Assessing the effects of early retirement programs*

by

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Abstract

We investigate induced retirement effects of the Norwegian early retirement program ”AFP” and emphasize effects caused by relocations of some individuals from disability pension to AFP. Our theoretical model predicts that AFP unambigously induces more early retirement. The substitution effect towards early retirement is strongest for low income individuals. Using a longitudinal sample, we demonstrate that i) economic incentives influence the retirement decision, ii) there is a significant net induced retirement effect and the magnitude is inversely related to income, iii) approximately 28 and 8 per cent of the AFP pensioners would otherwise have been disabled or unemployed.

JEL Classification: J26, H55, C23

Keywords: Induced retirement, social security, tax-transfer programs

* We appreciate financial support from the Norwegian Research Council and the Ministry of Health and Social Affairs.

1. Introduction

Since the early 1970s we have witnessed a growing availability of various early retirement options in almost all OECD economies.[1] In many economies these options have included a liberalization of the entitlement conditions for older workers' access to disability and unemployment programs.[2] Moreover, many economies have introduced general early retirement programs implemented as an extension of the ordinary public pension scheme or negotiated between the unions, the firms and potentially the government as a third part. Looking mainly at the effects of the latter type of programs, we note that they have been rationalized by a postulated need for a flexible retirement age interpreted as both the option to retire before the standard retirement age and the opportunity to remain in the labor force for some additional years. Data for the OECD economies suggest that this flexibility works only one way, however. As illustrated in a lot of studies, the average retirement age has declined steadily over the last couple of decades, see for example OECD (1998a, 1998b).[3] Consequently, we may suspect that there are significant induced retirement effects associated with the various early, or flexible, retirement schemes. According to the cited OECD studies most of these schemes give in fact strong economic incentives to withdraw from the labor force before the standard pension age.

The observed escalation of early retirement increases the well known and potentially severe problems related to ageing populations in all OECD economies. Early retirement implies reductions in the labor force and consequently a lower potential GDP. In addition the associated increase in the ratio between the number of social security receivers and labor market participants threatens the financial viability of these economies' social security systems, which essentially are financed on a pay-as-you-go basis.

This paper considers the effects of the Norwegian general early retirement program "AFP". The AFP program was introduced in 1989 as the result of negotiations between employers, unions and the government which also contributes to the financing of the scheme. Approximately 60 per cent of the labor force have access to AFP early retirement. Gradually the entitlement age for AFP has been lowered from 66 in 1989, to 65 in 1990, to 64 in 1994, to 63 in 1997 and finally to 62 since 1998. The standard pension age in Norway is 67. As described in more dtail below, AFP early retirement requires that some rather weak conditions for labor market participation are satisfied.

[1] See for example the surveys of OECD (1998a, 1998b) and Gruber and Wise (1997).
[2] European evidence indicates that this practice tends to gain momentum in recessions, see Dahl et al. (1999) and OECD (1998a).
[3] Correspondingly, the participation rate in the labor force for older men has declined in the OECD area. On the other hand, the participation rate for women aged 55 to 64 has been stable or even increased, while their average retirement age has declined. Thus, larger shares of the women aged 55-64 participate in the labor force but among these active women the retirement age has declined.

The AFP program is rather generous in the sense that early retirement does not influence the level of the ordinary pension benefits after age 67. In fact individuals in the AFP program continue to accumulate claims to the ordinary supplementary pension as if they had continued in the labor force. The net replacement rate in the AFP program, which is a declining function of the income level, is approximately 65 per cent for individuals with a medium income.[4] This reflects that the AFP benefit is calculated as the pension benefit the individual would have received at age 67 plus an additional ”AFP-subsidy”.[5]

Not surprisingly, the AFP program has gradually gained increased popularity in response to the reductions in the entitlement age and a growing knowledge of this fairly new scheme among the workers. Since 1993 AFP has been the most utilized exit path from the labor force for individuals aged 64-66 years. In 1997 the AFP scheme was responsible for 60 per cent of the exits in this age group.

Our point of departure is a stylized theoretical life-cycle model with endogenous retirement. This model predicts that the AFP program unambigously induces more early retirement. It also follows that the substitution effects towards early retirement is stronger for low income individuals than high income individuals. Using a large longitudinal sample, we test these predictions. A crucial issue, which is particularly highlighted in this paper, is to disentangle the net retirement and labor supply effects of the AFP program from the effects caused by possible relocations of some individuals from other transfer programs (notably disability pensions and unemployment benefits) to the AFP program. It turns out that the economic incentives of the AFP program induce a considerable net retirement effect, i.e. individuals who otherwise would have continued in the labor force choose AFP. The strength of this effect is inversely related to the income level. Our analysis also shows that approximately 28 per cent and 8 per cent of the AFP pensioners would otherwise have been on disability or unemployment schemes respectively.

This paper is part of the large literature on retirement behavior, see Lumsdaine and Mitchell (1999) for a broad and updated survey. It is particularly closely related to other analyses of retirement patterns in the Nordic countries, notably Hernæs et al. (1999), Dahl et al. (1999), Pedersen and Smith (1996) and Lilja (1996). Hernæs et al. provide an analysis of the same Norwegian AFP scheme as the present paper studies. Based on a competing risk model they consider transitions from full time work to full retirement or to the combination of partial retirement and part-time work. It turns out that economic incentives influence the (early-) retirement decision, and by means of simulations they demonstrate that a rather generous

[4] We note that the net replacement rate of individuals who combine part-time AFP with part-time labor market participation, may be well above 100 per cent due to the joint effects of the AFP program and the tax system.

[5] For more details about the AFP program see the Norwegian government white paper NOU 1998:19. A useful and compact survey of the institutional settings in Norway is offered by Hernæs et al. (1999).

”bonus” is neccessary if individuals should postphone retirement for one year. Hernæs et al. do not deal with the potential interaction between the AFP scheme and the other early retirement pathways, i.e. disability and unemployment benefits. Nor do they investigate how the retirement behavior varies between income groups.

Turning to Dahl et al. (1999), they too consider Norwegian retirement behavior. They analyze transitions from work to either disability pensions or unemployment benefits and identify various push and pull factors which explain transitions to these destinations. Their analysis indicates that disability and unemployment are not exchangeable pathways. Moreover, economic incentives seem to be of some importance for exits to unemployment and disability. Unfortunately, Dahl et al. do not capture AFP early retirement at all.

Using Danish data, Pedersen and Smith (1996) analyze transitions from work to respectively disability and a general early retirement scheme (”Etterlønn”). The latter scheme has some similarities with the Norwegian AFP program. Pedersen and Smith show that there are different sets of factors which explain exits to these retirement pathways. We note in particular that a higher replacement rate stimulates exits through the general scheme but not through disability. A Finnish study by Lilja (1996) confirms that different sets of factors explain transitions through different exit routes. Lilja’s results also indicate that high income groups retire later than low income groups.

The next section presents our theoretical model and derives predictions for the empirical analysis. Section 3 describes our data set, while section 4 deals with the empirical specification. Our results are presented and interpreted in section 5. Finally, section 6 summarizes our results and discusses policy implications.

2. The retirement decision – economic principles

Focusing on the impact of early retirement programs on the economic incentives to retire, we consider a simple two-period life-cycle model.[6] In the first period of life, as ”young”, the individual works full time and supplies inelastically one unit of labor. In the second period of life, as ”old”, retirement is possible. The individual chooses the share α of this period which is spent in the labor force. Thus, α captures the retirement age in the sense that the individual participates in the labor forcec in the first α part of the second period, while the last $1-\alpha$ part is spent in retirement. We assume that there is a standard ”official” retirement age α^*. In the following we will focus exclusively on cases where $0<\alpha\leq\alpha^*$, i.e. we consider the large share of

[6] Our model has similarities with the life-cycle models with endogenous retirement presented by Feldstein (1977), Crawford and Lilien (1981) and Myles (1995) (section 14.4.1).

the population which retire before (or at) the standard retirement age and disregard the very few who stay in the labor force after that age.

The individual maximizes the utility function

(1) $U = u(c_1) + u(c_2) + v(l)$,

where c_t is consumption in period t (t=1,2), l is the length of the retirement period (l=1–α) and we have $u' > 0$, $u'' < 0$, $v' > 0$ and $v'' < 0$. For simplicity the real interest rate is zero and there is no discounting of future utility. Assuming that the individual has access to a perfect credit market, it immediately follows that $c_1=c_2=c$. Then we can rewrite (1) as

(1') $U = 2u(c) + v(1-\alpha)$.

Moreover,

(2) $c = \frac{1}{2} b(\alpha)$,

where $b(\alpha)$ is the net life income defined as the present value of all net income flows over the life-cycle. We have

(3) $b(\alpha) = w(1-\tau) + \alpha w(1-\tau) + \pi(\alpha)$,

where w is a constant gross wage rate, τ is a constant proportional tax rate and $\pi(\alpha)$ is a pension benefit.

Maximization of (1') subject to (2) and (3) yields

(4) $u'(c)b'(\alpha) = v'(l)$, $b'(\alpha) = w(1-\tau) + \pi'(\alpha) \equiv \beta$,

i.e. the optimal retirement age ensures that the marginal gain from a longer time in the labor force must equal the marginal gain from a prolonged retirement period.[7] We interpret β as "the price of a longer retirement period" since this derivative expresses the marginal price of leisure in terms of consumption. We will generally assume that β>0. Otherwise the individuals would not work at all.

We write the pension formula as

(5) $\pi(\alpha) = (1-\alpha)\left[A + f(y)\right] + \psi(\alpha^* - \alpha) + p(\tau w + \alpha \tau w)$.

The first term on the RHS captures that the individual receives a flat benefit A and a supplementary benefit $f(y)$ ($f(0)$=0, $f'(y) \geq 0$) during retirement. The supplementary pension level is determined by the number of "earning points", y, which is closely related to gross income received earlier in life, and given by the formula

[7] We assume that the first-order condition (4) uniquely defines an optimal α. Since $v'(l)$ is an increasing function of α, we must assume that the expression on the RHS of (4) is either non-increasing in α or increasing at an lower rate than $v'(l)$. This seems to be a very weak assumption since $u'(c)$ is decreasing in α and $b'(\alpha)$ is decreasing for most individuals when we take the typical non-actuarial pension system of most OECD economies into account.

(6) $$y = \max\left\{0\ , w(1+\alpha) + \gamma w(\alpha^* - \alpha) - y^{\min}\right\}.$$

Here $y^{\min}$ is an exogenously given minimum level of earning points necessary to receive a positive supplementary pension. The parameter $\gamma \geq 0$ captures to what extent the individual accumulates earning points in the early retirement period.

The second term on the RHS of (5) reflects that the individual may face an additional early retirement subsidy ($\psi>0$) or penalty ($\psi<0$). Finally, the last term on RHS of (5) captures a possible direct relationship between own contributions and benefits ($0 \leq p \leq 1$).

To what extent the tax-transfer system stimulates individuals to substitute a longer early retirement period for more time spent in the labor force depends on β. Using (5), we obtain

(7) $$\beta = w(1-\tau) - \left(A + f(y)\right) + (1-\alpha)\left(f'(y)y'(\alpha)\right) - \psi + p\tau w\,.$$

In order to interpret (7), we first note that the case of a fully actuarial system (p=1, A=0, $f(y)$=0, ψ=0), or alternatively no system at all ($\tau=\pi=0$), implies that this equation simplifies to

(8) $$\beta^{actuarial} = w.$$

Clearly, the actuarial case leads to socially efficient retirement choices provided that the wage rate reflects the marginal productivity of the individuals. If we imagine that the same $v(l)$ and $u(c)$ functions are valid for all individuals, it follows from (4) and (7) that high income individuals will retire later than low income individuals. Equivalently, if we consider representative individuals over time, income growth leads gradually to a lower retirement age.

Looking at (7), we observe that a higher τ, a higher A and $f(y)$, a lower value of $f'(y)y'(\alpha)$, a lower ψ and a lower p all contribute to reductions in β relative to the socially efficient level. The current Norwegian system is characterized by A>0, p=0, ψ>0 and also γ=1 for individuals eligible for AFP benefits.[8] We note from (6) that the latter feature simply implies that y is independent of α, i.e. $f(y)$ is fixed and $f'(y)y'(\alpha)$ =0, This means that early retirement in the AFP program leads to free accumulation of earning points as if the individuals had continued in the labor force until α^*. It follows from (7) that the Norwegian case implies

(9) $$\beta^{Norway} = w(1-\tau) - \left(A + f(y)\big|_{\gamma=1}\right) - \psi\,.$$

Thus, all parameters in the stylized pension formula contribute to reductions in β compared to the socially efficient case. Consequently, Norwegian individuals eligible for the general AFP early retirement program face strong substitution effects towards early retirement. Moreover, it also follows that this effect is stronger for low income individuals since they face a larger

[8] Employing the stylized pension formula (5), we can not, of course, include all aspects of the complex Norwegian pension system. Still, our approach captures the relevant economic incentives in the pension system which face individuals who are eligible for the general AFP early retirement program. We do not capture the relevant economic incentives facing some other groups, for example individuals who stay in the labor force after the official pension age of 67, part-time workers or professions with a lower pension age fized by law. Clearly, our theoretical framework also disregard disability pension.

relative reduction in β than high individuals. This is true even if we take into account that the tax rate in reality is increasing in income (as long as the marginal tax rate is below 100 per cent).

Using (2), (3), (4) and (9), it is straightforward to derive the comparative static results which are summarized in table 1.

Table 1: Comparative static results

	$\partial\alpha/\partial A$	$\partial\alpha/\partial\psi$	$\partial\alpha/\partial p$	$\partial\alpha/\partial\tau$
Substitution effect	<0	<0	>0	<0 (0 for p=1)
Income effect	<0	<0	<0	>0 (0 for p=1
Total effect	<0	<0	?	? (0 for p=1

Highlighting the Norwegian case, a main question is whether the introduction and gradual escalation of the AFP program have induced early retirement. In order to answer this question we can not look at the partial effects of changes in different parameters as shown in table 1. Instead we must imagine an individual who initially, before the implementation of the AFP program, plans to retire at the standard age α^* (or alternatively at an earlier stage, but without receiving any pension benefits before α^*). It is then obvious that the AFP program, which offers i) an early retirement benefit which is higher than the regular pension (ψ>0) and ii) free accumulation of earning points as discussed above and no reductions in the regular pension benefit, leads to substitution effects which induce early retirement. Moreover, the income effect is either zero (if the individual planned to retire at α^*) or negative if the individual initially planned top retire before α^*. Formally, this can be verified by rewriting (5) as

(10) $$\pi(\alpha) = (1-\alpha^*)[A + f(y)] + \theta(\alpha^* - \alpha)[A + f(y) + \psi],$$

where θ=1 corresponds to equation (5) when we recall that p=0 and γ=1 in the Norwegian case). The introduction of the AFP program can be interpreted as an increase in θ. It is straightforward to verify that $\partial\alpha/\partial\theta < 0$.

Summing up, theory gives the following predictions about the impact of the AFP early retirement program:

- The AFP program leads unambigously to induced retirement.
- Because low income individuals face stronger substitution effects towards early retirement than high income individuals, we expect a larger share of the low income individuals, who are eligible for the AFP program, to choose AFP early retirement.

The rest of this paper is devoted to an empirical analysis which tests these predictions and assesses the net impact on labor supply when we take into account possible relocations of some individuals to AFP from other transfer programs.

3. Data

Our data are collected from a large longitudinal database, which covers the period 1992-1996. (the "MOTIPE" database).[9] This database contains individual information on socio-economic background, labor market participation and social insurance status of the entire population of individual aged 50 to 70. Since the eligibility age for AFP was reduced to 64 in 1994, we use a subsample of individuals who reached the age of 64 during the first half of 1994 and who occupied a job at that time. We track these individuals for a time span of two and a half years. Obviously, this is the longest available time span since 1996 is the last year recorded in the data. At the end of the period each individual is classified according to five mutually exclusive states of destination: i) Still in work, ii) AFP pensioner, iii) Disabled, iv) unemployed or v) "other". By definition, these states of destination are absorbing.

We exclude individuals who were disabled or unemployed at the outset as well as individuals with missing variables during the sample period. This leaves us with a final sample of 6441 individuals, which we divide in two subsamples. One subsample includes 4637 individuals entitled to AFP (the AFP sample), while the other includes 1804 individuals not entitled to AFP (no-AFP sample). All employees in the public sector and approximately 43 per cent of the employees in the private sector are entitled to AFP provided that they meet the requirements for labor market participation. Essentially, these requirements are i) 10 years with income at least equal to the basic pension (37033 NOK in 1993) since the age of 50, ii) 10 years with income at least equal to twice the basic pension since 1967 and iii) annualized income at least equal to the basic pension in the calender year of AFP retirement and in the year before.

Looking closer at the classification of individuals with respect to the possible states of destination, we note that we restrict the group of AFP early pensioners and disabled to only include individuals who receive at least 50 per cent of the full benefit. Further, we give AFP priority over disability pension and unemployment benefits. This means that an individual with a disability or unemployment spell before a transition to AFP is classified as an AFP early pensioner. We also note that the "other" group includes individuals who are retired through private or firm-provided retirement schemes, self-employment or out of the labor force due to other reasons.

Table 2 summarizes the various independent variables. We observe that three different income variables are employed. As an approximation to the net income the individuals would receive from continued participation in the labor force, we use net income (EMPINC) recorded in 1993, i.e. the year prior to the start of our sample period. The net income as respectively disabled (DISINC) and AFP early pensioner (AFPINC) is computed on the basis of the

[9] This database is administered by the Norwegian National Insurance Administration (NIA).

individuals net income in 1993 and the relevant tax, benefit and pension rules. We also note that the variable “SICKDAYS” underreports the true number of days on sick leave. This tendency reflects that only long-term sick leave (more than 14 days) is reported to the Norwegian National Insurance Administration (NIA).

Table 3 presents the mean and standard deviation of each independent variable for both the total samples and the subsamples. Except for the industry and sector variables we do not observe any large differences between the subsamples. This is not surprising because the classification of individuals into one of the subsamples hinges essentially on whether or not the actual firm is affiliated to the AFP-scheme.

Table 4 reports the transition probabilities to the possible destination-states. There are some striking dissimilarities between the subsamples. The share, which remains in the labor force after 2.5 years, is much higher in the no-AFP sample (61.8 per cent) than in the AFP sample (37.6 per cent). One the other hand, a larger share of individuals in the no-AFP sample has a transition to disability pension. Moreover, we notice that a larger share of individuals in the no-AFP sample has a transition to both the unemployed group and the “other” group. Based on the latter observation we conjecture that more individuals in the no-AFP sample retire due to private or firm-provided early retirement schemes.

4. Empirical specification

We apply the standard multinomial logit model for the choice of labor force status. Consider an individual i with labor force status j, who has a utility function consisting of a deterministic part, U_{ij}, and a random part, e_{ij}. We denote this unobserved function by d_{ij}*,

(11) $$d_{ij}* = U(I_{ij}, l_{ij}; \mathbf{z}_i) = U_{ij} + \varepsilon_{ij},$$

where I_j and l_j denote income and leisure in state j, respectively, and $\mathbf{z}_i$ is a vector of background characteristics. The set of possible states is J.[10] For the econometric specification we write $\mathbf{x}_i = (I_{i1},..,I_{iJ}, l_{i1},.., l_{iJ}, \mathbf{z}_i)$ and assume that the latent utility function in state j is linear in $\mathbf{x}$ and the error term,

(12) $$d_{ij}* = \mathbf{?}_j '\mathbf{x}_i + \varepsilon_{ij},$$

where h_j is a state-specific vector of coefficients. The individual chooses the utility maximising state, Y. We do not observe the latent utility function, only which state is chosen. Assuming that

[10] For individuals who are not eligible for AFP, J includes Work, Unemployment, Disability, and Other (not in the registers). For those who are eligible, AFP comes in addition.

Table 2: Variable definitions

MALE	Dummy = 1 for males, 0 for females
EMPINC	Taxable income in 1993, measured in 1000 NoK
AFPINC	Calculated net income as early pensioner (AFP) , measured in 1000 NoK
DISINC	Calculated net income as disabled, measured in 1000 NoK
EXPER	Years with income above basic counting unit in pension system (NoK 37033 in 1993)
UNEMPDAYS	Days as unemployed in 1992-1993
SICKDAYS	Days of absence due to sickness in 1992-1993
MARRIED	Dummy = 1 if married, 0 otherwise
FULLTIME	Dummy =1 if working ≥ 30 hours per week, 0 otherwise
PRIVSECT	Dummy = 1 if working in the private sector, 0 otherwise
GOVSEC	Dummy =1 if working in the governmental sector, 0 otherwise
MUNISECT	Dummy = 1 if working in the municipal sector, 0 otherwise
MANUF	Dummy = 1 if working in manufacturing, 0 otherwise
AGRIC	Dummy = 1 if working in agriculture, 0 otherwise
PETRO	Dummy = 1 if working in petroindustry, 0 otherwise
FINANCE	Dummy = 1 if working in finance, 0 otherwise
CONSTR	Dummy = 1 if working in construction, 0 otherwise
RETAIL	Dummy = 1 if working in retail, 0 otherwise
TRANSP	Dummy = 1 if working in transportation, 0 otherwise
PUBLSERV	Dummy = 1 if working in public services, 0 otherwise

Table 3: Descriptive statistics (standard deviations in parentheses)

	All	With AFP entitlement	Without AFP entitlement
MALE	0.56	0.56	0.56
AFPINC	108.4 (29.4)	110.0 (28.1)	104.4 (32.4)
DISINC	98.2 (30.6)	98.7 (29.4)	97.1 (33.5)
EMPINC	144.6 (64.0)	145.0 (53.8)	143.5 (84.9)
EXPER	24.2 (4.8)	24.6 (4.1)	23.2 (6.2)
UNEMPDAYS	12.9 (71.8)	11.0 (64.1)	18.0 (89.2)
SICKDAYS	18.2 (51.5)	23.1 (57.1)	16.4 (49.7)
MARRIED	0.78	0.78	0.78
FULLTIME	0.71	0.72	0.68
PRIVSECT	0.58	0.44	1.00
GOVSEC	0.24	0.33	0.00
MUNISECT	0.18	0.25	0.00
MANUF	0.18	0.20	0.11
AGRIC	0.02	0.01	0.04
PETRO	0.01	0.01	0.01
FINANCE	0.05	0.02	0.12
CONSTR	0.04	0.04	0.04
RETAIL	0.17	0.10	0.33
TRANSP	0.07	0.06	0.10
PUBLSERV	0.44	0.52	0.23
N	6441	4637	1804

Table 4: Transition frequencies by AFP entitlement

	All	**With AFP entitlement**	**Without AFP entitlement**
Still in work	2857 (44.4)	1743 (37.6)	1114 (61.8)
AFP pensioner	2335 (36.3)	2335 (50.4)	-
Disabled	481 (7.5)	241 (5.2)	240 (13.3)
Unemployed	263 (4.1)	106 (2.3)	157 (8.7)
Other	505 (7.8)	212 (4.6)	293 (16.2)
N	6441	4637	1804

the error terms are i.i.d. and follow the Type I extreme value distribution, we obtain the multinomial logit model:

(13) $$\Pr(Y_i = j) = \frac{\exp(\boldsymbol{\eta}_j{}'\mathbf{x}_i)}{\sum_{k\in J}\exp(\boldsymbol{\eta}_k{}'\mathbf{x}_i)} := P_{ij}.$$

To estimate the model, some state must be chosen as the reference, and the according η_j-vector must be normalised to zero. The specification of **x** was detailed in table 2.

For interpretation, it is easy to show that for some variable x_m,

(14) $$\frac{\partial}{\partial x_m}\left(\frac{P_j}{P_k}\right) = \left(\frac{P_j}{P_k}\right)\exp(\eta_{jm} - \eta_{km}) \Rightarrow \frac{\frac{\partial}{\partial x_m}\left(P_j / P_k\right)}{\left(P_j / P_k\right)} = \exp(\eta_{jm} - \eta_{km}),$$

i.e., the exponentiated difference between the coefficients is the relative change in the odds associated with a marginal change in x_m. In particular, since the coefficients of the reference state are normalised to zero, an exponentiated coefficient measures the relative change in the odds between that state and the reference state. Alternatively, by differentiating (12) we get the marginal effect as

(15) $$\frac{\partial P_j}{\partial x_m} = P_j\,(\eta_{jm} - \sum_{k\in J} P_k \eta_{km}).$$

Unlike the coefficients, the marginal effects are not affected by the choice of reference state. They must, however, be evaluated at some particular value of the explanatory variables.

Our main interest in this paper is the effect of introducing the AFP scheme. Consider some state j and let the dummy variable T_i be 1 if individual i is entitled to AFP, 0 otherwise. The expected effect of this entitlement on the latent utility function is

(16)

$$E(y_{ij}^* | T_i = 1) - E(y_{ij}^* | T_i = 0) = E(U_{ij} | T_i = 1) - E(U_{ij} | T_i = 0) + E\{(\varepsilon_{ij} | T_i = 1) - (\varepsilon_{ij} | T_i = 0)\}.$$

Even if we could observe utility, this parameter could not be estimated directly, as the same individual is only observed in one regime. But assuming that the unobserved factors ε_{ij} are not affected by the entitlement, i.e. that $E\{(\varepsilon_{ij} | T_i = 1) - (\varepsilon_{ij} | T_i = 0)\} = 0$, we can obtain an unbiased estimate of the effect on the propensity of choosing state j by using the estimated response of an individual who is not eligible for the AFP as a proxy for the response of one who is:

(17) $$\hat{\Delta} = P(\hat{\boldsymbol{\eta}}'_{j,T=1}\mathbf{x}_i) - P(\hat{\boldsymbol{\eta}}'_{j,T=0}\mathbf{x}_i),$$

where $P(.)$ is the multinomial logit in equation (12). The assumption $E\{(\varepsilon_{ij} | T_i = 1) - (\varepsilon_{ij} | T_i = 0)\} = 0$ is crucial, but in our view justified. Clearly individuals making career decisions in the 1940s and -50s did not self-select into professions motivated by a reform which was introduced in 1989.

5. Results

The model was estimated separately for the groups with and without AFP entitlement. As the marginal effects are easier to interpret, table 5 only reports those. The estimated coefficients may be found in an appendix. We only comment on the results we find most important.

In table 5 we first note that the effect of income in 1993, EMPINC, on the probability of choosing AFP is as predicted: it reduces the probability of AFP-retirement. Increasing EMPINC by NOK 10,000 (approx. € 1250) reduces P_{AFP} by 1.1%. The effect on the probability of staying in work is exactly the opposite. On the other hand, prospective income in the AFP-state (AFPINC) increases P_{AFP}, whereas the potential disability income (DISINC) decreases the probability of AFP-retirement (but, unexpectedly, has no statistically significant effect on disability retirement). Working full time increases the probability of staying in work, probably a result of full time workers have a closer attachment to the labor force. (We are unwilling to concede that leisure is an inferior good.) The negative effect of AFPINC on the unemployment state makes sense to the extent that "permanent" unemployment benefits act as early retirement. It may seem slightly surprising that the negative effect of DISINC on the AFP-state is so much larger than the one of EMPINC, but the reason may be that disability retirement and AFP-retirement are closer substitutes than work and AFP. It is also a bit unexpected that the economic variables have no significant effects on disability retirement. We interpret this as an indication that for individuals with AFP entitlement, there is a strong health component in the decision to become a disability pensioner.

Turning to the effects of unemployment experience and health problems, we find that previous unemployment has a negative effect on the employment probability, and a positive effect on AFP-retirement. Health problems as measured by previous sickness absence (SICKDAYS) increase the probabilities of both types of retirement, and decrease the probability of employment.

Males have a larger propensity to retire than females (positive effects on AFP and disability). This could be related to health status but also to females on average having less income in retirement than males. Being married affects P_{AFP} positively and P_{WORK} negatively.[11]

The main purpose of the regression for individuals without AFP-entitlement is to provide estimates used when assessing the effect of introducing the AFP scheme. However, inspection of the lower panel of table 5 reveals that for the retirement probabilities the effect of being male disappears, the effect of previous sickness on disability is increased, and there is

[11] A preliminary specification included spouse's income but this variable was dropped as it had no statistically significant tests.

Table 5: Multinomial logit results: Marginal effects (asymptotic standard errors in parentheses)

AFP SAMPLE

	Still in work	AFP	Disability pension	Unemployment	Other
MALE	-0.0624**	0.0527**	0.0190**	0.0014	-0.0107
	(0.0249)	(0.0253)	(0.0078)	(0.0041)	(0.0076)
EMPINC	0.0011***	-0.0011***	-0.00001	0.00004	0.00002
	(0.0003)	(0.0003)	(0.00009)	(0.00003)	(0.00006)
AFPINC	-0.0038	0.0059**	-0.0008	-0.0009***	-0.0004
	(0.0029)	(0.0029)	(0.0008)	(0.0003)	(0.0007)
DISINC	0.0054*	-0.0077***	0.0003	0.0007**	0.0013*
	(0.0028)	(0.0029)	(0.0008)	(0.0003)	(0.0007)
EXPER	-0.0234***	0.0241***	0.0007	-0.0002	-0.0012
	(0.0027)	(0.0028)	(0.0008)	(0.0004)	(0.0008)
UNEMPDAYS	-0.0003**	0.0002*	0.00001	0.0001***	0.00002
	(0.00016)	(0.00016)	(0.00003)	(0.00001)	(0.00004)
SICKDAYS	-0.0005***	0.0003**	0.0002***	0.00001	0.00003
	(0.0002)	(0.00016)	(0.00003)	(0.00001)	(0.00004)
MARRIED	-0.0962***	0.1128***	-0.0009	-0.0006	-0.0150***
	(0.0186)	(0.0192)	(0.0056)	(0.0029)	(0.0052)
FULLTIME	0.0604***	-0.0452**	0.0022	-0.0092***	-0.0083
	(0.0218)	(0.0221)	(0.0065)	(0.0032)	(0.0060)
CONS	0.3703***	-0.2250***	-0.0534**	0.0044	-0.0964***
	(0.0682)	(0.0713)	(0.0210)	(0.0095)	(0.0203)
N	1743	2335	241	106	212
Log likelihood			-4664.85		

NON-AFP SAMPLE

	Still in work	Disability pension	Unemployment	Other
MALE	0.0136	-0.0144	0.0458**	-0.0451
	(0.0383)	(0.0238)	(0.0201)	(0.0291)
EMPINC	0.0006**	-0.0004*	-0.0001	-0.0001
	(0.0003)	(0.0002)	(0.0001)	(0.0002)
DISINC	0.0011	-0.0008	-0.0006	0.0003
	(0.0008)	(0.0005)	(0.0004)	(0.0006)
EXPER	-0.0079***	0.0055***	-0.0008	0.0032
	(0.0027)	(0.0019)	(0.0013)	(0.0021)
UNEMPDAYS	-0.0001	-0.0003*	0.0002***	0.0002*
	(0.0002)	(0.0002)	(0.00001)	(0.0001)
SICKDAYS	-0.0004*	0.0004***	-0.0001	0.0001
	(0.0002)	(0.0001)	(0.0001)	(0.0002)
MARRIED	-0.0777***	0.0476**	0.0230	0.0070
	(0.0290)	(0.0194)	(0.0155)	(0.0218)
FULLTIME	-0.0993***	0.0941***	0.0040	0.0011
	(0.0310)	(0.0209)	(0.0154)	(0.0236)
CONS	0.5366*	-0.2452***	-0.0468	-0.2447***
	(0.0695)	(0.0477)	(0.0332)	(0.0541)
N	1114	240	157	293
Log likelihood		-1772.96		

Notes: * Significant, 10 % level ** Significant, 5 % level *** Significant, 1 % level.
The marginal effects are evaluated at the means of the independent variables.
Controls for industries and regions are not reported, cf. Tables A1 and A2 in the Appendix

now a positive effect of being married to a benefits receiver on the probability of becoming a disability pensioner oneself.

Table 6: Transitions in the AFP sample

	Observed fraction	Without AFP entitlement[1]	Difference	Difference as % of AFP
Still in work	37.6	54.3	-16.7	33.1
AFP	50.4	-	-	-
Disabled	5.2	19.5	-14.3	28.4
Unemployed	2.3	6.5	-4.2	8.3
Other	4.6	19.7	-15.1	30.0

[1] Computed by using coefficients from non-AFP sample on AFP sample

Our main interest is whether the introduction of AFP induced retirement, or just substituted for disability pensions. In part, the question is already answered by the aggregate frequencies reported in table 4, which revealed that the employment rate is much smaller in the entitled group than in the other. Using the estimated models, we can also compute the effect of AFP entitlement on the entitled: The second row in table 6 shows the predicted outcomes of the entitled group in absence of entitlement (i.e., we use the estimates of the non-entitled group on the characteristics of the entitled group). In the third row we find the $\hat{\Delta}$s . The effect on employment is –16.7%, whereas the effect on disability is –14.3%. The fourth row shows the differences as percentages of the AFP fraction: in absence of the scheme, 28.4% of the AFP pensioners would be disability pensioners, whereas 33.1% would be working. Including the unemployment benefits receivers, 36.7% of the AFP-pensioners are recruited from other groups of NIA beneficiaries. In other words, slightly more than one third of the inflow to AFP is substitution for "unofficial" early retirement, whereas the rest consists of workers and individuals who would otherwise have been out of the labor force. Taking into account that some in the last group might have been means tested social assistance receivers, the substitution effect might be adjusted a bit upwards. But it seems fairly safe to conclude that at most 50% of the AFP take-up is due to substitution for other schemes.

In table 7 we perform the same exercise broken down by uncome groups. The substitution between disability pension and AFP is larger for the medium and low income groups, whereas a larger fraction of the high income group would have been working in absence of the AFP-scheme (34.1% as compared to 28.4%).

Table 7: Transition in the AFP sample by income group

	Part-time workers			Low income[1]			Medium income[2]			High income[3]		
	OF	WOT	% of AFP	OF	WOT	% of AFP	OF	WOT	% of AFP	OF	WOT	% of AFP
Still in work	35.0	56.3	41.4	33.5	48.9	28.4	37.2	51.8	28.4	45.1	60.1	34.1
AFP	51.4	-	-	54.3	-	-	51.4	-	-	44.0	-	-
Disabled	6.4	16.1	18.9	6.4	24.6	33.5	5.1	22.1	33.1	2.6	15.7	29.8
Unemployed	2.6	5.3	5.3	2.6	8.6	11.0	2.4	6.7	8.4	1.5	5.6	9.3
Other	4.6	22.3	34.4	3.2	17.9	27.1	3.9	19.4	30.2	6.8	18.7	27.0
N		1267			1104			1187			1097	

OF: Observed fraction   WOT: Without entitlement (Computed by using coefficient from non AFP sample on AFP sample)

[1] Low income: Working full time with income < 185000 kr.

[2] Medium income: Working full time with 185001 kr.< income <240000 kr.

[3] High income: Working full time with income > 240001 kr.

6. Final remarks

Our statistical results convince us that the economic incentives of the AFP early retirement scheme to a large extent drive individuals out of the labor force – as predicted by theory. Low income individuals face stronger incentives towards AFP than high income individuals. Consequently, our finding of an inverse relationship between income and the magnitude of the induced retirement effects strenghtens our case.

In almost all OECD economies including Norway, it is a main policy objective to stimulate labor supply in order to combat negative effects of ageing on growth and social security financing. Clearly, this objective implies, among other things, that economic policies should counteract the observed escalation of early retirement. The main policy message of this paper is therefore to highlight the need for social security reforms which improve the economic incentives to stay longer in the workforce. In effect this means reforms which increase the retirement schemes' marginal degree of actuarial fairness. In this respect, it is interesting to point at pension reforms in economies as different as Chile and Sweden.[12] The public pension schemes in both these economies are characterized by a flexible retirement age in combination with a very close link between marginal contributions and benefits. (Of course, both systems include a fixed minimum pension as a safety net.) In Chile the public supplementary pension is fully actuarial and based on real individual accounts. The new Swedish system is characterized by both a minor funded part based on real individual accounts and a pay-as-you-go financed supplementary pension which is based on a fairly close to actuarial concept with an individually

[12] The pioneering Chilean system is surveyed by Edwards (1996). Kruse (1997) describes the new Swedish system.

simulated pension wealth. In Norway, however, recent pension reforms including the implementation of the AFP scheme as well as considerable increases in the fixed minimum pension contribute to stronger economic incentives towards retirement.

Social security reforms which lead to increases in the marginal degree of actuarial fairness, may alter the initial trade-off between efficiency and redistribution. It may be hard to imagine that such reforms will not redistribute wealth and welfare from poor to rich. Taking the intertemporal budget constraint of the public sector into account, the redistributive effects of these kind of reforms may be slightly more subtle, however. What we have in mind is that social security reforms which increase the degree of marginal actuarial fairness, will stimulate labor supply and consequently increase the economy's tax base. In turn this may reduce the tax burden for all individuals and potentially trigger net gains for all income groups. In order to evaluate whether social security reforms with such nice welfare effects are possible, it seems neccessary to run numerical simulation exercises with an overlapping generations model with different income classes within each generation.[13] This is a natural topic for future research.

[13] A numerical overlapping generations model with such features is presented by Fehr (2000).

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Appendix

Table A1: Multinomial logit results for the sample with AFP entitlement (coefficients with asymptotic standard errors in parentheses)

	AFP	Disability pension	Unemployment	Other
MALE	0.2585**	0.7145***	0.2783	-0.1921
	(0.1082)	(0.2422)	(0.3688)	(0.2644)
EMPINC	-0.0047***	-0.0031	0.0009	-0.0032
	(0.0012)	(0.0029)	(0.0028)	(0.0020)
AFPINC	0.0207*	-0.0127	-0.0678**	-0.0035
	(0.0126)	(0.0250)	(0.0269)	(0.0258)
DISINC	-0.0282**	-0.0043	0.0492*	0.0282
	(0.0124)	(0.0242)	(0.0266)	(0.0256)
EXPER	0.1052***	0.0808***	0.0451	0.0198
	(0.0118)	(0.0243)	(0.0356)	(0.0277)
UNEMPDAYS	0.0013**	0.0011	0.0056***	0.0015
	(0.0007)	(0.0012)	(0.0008)	(0.0013)
SICKDAYS	0.0020***	0.0061***	0.0016	0.0014
	(0.0007)	(0.0010)	(0.0020)	(0.0015)
MARRIED	0.4578***	0.2177	0.1919	-0.2470
	(0.0817)	(0.1741)	(0.2582)	(0.1801)
FULLTIME	-0.2393***	-0.0888	-0.9668***	-0.4222**
	(0.0951)	(0.2037)	(0.2888)	(0.2106)
GOVSEC	0.1543	-2.3765***	-0.7705	-2.5127***
	(0.1527)	(0.5131)	(0.5741)	(0.4461)
MUNISECT	-0.1649	0.0647	-1.0682**	0.1554
	(0.1513)	(0.3251)	(0.5207)	(0.3298)
AGRIC	-0.8049***	-0.7246	-1.8196*	-0.2988
	(0.3001)	(0.6403)	(1.0551)	(0.7660)
PETRO	-0.2498	-0.6339	0.2455	1.8499***
	(0.3929)	(1.0573)	(0.7095)	(0.4685)
FINANCE	-0.4828***	-0.0938	-1.3908*	-0.6940
	(0.2347)	(0.5044)	(0.7782)	(0.6285)
CONSTR	0.4905***	-0.0343	0.6360	0.2649
	(0.1919)	(0.4668)	(0.3982)	(0.4256)
RETAIL	-0.4353***	-0.0005	-1.2865***	0.4861*
	(0.1275)	(0.2563)	(0.3570)	(0.2729)
TRANSP	-0.3643**	-0.2339	-1.7602***	0.6636*
	(0.1590)	(0.3753)	(0.6716)	(0.3610)
PUBLSERV	-0.3665***	0.2720	-1.3539***	0.7920***
	(0.1275)	(0.2880)	(0.4729)	(0.2988)
REG2	0.1916**	0.0292	0.3910	-0.1135
	(0.0914)	(0.2174)	(0.2945)	(0.2001)
REG3	0.2999***	0.3137	0.2253	-0.4259**
	(0.0846)	(0.1965)	(0.2814)	(0.1942)
REG4	0.1450	0.6819***	0.1931	-0.5743**
	(0.1139)	(0.2293)	(0.4049)	(0.2771)
CONS	-1.3693***	-2.5070***	-0.5573	-4.1094***
	(0.2995)	(0.6351)	(0.8655)	(0.6706)
N	2335	241	106	293
Log likelihood		-4664.85		

Notes: * Significant, 10 % level ** Significant, 5 % level *** Significant, 1 % level.

Table A2: Multinomial logit results for the sample without AFP entitlement (coefficients with asymptotic standard errors in parentheses)

	Disability pension	Unemployment	Other
MALE	-0.1450	0.6245**	-0.3163
	(0.2411)	(0.3117)	(0.2330)
EMPINC	-0.0042**	-0.0025	-0.0013
	(0.0021)	(0.0021)	(0.0014)
DISINC	-0.0084	-0.0107*	0.0000
	(0.0053)	(0.0061)	(0.0046)
EXPER	0.0593***	0.0011	0.0329**
	(0.0189)	(0.0198)	(0.0166)
UNEMPDAYS	-0.0021	0.0031***	0.0012
	(0.0016)	(0.0006)	(0.0008)
SICKDAYS	0.0045***	-0.0003	0.0010
	(0.0012)	(0.0021)	(0.0014)
MARRIED	0.5299***	0.4419*	0.1635
	(0.1960)	(0.2381)	(0.1732)
FULLTIME	0.9653***	0.2067	0.1576
	(0.2159)	(0.2362)	(0.1872)
AGRIC	0.0810	-1.0962*	0.1806
	(0.4042)	(0.5806)	(0.4252)
PETRO	-0.0465	0.6787	0.5705
	(1.1082)	(0.8509)	(0.8379)
FINANCE	-0.2470	-0.2143	-0.3873
	(0.3290)	(0.3382)	(0.3356)
CONSTR	0.1809	-0.2274	0.2791
	(0.3883)	(0.4495)	(0.4043)
RETAIL	-0.5837**	-0.0825	-0.3776
	(0.2628)	(0.2544)	(0.2655)
TRANSP	0.0734	-0.5534	1.4884***
	(0.3374)	(0.4175)	(0.2771)
PUBLSERV	0.7639***	-1.3198***	0.9436***
	(0.2521)	(0.3837)	(0.2569)
REG2	0.5692***	0.4513*	0.1094
	(0.2039)	(0.2447)	(0.1976)
REG3	0.2516	0.2629	0.1436
	(0.1862)	(0.2150)	(0.1640)
REG4	0.8241***	0.5874*	-0.1459
	(0.2783)	(0.3462)	(0.3051)
CONS	-2.9351***	-1.4707***	-2.4159***
	(0.4888)	(0.5084)	(0.4380)
N	241	106	293
Log likelihood		-1772.96	

Notes: * Significant, 10 % level ** Significant, 5 % level *** Significant, 1 % level.