t')} \qquad [2]$$

where $\tau(t')$ and $w(t')$ are respectively the contribution rate and the worker's wage at time t'. As explained higher, only a fraction of the wage is taken into account for computing contributions and points accumulated each year :
- for non-executives, the wage which is truncated to three social-security ceilings, and contributions are collected by ARRCO
- for executives, contributions are collected by ARRCO for the part of the wage below the ceiling, and by AGIRC for the segment of the wage which is comprised between 1 and 4 ceilings.

The contribution rates, reference wages and values of points which prevail are not the same in both schemes. Table 3 gives levels for 1993

Concerning retirement age in these complementary schemes, normal retirement theoretically remains at age 65, even after the 1983 reform which introduced retirement at age 60 in the general regime. For retirement below 65, a quasi actuarial adjustment is supposed to be applied. But, since the 1983 reform, this adjustment is not applied to people who fulfill the conditions for a basic retirement at full rate (more than 37.5 years of contribution). The resulting extra expenditures for the complementary schemes are supported by a specific entity, financed through various contributions : the *Association pour la Structure Financière*. This simply means that complementary schemes have been *de facto* transformed in schemes where

normal retirement is at age 60, but without bearing its cost (or only bearing it in terms of foregone contributions).

II.2.c - Taxation, contributions, earnings tests

Taxation rules differ for pensions and wages.

A certain number of contributions concern *only* apply to wage earners. Pensioners are completely exempted from these contributions. This is the case for contributions to unemployment insurance, at a rate of about 3.2%. This is also the case for contributions to pension schemes, at the following rates :
- for the general regime, 6.55 % of the fraction of the wage below the Social Security ceiling
- for complementary schemes (ARRCO and AGIRC) :
    - for non-executives, 2 % of the wage below 3 times the SS ceiling to ARRCO
    - for executives, 2 % of the wage below the SS ceiling to ARRCO, and 4.68 % on the fraction of the wage between 1 and 4 times the SS ceiling to AGIRC.

It must be added that, concerning complementary schemes, these basic contributions rates which are the ones used to compute the accumulation of points and future entitlements are now systematically affected by majoration coefficients, which are now equal to 125% in both regimes. This is an additional tax, meaning that points are, in fact, bought 25% above their face value.

We next have contributions which concern *both wage earners and pensioners*, but at *different rates*. This is the case of contributions to health insurance, whose rates are 6.8% on wages, 1.4% on pensions from the general regime and 2.4% on complementary pensions.

We have then taxes or contributions which are *similar for both sources of income*. These are:
- The generalized social contribution (CSG), introduced in 1988, whose rate is now equal to 2.4%, and whose aim is to finance a certain number of non-contributive allowances.
- The personal income tax, which is progressive, and whose rules are almost the same for pensions and wages (the only difference consists in a tax allowance, on wages, whose aim is to compensate for expenditures linked to professional activity).

Table 4 shows these different rates, and gives in addition the rates for contributions paid by employers.

Concerning at last earnings tests in the attribution of pensions, the rules differ across regimes, but we can generally consider that they strongly discourage the continuation of activity after the claiming of the pension. Concerning the general regime, there is no formal impossibility of combining benefits with labour income, but claiming for pension rights implies the interruption of the labour relation with the current employer. The only possibility is then to combine benefits with independent work or work with another employer, a possibility which will only concern a small minority. Furthermore, concerning complementary schemes, starting a new activity generally leads to the interruption of benefits.

II.3 - Preretirement

Preretirement systems developed in France in several steps. We can distinguish between two main periods, before and after the drop of normal retirement age to 60 in 1983.

II.3.a - Preretirement during the 70's

The first subperiod was dominated by measures concerning workers aged between 60 and 64.
- The first step goes back as early as 1963, when a specific allowance (ASFNE - Special allowance from the National Fund for Employment) was created to help workers aged 60 or more falling into unemployment after collective lay-off.
- This allowance has been progressively replaced, starting 1972, by a system of resource maintenance (*garanties de ressources*). It ensured 60 to 70 % of his last income to any individual losing his job after 60, up to the age of 65 which was then the normal retirement age. This system gained considerable extension, covering up to 400,000 people in 1983, i.e. roughly one fourth of the population in the 60-64 age bracket.
- Some allowances were also introduced for workers below age 60, but in specific sectors suffering from very large employment problems, such as the iron industry.

It is in this context that retirement at age 60 was introduced in 1983. For one part, this implied that this highly symbolic reform primarily acted as a pure substitution process, normal pensioners progressively replacing people benefiting from resource maintenance programs, and this explains why the reform did not produce any significant break in the evolution of activity as it could be checked on Figure 1 and Figure 5.

This does not mean however that the reform was completely neutral. First because it changed considerably the nature and the reversibility of the protection which was offered : there was a shift from a kind of unemployment insurance to a system of quasi-universal pension. Second because this change created a further impulse to a lowering of activity rates before 60. The introduction of retirement at age 60 was initially expected to definitely eliminate the necessity of any form of preretirement. But, in face of a still rising rate of unemployment, and in a period of rapid industrial reconversion, it became rapidly unavoidable to reintroduce some form of special safety net before entry into normal retirement.

II.3.b - Preretirement since 1983

This lead to the second step, where preretirement developed along two lines, in proportions which have varied over time and which reflect the fluctuating desire, by the State, to exert a strong control over the process. The first tool was once again the National Fund for Employment, with the reactivation of the ASFNE : people who are entitled to such benefits have left their firms under specific conditions resulting from a negotiation between the firm and the State. The second tool, which implies much less control, consists in specific dispositions of the French system of unemployment insurance. Under the common rule, people falling into unemployment are entitled to a compensation for a limited period of time, and this compensation, since 1992, is also decreasing with the duration of unemployment. But these rules do not apply to people losing their jobs past a certain age (57 until mid 1993, now raised to 58), who can benefit from a full compensation until they are able to benefit from a normal pension at a full rate. This system is not officially described as a preretirement system, and there is actually one strong difference with a pension system, which is the fact that people cannot enter into it completely freely : they can do so only if they have been explicitly laid off by their employers.

It must be added that the coexistence of these two systems generates some problem for the measurement of labour force participation rates in these age groups : truly 'preretired' people are naturally counted as inactive. For people who benefit from unemployment insurance, they are normally considered as active. Yet, since they are generally exempted from active job-seeking, they can also be counted as inactive (according to international conventions). Such ambiguities are still stronger when labour force status is self-declared, as it was the case for some of the statistics given in section I.

II.4 - Recent or ongoing reforms

Concerning the general regime, a reform was enacted in 1993 whose main features are the following ones:

- After their liquidation, pensions will be indexed on prices, instead of being indexed on either net or gross wages. This measure will have the impact of reducing the relative standard of living of older pensioners. In fact, this measure is essentially a confirmation of what had become the standard practice over the last decade. Nevertheless, in case of rapid increases of net wages (high productivity growth), some occasional and discretionary reindexation could be introduced ("*clause de rendez vous*")
- Leaving at age 60 will remain possible, but, in order to benefit from the full rate, pensioners will face duration conditions which will become progressively tighter : from 37.5 years under the current rule to 40 years for people leaving in 2003.
- The reference wage used in the formula [1] above will progressively be computed on a longer number of years, from the best 10 years under initial conditions, up to the best 25 years for cohorts leaving in 2008.

No similar reform has been applied, at this stage, to any of the special regimes. The extension of these new rules to some of these regimes was precisely one of the reasons of the social contest which arose in November 1995, around the Juppé plan. This extension is temporarily suspended.

Concerning complementary schemes, measures have mainly consisted, at this stage, in increasing contractual rates (a policy which has the drawback of increasing future rights), in increasing calling rates (this policy does not have the same drawback : it generates receipts without generating new rights), and in moderating the value of the point. These regimes also reduced some non contributory advantages. But a different policy now starts being implemented, which consists in increasing the reference wage : this policy amounts to reducing future benefits, without changing the current level of contributions. It is equivalent to an anticipation of future reductions of the value of the point.

Part III : Retirement Incentives

Is behaviour consistent with the incentives generated by the pension system, and especially with the incentives generated in 1983 by the introduction of retirement at age 60 ? We shall first look at the informal evidence given by hazard rates derived from the profiles which were given in Part I and from other sources. We shall then move to more formal computations of Social Security entitlements at different ages. Given the remark above concerning the

difficulty of dealing with special regimes, we shall limit ourselves to the 'normal' case of a worker affiliated to the general regime and compulsory complementary schemes of the ARRCO/AGIRC group.

III.1 - Informal evidence

The four next figures show patterns of behaviour which seem qualitatively consistent with the main features of pension systems which have just been described.

Figure 13 and Figure 14 give, for men and women, rates of exit from the labour force directly derived from the labour force participation rates already used for Figure 9. These transition rates have been computed using two successive realizations of this survey, in 1995 and 1996. They show that exits from the labour force occur continuously between ages 55 and 60, where they can be attributed to preretirement schemes, then peak with entry into normal retirement at age 60, with a residual of exits after this age for people who probably do not satisfy the rules of eligibility for the full rate at age 60, the relative importance of such cases being apparently greater for women who, due to shorter careers, are less likely to arrive at 60 with 37,5 years of past contributions, and who are then forced to wait until age 65.

Figure 15 gives more details concerning the link between age and the probability of claiming for one's benefits, rather than exit from the labour force. The data are derived from a panel of pensioners established in 1986 by the SESI (the statistical office of the French Ministry of Social Affairs). Data were collected directly from pension funds. They consist in the follow-up of five cohorts of pensioners, born respectively in 1906, 1912, 1918, 1922, 1926. Data are available concerning the ages at which these successive cohorts entered into normal retirement. This sample allows us to assess the impact of the 1983 reform. Before 1983, some workers could already retire from the labour force at 60, but, for most of them, this was made through preretirement schemes, and the age at which they claimed benefits from the general regime remained equal to 65, hence the predominant peak at 65 for the 1912 cohort. The 1983 reform, lowering normal retirement age to 60, made these preretirement schemes pointless and workers began claiming benefits from the general regime at 60. Hence the age at claiming decreased, with a progressive shift to a situation where the predominant spike is at age 60, after a transition period characterized by bimodal profiles.
Figure 15 relies on the distribution of retirement age within each cohort. From these data, we can compute hazard rates giving, at each age, the instantaneous probability of retiring. Figure 16 shows hazard rate profiles within the same four cohorts. Here again, 60 and 65 play a specific role. The spike at 65 remains high across time, with retirement occuring for at least 70 % of wokers still working at this age. If the 1983 reform did not change this behavior, it strongly increased the probability of claiming at 60, the corresponding hazard rate rising from about 10 % in the 1912 cohort to 40 % in the 1926 cohort. Thus, after the reform, even though 65 remains somehow the upper bound for retirement age, fewer workers stay in the labor force up to this age. More people can get a full pension and therefore retire before 65, notably at 60.

III.2 - Simulation Modelling

Our analysis focuses on workers' entitlements from the Social Security[4]. Precisely, the Social Security Wealth (SSW) is defined as the weighted sum of future pensions and contributions,

[4] including mandatory complementary schemes.

all terms being discounted from the time of evaluation by both a discount rate for time preference and the worker's survival probability at each date. All computations are supposed to apply to a worker aged 55 years. Thus, probabilities are defined conditionally on survival at 55. All amounts are evaluated at this age, which allows comparisons of SSW at different dates. The detailed formula of the SSW is given in Appendix 1.

Several elements enter the calculation of the SSW. Concerning the level of pensions, we follow the rules of the general regime to compute benefits for the worker and his survivor. Here, computations are only run on a yearly basis (not a monthly one). Each year, pensions are revised according to the price index (up to 1982, they used to be indexed on the mean gross wage, which was more favorable). We follow standard assumptions on the future values of price and wage growth. We use specific sex-cohort-age life tables to adjust for survival prospects. We subtract contributions[5] to Social Security and complementary schemes while the worker is still working.

In France, receiving a pension from the general regime requires to stop working for the current employer, so that, in any case, we can assume that the age at exit from the labour force cannot be higher than the age at pension claiming. Can it be lower ? Two cases must be considered:

- For people retiring after age 60 we shall consider that the two ages exactly coincide. As in the case of the United States, these decisions are not systematically the best ones insofar as, if the worker is not entitled a full rate pension, he may increase his entitlements by simply getting older. Nevertheless, empirically, most workers are entitled a full rate pension at the time of retirement so that there is no profit in postponing the claiming of benefits.
- For people leaving activity before 60, on the contrary, we shall assume that pension claiming is delayed up to this age. Since there is no possibility of claiming before age 60, at least in the general regime, this is the only reasonable assumption which can be made.

We run our computations for different types of worker. In the base case, we consider a worker of the 1930 cohort. We reconstitute his earnings history as follows. From empirical data, we evaluate the median wage of male workers of the 1930 cohort between 1967 and 1994. We complete backwards this profile according to the mean wage index. From the data, we get a profile up to age 64. But, due to a rapid decrease in the participation rate, a non-negligible selection bias[6] affects the estimation of the median wage after 55. For this reason, we follow the correction suggested in the United-States study, assuming that earnings stay constant in real terms from age 51 onwards.

In the base case, the real discount rate for time preference is set to 3 %. The worker's wife was born in 1933. We consider she did not work during her life so that she cannot claim a pension on her own right. As a survivor, she is entitled a pension slightly over 50% of her husband's.

Besides the SSW, we can compute some others indicators varying with the retirement age. First, we calculate replacement rates, after the deduction of social contributions and income taxes. To take into account taxes on income, we have to make assumptions on household

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[5] We consider here contributions both from the worker and the employer, since, whatever their origin, contributions imply cuts on present earnings to get entitlements to future pensions from the Social Security.

[6] Contrary to what is observed in the United States, the earnings profile observed after 60 does not decline but increases. Two reasons may explain this fact. First, there are few part-time workers at this age since everyone is eligible to a pension, at least a minimum pension from the welfare state, and getting this pension implies stopping work. Second, in the framework of an earnings vs. leisure tradeoff, incentives to keep on working after 60 are stong for high earnings workers.

composition since, in France, the level of taxes depends on the number of dependents. We will consider the simple situation of a 'fiscal household' with no child so that the family comprises either a single worker or a couple.

Then we compute accrual values, defined as the difference between SSW values in two following years. We will describe later the different factors accounting for the change in SSW between two years. We compare this accrual to the value of the SSW by computing the accrual rate. At last, to get a measurement of incentives to retire, we compare the accrual value to the earnings of the last year of work : the opposite value of the ratio is called the tax/subsidy rate. When the tax/subsidy rate is positive, working one more year entails a decline in SSW, which somehow represents a tax on last year's earnings.

Results for the different cases are presented in the next two parts.

III.3 - Base case results

Table 5 shows figures concerning the base case. Each row corresponds to the last year of work, ranging from 54 to 69. If, at the end of this last year of work, the individual is less than 60, we assume that he waits until age 60 to get his pension (60 is the minimum age for claiming). In other cases, retirement is assumed to start just after the end of the last year worked.

Table 5 first shows replacement rates which appear very high (more than 90 %). This is consistent with empirical observations from various surveys and results from several factors. First, benefits include (mandatory) complementary pensions, thus replacement rates can exceed the 50 % full rate from the general regime. Second, pensions bear less SS taxes than wages (about 20 % on wages vs. less than 5 % on pensions). Third, income taxes are progressive so that subtracting income taxes raises the replacement ratio. The combination of all these factors eventually leads to a situation where after tax pensions are very close to after tax wages. Besides, in this base case, the worker is entitled a full rate pension from the general regime at 60, that is why the replacement rate is already very high at this age, and then slowly increases with complementary pensions.

If we turn to SSW and its variations with age, we need refer to the interplay between age at claiming and the number of years of contribution which was already illustrated by Table 2[7]. In the base case, workers are assumed to have contributed since age 20. This implies the following dependency between age at exit from the labour force and SSW :
- Between ages 55 and 57.5, one more year of contribution has two positive effects: it increases the coefficient α by 5 percentage points[8] and it increases parameter N (number of years of contribution) by about 1/35=3%. This increases the future level of the pension of an amount which is roughly 6-7% of the average wage. Multiplied by the length of retirement, which is roughly 20 years, this implies a SSW accrual of more than 100 % of his wage, which

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[7] Remember that three elements enter the computation of the basic pension : the average wage over the 10 best years, the rate α (from 25 % to 50 %, when age rises from 60 to 65 or when the number of contributed years increases from 32.5 to 37.5), the ratio of the number of contributed years over 37.5. The full rate is defined as α being equal to 50 %.

[8] Last year of work at 57 only increases α by 2.5 % because the full rate is obtained at 57.5, after 37.5 contributed years

easily dominates the loss coming from the fact that the individual will pay one more year of contributions. This results in the large 'subsidy' observed on the last column.
- At ages 58 and 59, working one more year does not bring any new entitlements to the general regime, and brings a few more entitlements to complementary schemes. It does not change the length of the retirement period but it costs one more year of contribution. The result is a slight decrease of SSW, and a moderate implicit taxation of labour.
- The picture is the same after age 60: almost no new entitlements and one more year of contribution, but with the difference that delaying exit from the labour force now reduces the duration of retirement. Therefore, one more year of work reduces SSW not only by the amount of contributions but also by the value of foregone pensions. This loss in SSW induces an implicit taxation of labour, whose rate tends toward the order of magnitude of the replacement ratio[9].

What is the consistency between the results of these computations and actual labour force participation rates which have been displayed earlier ? Taken literally, these theoretical computations would suggest that the optimal age at departure is 58 years. But actual hazard rates show that real behaviour differs from this in various ways : either people leave earlier than this age, either later.

In the first case, this is sometimes the result of incentives due to specific regimes where very early retirement is possible, but it can also be explained, in most cases, by the importance of preretirement schemes or the specific rules applying to unemployment benefits at later ages. As explained earlier, workers who are laid off before 60 can benefit, under specific conditions, from preretirement schemes or unemployment insurance until they are eligible to a full rate pension from Social Security (at least age 60). Years spent in one of these schemes are validated as contributed years to the basic regime, therefore, pension entitlements increase even if the worker is no longer active. In terms of future pensions, workers are not penalized.

Table 10 illustrates the consequences of this latter possibility for an individual who, between his exit from employment and his access to a pension from the general regime at the full rate, would receive unemployment benefits, this implying, of course that his exit from employment results from layoff and is not voluntary[10]. In that case, it appears that there is a strong incentive to leave after age 56. Taken literally, it only means that there would be a strong incentive to be fired off at this age. As a consequence, this can account for low activity rates beyond that age only if it appears that firms also find their advantage in the system : this is probably the case, since the system allows them to reduce employment at low social cost.[11]

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9 Nevertheless, the tax/subsidy rate differs from the replacement ratio (pensions/wage) for several reasons. First, the loss includes contributions in addition to foregone pensions. Then, we relate this loss to the gross wage, since all taxation rates apply to the gross wage (refering to the net wage would yield higher tax/subsidy rates). At last, in the computation of the SSW, values are affected by the survival probability of the worker, which makes the absolute value of the accrual decrease with age, contrary to the replacement rate.

10 The coverage of preretirement schemes was very briefly extended, around 1980, to voluntary quits, but this resulted in an explosion of preretirement expenditures which rapidly led to abandon this possibility.

11 The resulting risk of collusion between employers and employees is frequently betrayed and some specific dispositions have been introduced to try to prevent it. Concerning unemployment insurance, an additional contribution is asked to firms firing people after a given age (Delalande contribution, after the name of his creator). Concerning other forms of preretirement (FNE), an ex-ante control is exerted by the state: the attribution of these kind of preretirement benefits is conditional upon the existence of a social plan prepared by the firm including some compensatory measures: for instance, firms have to commit themselves to a certain amount of recruitment of young workers, or to maintain their middle age workers in employment for a certain duration, a.s.o.

On the opposite, those who do not benefit (or suffer) from these possibilities generally leave after that age, and generally at age 60 (see the hazard rates on Figure 13). This is due to the fact that 60 remains the minimum age at which normal pension benefits can be claimed. What the results above show only means that, from the point of view of the ratio of benefits to contributions, it would be optimal to stop contributing at age 58, and then start getting benefits at age 60. But this would mean no income source at all between ages 58 and 60, a solution which can be ruled out a priori for individuals who, generally, are liquidity-constrained, and cannot consider leaving two years without any income source.

Is there an alternative way to compute SS accrual rates which would be more consistent with this behaviour ? One possibility would be to forbid any lag between interruption of activity and the claiming of pension rights. This would imply, for people leaving before age 60, a SSW equal than zero (and even lower than zero after subtracting contributions), since these people would not benefit from any pension at all. This way to compute SSW has not been used here, both because its results would have been trivial, and because they are not realistic either: an individual who would be forced to leave before age 60, of course will, whatever his liquidity constraint, wait until 60 to claim his pension.

III.4 - Other cases

Next tables show variations from the base case. Whatever the situation, we observe both the importance of the rate of the pension and high values for replacement rates.

In the case of a single worker (Table 6), the level of the SSW is smaller than in the base case, simply because there is no survivor benefits. Besides, though pensions and wages are the same as in the base case, replacement rates are slightly different because income taxes depend on the number of people in the household. However, incentives to retire are the same, with a maximum SSW for last year of work at 57, and a high tax on wages for work beyond 60.

Table 7 presents results with a wage profile at the 10th percentile of the distribution. Replacement rates are slightly higher than in the base case. Concerning the SSW and the tax/subsidy rate, results are similar to the previous ones, with a positive accrual as long as the level of pensions increases, a small decrease at 58 and 59 and then a huge decrease after 60 resulting from foregone benefits.

In Table 8, we examine the case of a worker at the 90th percentile of the wage distribution. Replacement rates are quite lower than in the base case because of the high level of wages. Wages taken into account in the computation of pensions are capped, in the basic general regime (by the Social Security ceiling) as well as in complementary schemes (by a higher ceiling). For this reason, even in after tax values, pensions amount to less than 70 % of wages. However, incentives show the same profile as in the base case.

The next case again stresses that incentives to go on working are strong until the worker is entitled a full rate pension. Table 9 describes results for a worker with an 'incomplete earnings history'. We suppose that the worker began to work at 26 so that he is not entitled a full rate pension at 60. Before age 58.5, the rate of the pension - not available before 60 - is 25 %. Between 58.5 and 63.5, the rate increases by 5 % per year[12], from 25 % to 50 %, but for each

[12] Like above, work at ages 58 and 63 only induces a 2.5 % increase in the pension rate since the rate rises only after 58.5 (32.5 years contributed) and reaches its maximum at 63.5 (37.5 years contributed).

year of work after 60, the worker foregoes one year of benefits. Thus, the accrual rate is positive at 58 and 59, remains positive between 60 and 62 though smaller than before, then becomes negative at 63 because of the limited increase in the rate (2.5%), and remains negative later. In this case, the relatively small increase in the pension induced by work at 63 does not offset the loss of one year's pensions, and thus leads to a decrease in SSW. Therefore, the maximum value of the SSW is obtained for a last year of work at 62, i.e. for leaving at age 63, that is before reaching the full rate which is obtained at 63.5 years. In fact, if computations were made on a quarterly basis, we would observe that the SSW reaches its maximum right at 63.5 : here again, there are strong incentives not to retire at a reduced rate, even if delaying after 60 implies giving up pensions. Finally, after reaching the full rate, we observe as in previous cases a heavy tax on work.

As for the replacement rate, values increase quickly up to the full rate, then keep going up slowly. Values are lower than in the base case because of the shorter career : the worker accumulated fewer points for complementary schemes. Nevertheless, the replacement rate eventually reaches 90 %.

In all of the cases, we get globally similar results. Rules of retirement schemes imply that the SSW is maximum when the pension is obtained at the full rate. Early retirement at a reduced rate implies a reduction of the SSW, which means that the system is not actuarially fair. The evidence is particularly clear in the case of an incomplete earnings history where, between 60 and 62, when immediate claiming is possible, it is still profitable to delay retirement in order to increase the pension level. On the other side, beyond the full rate, pursued work entails a decrease of the SSW, which acts as a tax on earnings.

Conclusion

There is little doubt that the question of knowing what determines age at retirement in France and what may drive its future evolution is particularly important for France. France has a labour force participation rates at older ages which is one of the lowest among similar developed countries, and like all these countries, it is expected to face rapid population aging during the first half of the next century, a problem whose partial solution may lie in an increase of the retirement age.

This paper provides some elements concerning the explanation of current labour force participation rates in France. The age at which benefits are claimed is roughly consistent by the conjunction of two elements :

- The possibility which is offered, under certain conditions, to get retirement at full rate at age 60
- And the fact that a majority of people presently satisfy these conditions.

Although we did not attempt to build any projections, these kinds of computation may prove useful in assessing the impact of future changes in these two elements. First the fact that conditions necessary to get full retirement at 60 will be progressively strengthened over the next decade, following the application of the Balladur reform of 1993. Second, the fact that changing labour force participation over the whole life cycle, and especially the fact that entry into the labour force is progressively delayed, will make it more difficult to fulfill these conditions. We did not attempt to simulate this aspect because it would have involved a full

projection of labour histories at the individual level[13], but it is clear that it is along the lines explored here that such simulations should be developed.

On the other hand, it remains true that the simulation of labour force participation around age 60 goes further than the computation of incentives provided by the single pension system. Interaction with unemployment insurance, preretirement schemes, the general situation on the labour market, and the behaviour of firms are the other aspects of a complex problem, which deserve specific treatment, and which were only briefly touched upon here.

13 A long run dynamic microsimulation model is currently being build to deal with this question, but with results which remain too preliminary to be included here.

Appendix 1

We first present a general formula to evaluate the Social Security Wealth (*SSW*) defined as the present discounted value of Social Security benefits for a worker of age a_0 and considering retirement at age r, denoted $SSW(a_0,r)$.

We use the following notations:

a_0	: worker's age at evaluation of the *SSW*
r	: age at retirement
max *age*	: maximum potential age
δ	: age difference between the worker and his spouse ($\delta>0$ when the spouse is younger)
$p(a)$	: probability of worker's survival at age a conditional on survival at age a_0
$q(a_f)$	: probability of spouse's survival at age a_f conditional on survival when the worker is a_0
$B(a)$	: amount of retirement benefits at age a conditional on retirement at age r
$C(a)$	: amount of contribution at age a to the Social Security and complementary pensions (depends only on the wage at age a)
$R(a_f/a)$	: amount of survivor benefits at spouse's age a_f conditionally to end of worker's activity at age a.
ρ	: discount rate

We decompose the *SSW* into three elements :

$PB(a_0,r)$	: present value at age a_0 of future benefits if retirement occurs at age r
$SSC(a_0,r)$	: present value at age a_0 of social security contributions until retirement at age r
$SuB(a_0,r)$	: present value at age a_0 of survivor benefits if the worker retires at age r

$$PB(a_0,r) = \sum_{a=r}^{a=\max age} p(a)B(a)\frac{1}{(1+\rho)^{a-a_0}}$$

$$SSC(a_0,r) = \sum_{a=a_0}^{a=r-1} p(a)C(a)\frac{1}{(1+\rho)^{a-a_0}}$$

$$SuB(a_0,r) = \sum_{a=a_0}^{a=r-1} (p(a)-p(a+1))\frac{1}{(1+\rho)^{a+1-a_0}}\left\{\sum_{a_f=a+1-\delta}^{a_f=\max age} R(a_f/a)q(a_f)\frac{1}{(1+\rho)^{a_f-(a+1-\delta)}}\right\}$$

$$+ \sum_{a=r}^{a=\max age} (p(a)-p(a+1))\frac{1}{(1+\rho)^{a+1-a_0}}\left\{\sum_{a_f=a+1-\delta}^{a_f=\max age} R(a_f/r-1)q(a_f)\frac{1}{(1+\rho)^{a_f-(a+1-\delta)}}\right\}$$

$$SSW(a_0,r) = PB(a_0,r) + SuB(a_0,r) - SSC(a_0,r).$$

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Table 1 : **Distribution of household income by source** (data : Taxable earnings Survey, 1984)
(households whose head is inactive)

	share of each source in %			
	activity earnings	pensions	minimum pension	property income
Total	6.1	76.2	5.3	12.4
former status of head				
- farmers	6.1	59.8	17.9	16.2
- independent workers	6.2	54.1	4.8	34.9
- wage earners	6.0	82.4	2.8	8.8
- other	6.9	65.5	12.1	15.5

Table 2 : **Replacement rate provided by the general regime for three reference cases**

Age	Number of contributed years	α (1)	number of years /37.5 (2)	replacement ratio (1)×(2)
		Individual A		
60	25	25 %	0.667	16.7 %
61	26	30 %	0.693	20.8 %
62	27	35 %	0.720	25.2 %
63	28	40 %	0.747	29.9 %
64	29	45 %	0.773	34.8 %
65	30	50 %	0.800	40.0 %
		Individual B		
60	30	25 %	0,800	20.0 %
61	31	30 %	0,827	24.8 %
62	32	35 %	0.853	29.9 %
63	33	40 %	0.880	35.2 %
64	34	45 %	0.907	40.8 %
65	35	50 %	0.933	46.7 %
		Individual C		
60	35	37,5%	0.933	35.0 %
61	36	42,5%	0.960	40.8 %
62	37	47,5%	0.987	46.9 %
63	38	50 %	1.000	50.0 %
64	39	50 %	1.000	50.0 %
65	40	50 %	1.000	50.0 %

Table 3 : **Current features of complementary schemes (in 1993)**

	ARRCO	AGIRC
Contractual contribution rate (% of gross wages)	5	13
Reference wage	21.18 FF	19.69 FF
Value of point	2.24 FF	2.36 FF

Table 4 : **Some contribution rates (in %)**

(data: Join-Lambert et al., 1994; Legros, 1995)

	Employer	Employee or protected person	Total
General regime			
-Health			
Workers	12.8	6.8	19.6
Pensioners		1.4	1.4
Pre-retired		5.5	5.5
-Family	5.4		5.4
-Old age			
Wages below the ceiling	8.2	6.55	14.75
Full wage	1.6		1.6
Unemployment insurance			
Below ceiling	5.34	3.22	8.56
From 1 to 4 × ceiling	5.47	3.86	9.34
Complementary pensions			
-Executives			
Below ceiling (ARRCO)	3(×1.25)*	2(×1.25)*	5(×1.25)*
From 1 ceiling to 4 × ceiling (AGIRC)	9.36(×1.21)	4.68(×1.21)	14.04(×1.21)
-Others (ARRCO)			
below 3 × ceiling	3(×1.25)	2(×1.25)	5(×1.25)

* The multiplicative coefficient refers to the concept of 'calling rates' (*taux d'appel)*, i.e. there is a basic statutory contribution rate, but the real contribution rate is obtained after multiplication by the calling rate, which was lower than 1 during the first decades of existence of the system, and now increases more or less regularly.

Table 5 : **Base Case Incentive Calculations**

Last year of work	Replacement Rate	SSW	Accrual	Accrual Rate	Tax / Subsidy
54		792068			
55		886083	94015	0.12	-0.91
56		986531	100447	0.11	-0.97
57		1034081	47551	0.05	-0.46
58		1029771	-4310	0.00	0.04
59	0.92	1024586	-5185	-0.01	0.05
60	**0.91**	**954881**	**-69705**	**-0.07**	**0.67**
61	0.92	892339	-62542	-0.07	0.60
62	0.91	826880	-65459	-0.07	0.63
63	0.92	768327	-58552	-0.07	0.56
64	0.92	710313	-58014	-0.08	0.56
65	0.93	656799	-53514	-0.08	0.52
66	0.94	607337	-49461	-0.08	0.48
67	0.95	559482	-47855	-0.08	0.46
68	0.96	513035	-46447	-0.08	0.45
69	0.96	468382	-44652	-0.09	0.43

Table 6 : **Incentive Calculations - Single Worker**

Last year of work	Replacement Rate	SSW	Accrual	Accrual Rate	Tax / Subsidy
54		666801			
55		740221	73420	0.11	-0.71
56		817607	77386	0.10	-0.75
57		851928	34321	0.04	-0.33
58		841109	-10819	-0.01	0.10
59	0.92	830107	-11002	-0.01	0.11
60	**0.91**	**756702**	**-73405**	**-0.09**	**0.71**
61	0.93	688481	-68221	-0.09	0.66
62	0.92	621819	-66662	-0.10	0.64
63	0.93	559498	-62321	-0.10	0.60
64	0.93	498909	-60589	-0.11	0.58
65	0.94	441338	-57571	-0.12	0.56
66	0.94	388614	-52724	-0.12	0.51
67	0.95	337712	-50901	-0.13	0.49
68	0.96	288461	-49252	-0.15	0.48
69	0.96	241174	-47287	-0.16	0.46

Table 7 : **Incentive Calculations - 10th percentile wage**

Last year of work	Replacement Rate	SSW	Accrual	Accrual Rate	Tax / Subsidy
54		527363			
55		589645	62282	0.12	-0.96
56		656541	66896	0.11	-1.03
57		688575	32033	0.05	-0.49
58		685953	-2622	0.00	0.04
59	0.97	682757	-3196	0.00	0.05
60	**0.96**	**636651**	**-46106**	**-0.07**	**0.71**
61	0.97	594697	-41954	-0.07	0.65
62	0.96	551248	-43449	-0.07	0.67
63	0.97	511754	-39494	-0.07	0.61
64	0.97	473039	-38715	-0.08	0.60
65	0.98	437188	-35851	-0.08	0.55
66	0.98	404200	-32988	-0.08	0.51
67	0.99	372531	-31669	-0.08	0.49
68	1.00	342151	-30380	-0.08	0.47
69	1.00	313030	-29121	-0.09	0.45

Table 8 : **Incentive Calculations - 90th percentile wage**

Last year of work	Replacement Rate	SSW	Accrual	Accrual Rate	Tax / Subsidy
54		1122847			
55		1239107	116260	0.10	-0.50
56		1365077	125970	0.10	-0.54
57		1430006	64929	0.05	-0.28
58		1435511	5505	0.00	-0.02
59	0.61	1440303	4792	0.00	-0.02
60	**0.61**	**1353627**	**-86676**	**-0.06**	**0.37**
61	0.62	1275728	-77899	-0.06	0.33
62	0.62	1192814	-82914	-0.06	0.36
63	0.63	1119002	-73812	-0.06	0.32
64	0.63	1045122	-73879	-0.07	0.32
65	0.64	976418	-68704	-0.07	0.30
66	0.65	915054	-61364	-0.06	0.26
67	0.66	854800	-60254	-0.07	0.26
68	0.67	795283	-59517	-0.07	0.26
69	0.68	737552	-57732	-0.07	0.25

Table 9 : **Incentive Calculations - Incomplete Earnings History**

Last year of work	Replacement Rate	SSW	Accrual	Accrual Rate	Tax / Subsidy
54		460363			
55		461053	690	0.00	-0.01
56		463250	2197	0.00	-0.02
57		464443	1193	0.00	-0.01
58		504618	40175	0.09	-0.39
59	0.58	586050	81432	0.16	-0.79
60	**0.65**	**626648**	**40598**	**0.07**	**-0.39**
61	0.74	665157	38509	0.06	-0.37
62	0.81	693905	28748	0.04	-0.28
63	0.86	681341	-12564	-0.02	0.12
64	0.86	627596	-53745	-0.08	0.52
65	0.88	577934	-49662	-0.08	0.48
66	0.88	532095	-45839	-0.08	0.44
67	0.89	487866	-44228	-0.08	0.43
68	0.90	445182	-42684	-0.09	0.41
69	0.91	404001	-41181	-0.09	0.40

Table 10 : **Incentive calculations - unemployment benefits between work and retirement**

Last year of work	Replacement Rate	SSW	Accrual	Accrual Rate	Tax / Subsidy
54		1065913			
55		1100430	34516	0.03	-0.33
56		1143812	43383	0.04	-0.42
57		1136666	-7146	-0.01	0.07
58		1079952	-56713	-0.05	0.55
59	0.93	1024586	-55366	-0.05	0.53
60	**0.92**	**954881**	**-69705**	**-0.07**	**0.67**
61	0.93	892339	-62542	-0.07	0.60
62	0.92	826880	-65459	-0.07	0.63
63	0.93	768327	-58552	-0.07	0.56
64	0.93	710313	-58014	-0.08	0.56
65	0.94	656799	-53514	-0.08	0.52
66	0.95	607337	-49461	-0.08	0.48
67	0.96	559482	-47855	-0.08	0.46
68	0.96	513035	-46447	-0.08	0.45
69	0.96	468382	-44652	-0.09	0.43

Figure 1 : **Participation rate of older men, France, long term**

(figures from Marchand and Thélot 1991; Bordes and Guillemot, 1994).

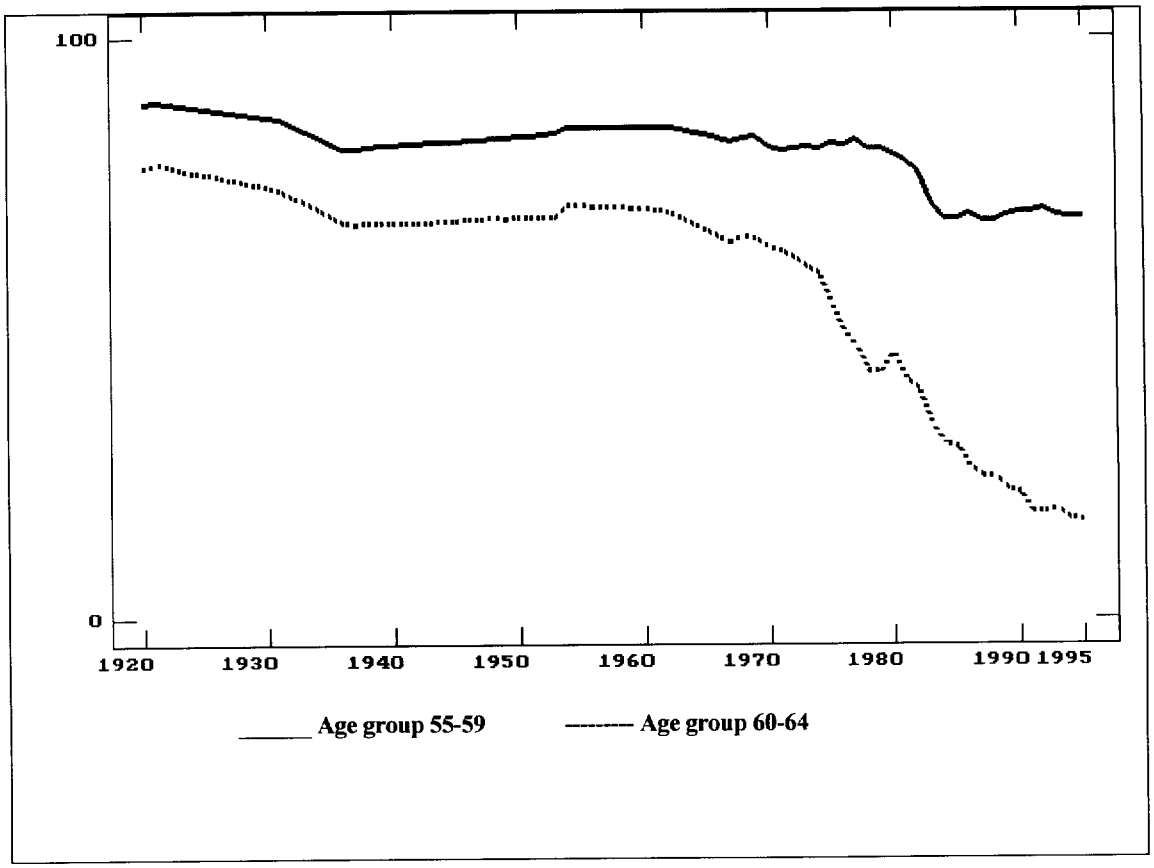
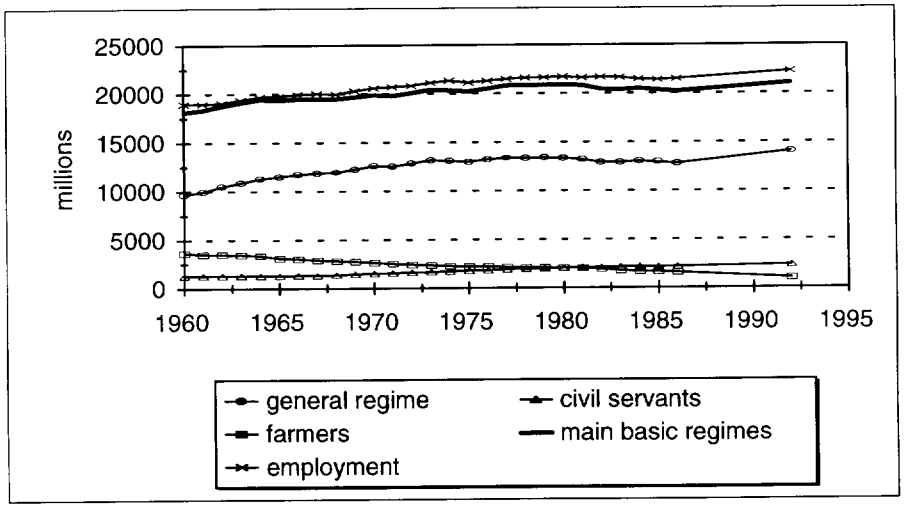
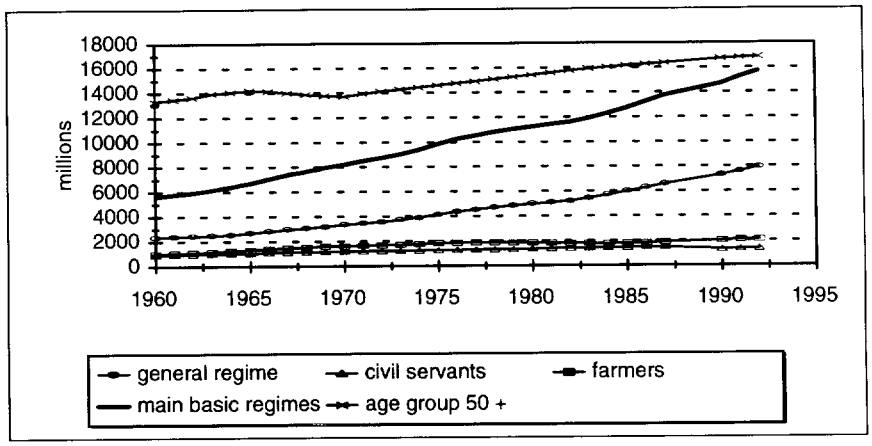


Figure 2 : **contributors to pension regimes**



note : on this graph, the category 'main basic regimes' includes nine basic regimes, which cover almost the whole employed population. This graph also shows separate figures for three regimes : the general regime which covers wage earners from the private sector, the regime of farmers and the civil servants pension scheme.

Figure 3 : **pensioners of basic regimes**



note : this graph shows the number of pensioners in different basic regimes. Like in Figure 2, the total number refers to nine basic regimes . As it is mentioned in the text, a retiree may receive pensions from several basic regimes (the average number of basic pensions is 1.4). Therefore, the last category shows the total number of pensions, but overstates the total number of retirees.

Figure 4 : **ratio of average old-age benefit to average wage**

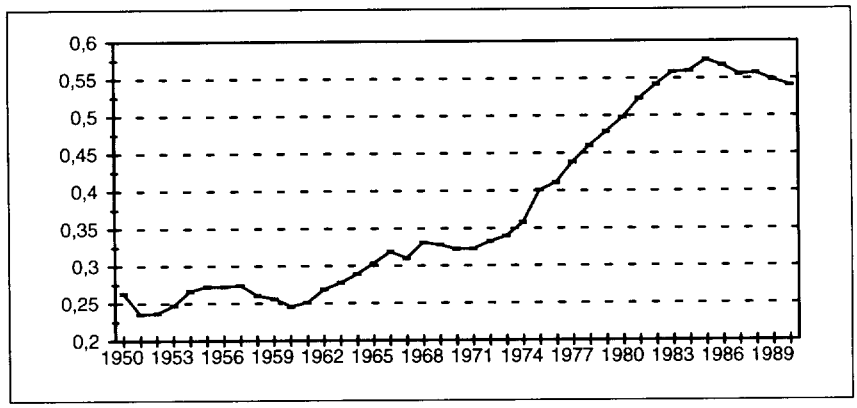


Figure 5 : **Historical trends in LFP of older men** (data : INSEE, 1994)

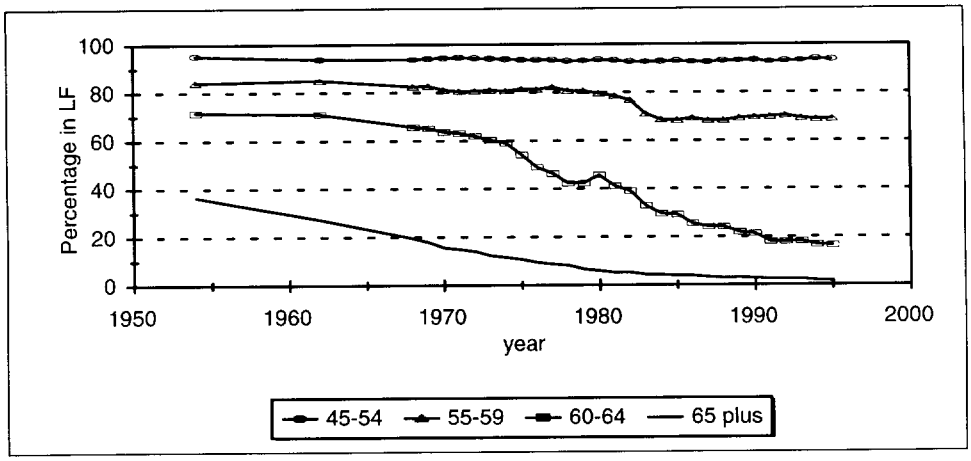


Figure 6 : **Status of active male workers aged 60-64 from 1968 to 1995**

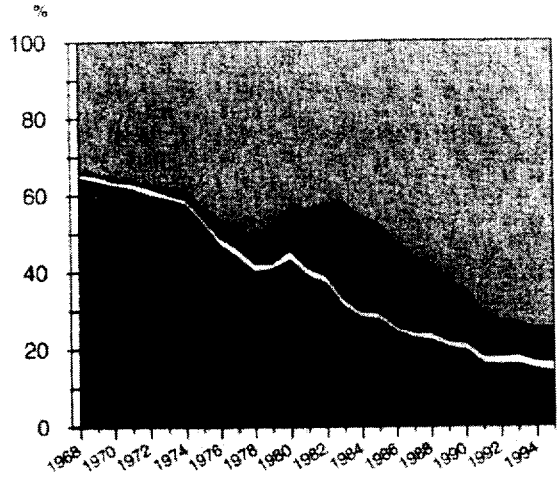
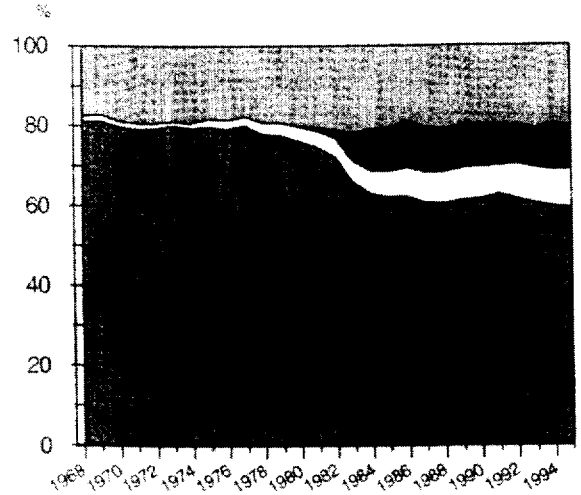


Figure 7 : **Status of active male workers aged 55-59 from 1968 to 1995**



Data : evaluations by the DARES from Employment Survey (INSEE) and UNEDIC surveys.

Graphs are from Blanchet and Marioni (1996).

Figure 8 : **Historical trends in LFP of older women** (data : INSEE, 1994)

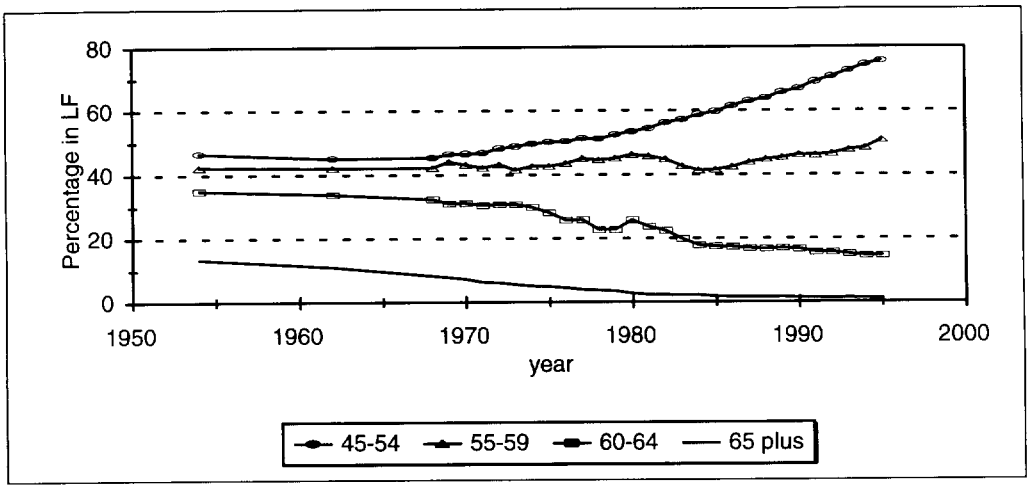


Figure 9 : **Participation rates by age and sex** (data : Employment Survey, 1996)

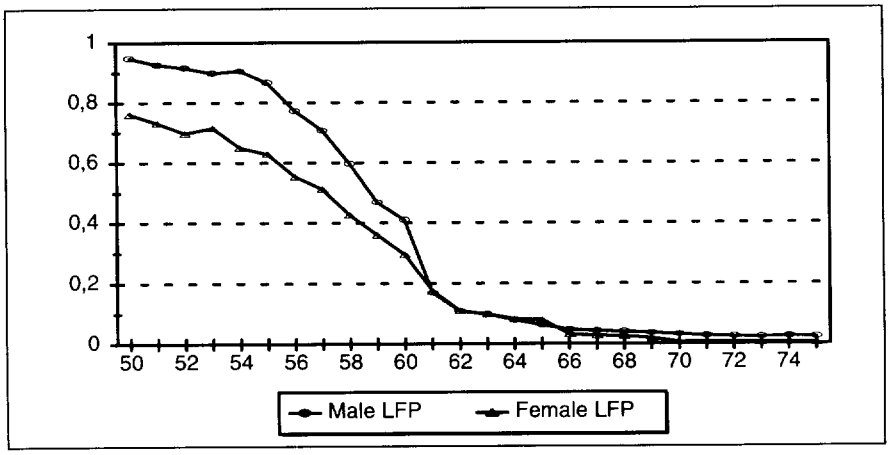


Figure 10 : **Employment rates by age and sex** (data : Employment Survey, 1996)

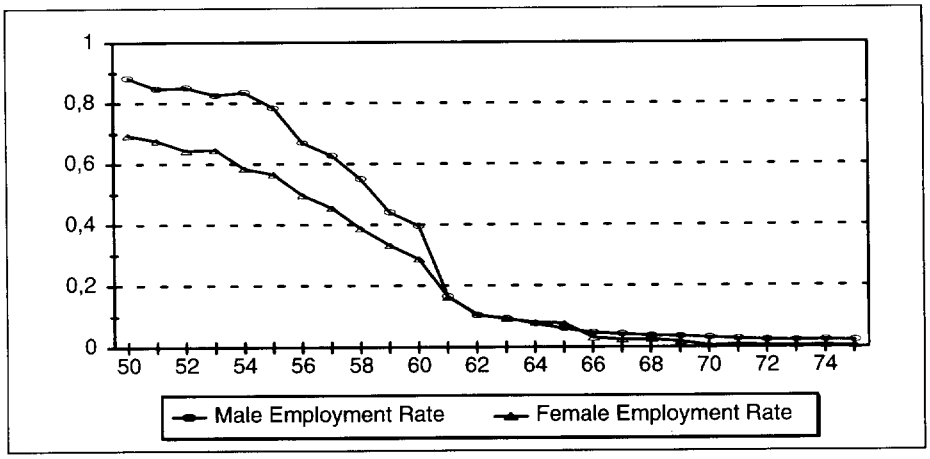


Figure 11 : **Distribution of Activities of Men by Age** (data : Employment Survey, 1996)

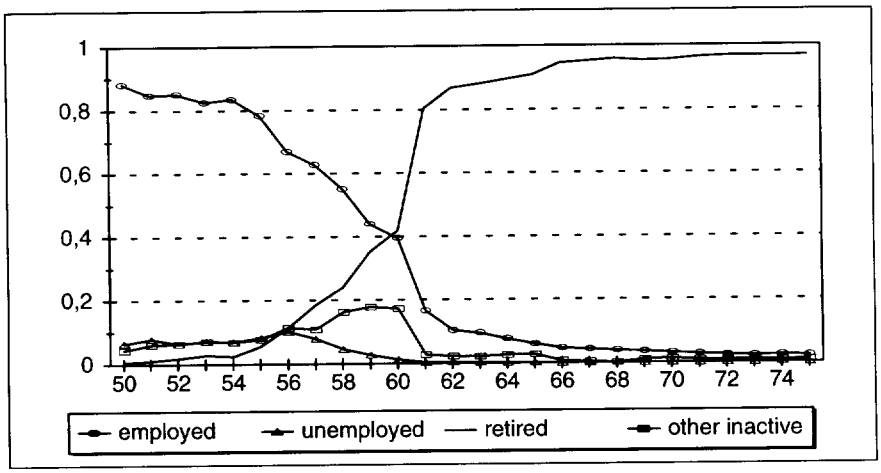


Figure 12 : **Distribution of Activities of Women by Age** (data : Employment Survey, 1996)

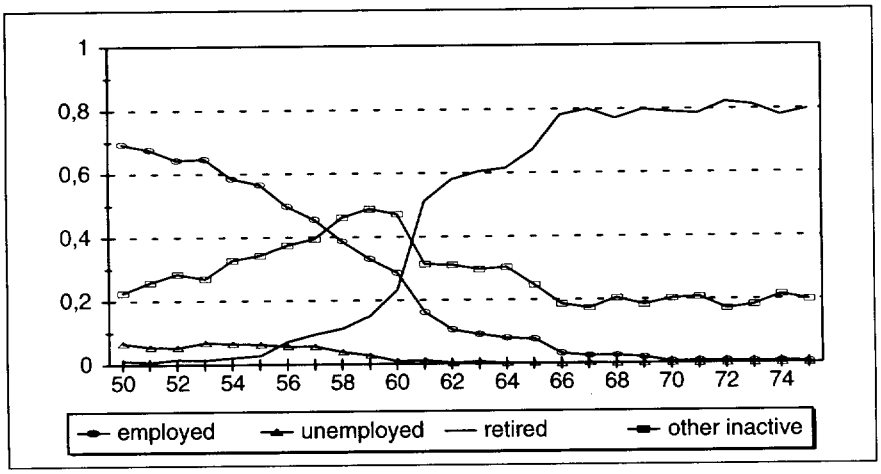


Figure 13 : **Hazard rate out of labour force for men** (data : Employment Surveys, 1995 & 1996)

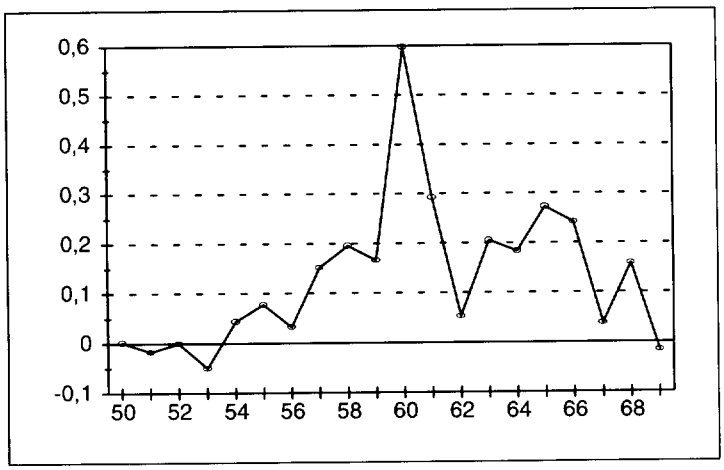


Figure 14 : **Hazard rate out of labour force for women** (data : Employment Surveys, 1995 & 1996)

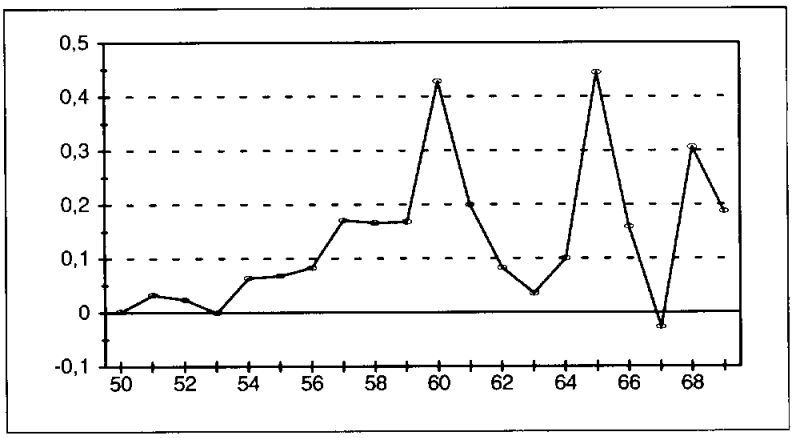
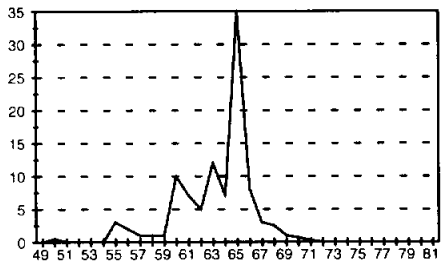
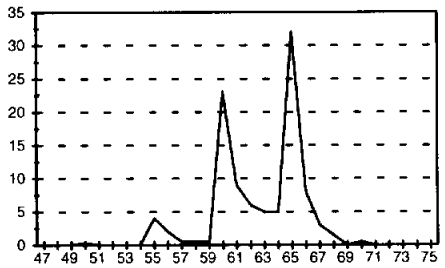


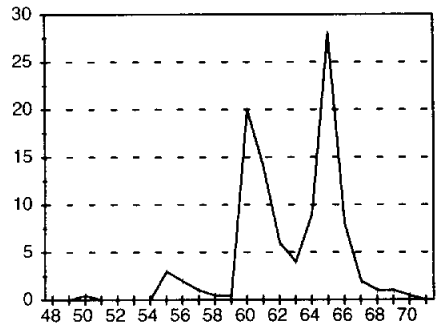
Figure 15 : **Age of entry into normal retirement within four cohorts**
(percentage retiring at each age)



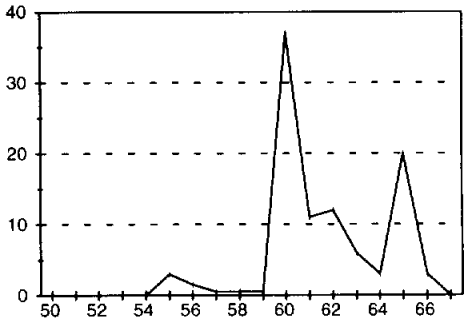
1912 cohort



1918 cohort



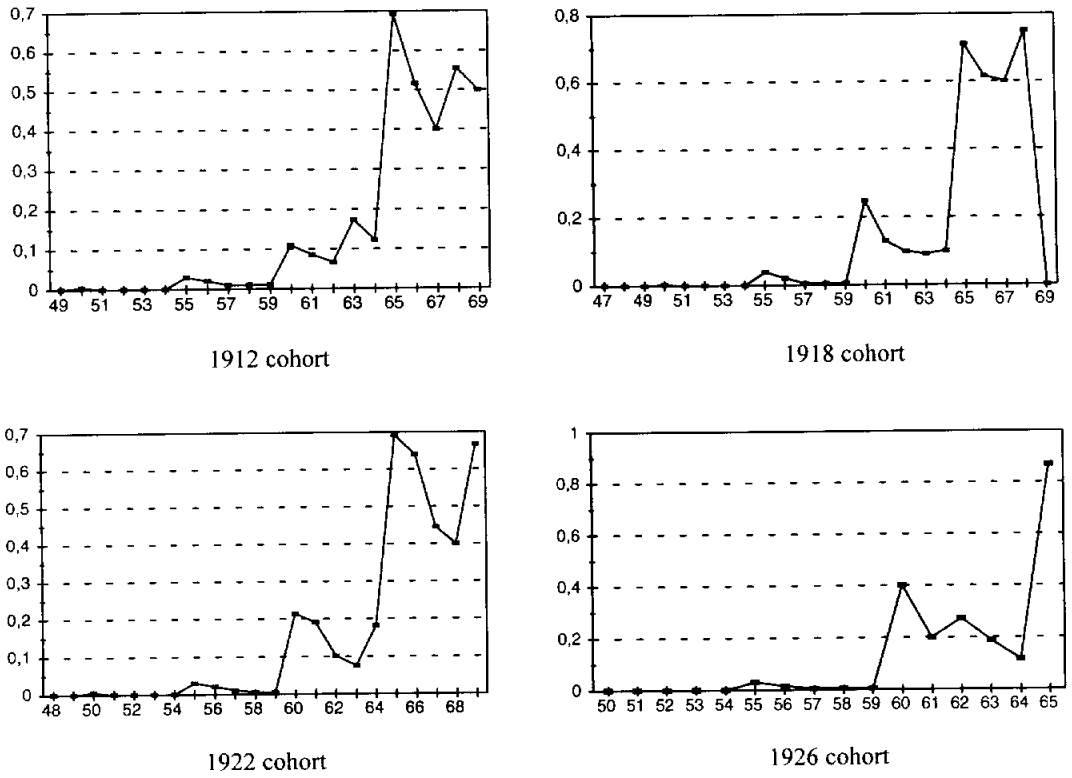
1922 cohort



1926 cohort

Note : graphs are from Dangerfield (1994).

Figure 16 : **Hazard rates into normal retirement within four cohorts**



Note : these hazard rates are calculated from distribution data in Figure 15.
(data : Dangerfield, 1994)

Figure 17 : **Tax/Subsidy Rate Across Earnings Profiles**