INCENTIVES TO RETIRE IMPOSED BY OLD-AGE PENSION POLICY IN ESTONIA

Mikk Medijainen[1]
University of Tartu, Statistics Estonia

Abstract

The paper analyses the incentives that Estonian state pension scheme imposes on retirement incentives. The specific focus is on actuarial neutrality and benefit equivalence of adjustments for early and late reitrement.The benefit adjustments for early and deferred retirement set in current legislation are established as not actuarially neutral and they do not assure benefit equivalence. They impose an incentive to postpone retirement for too long – assuming rational behaviour the effective retirement ages should be way above statutory retirement age if current legislation is not amended. Assuming a real discount rate of 3%, the rational effective retirement ages would lie at 70 in 2016 and 72 in 2026. Not legislating benefit adjustments that assure benefit equivalence could bring along adverse effects, such as higher than expected replacement rates and thereby higher than expected overall costs.

Keywords: incentive to retire, actuarial neutrality, benefit equivalence

JEL Classification: H31, H55, J14, J26

1. Introduction

The fiscal soundness of many pension systems in developed countries is put under stress due to aging populations. Population aging is driven by two main factors – decreasing fertility and increasing longevity. While the first one mostly affects the financing side of traditional (or pay-as-you-go) pension schemes, the second is the driver of costs in pension systems. This is further aggravated by a trend towards leaving the labour force earlier. The fraction of people still employed at ages 60-64 has dropped significantly in past 50 years (Gruber and Wise 2006: 43-44).

Although there clearly are many reasons why people retire earlier, one must always consider the incentives that the pension system itself imposes[2]. Pension system as a part of general social insurance system of a country explicitly defines the conditions at which it is possible to exit labour market at any given age. Therefore it is a very

---

[1] The author of the paper is grateful to the Estonian Science Foundation (research grant No 7756) and for the Estonian Ministry of Education and Science (grant No SF0180037s08). Author would also like to thank Tiiu Paas, Andres Võrk and Lauri Leppik for insightful comments. Any remaining errors or omissions are that of the authors.

[2]Reasons for early retirement other than stemming from the social insurance system itself are mostly individual (meaning that they average out over the whole population) – health, occupation, structure of family, overall wealth etc.

important influencing factor of labour market behaviour of the elderly. Many empirical studies show that the social security system might be the main driver behind the decline in the effective retirement age (Gruber and Wise 2006: 1-2, Palme and Svensson 2003:2-3, Brugiavini and Peracchi 2005:2, Walraet and Mahieu 2002: 7-8).

Besides the statutory retirement age, there are some other factors to consider while assessing the incentives that pension systems impose on people. One of them is the possibility of early pensions. The age, at which one can first become entitled to an old-age pension – the early retirement age – is typically considered to be substantially more important than the statutory retirement age (Gruber and Wise 2006: 5)

Many pension offer replacement rates for early retirees that are very close to the ones received at normal retirement age. For that reason there is a strong incentive to stop working after early retirement age – by this, the social security systems impose an implicit tax on working. In most EU countries for example, the average effective age of retirement (the age at which individuals really retire) is significantly lower than the statutory retirement age (Eurostat 2007: 3). For example, while the statutory retirement age in 2005 lies between 60 and 65 years for women and 62 and 65 years for men in EU, the median effective retirement age at the same year is 59,4 for women and 60,7 for men (*Ibid*: 2). The implicit tax on working after the early retirement age is often very significant – in many cases amounting to 50-80 per cent of income (Blöndal and Scarpetta 1999:88). The fall in effective retirement age is therefore not a fundamental change in labour-leisure preferences, but should rather be attributed to rational individuals maximising their pension wealth.

Therefore, one could find a way to relieve the fiscal strain put on several social insurance systems by increasing labour supply among older workers. To do that, pension system in compliance with the whole social insurance systems, must provide better financial incentives to continue working. Simply changing the statutory retirement age might not be an effective tool to achieve these goals if there are no similar changes in replacement rates. A more effective way is to decrease the pension benefit for early retirement and increase it for deferred retirement.

The size of these decrements or increments of benefits is naturally dependent on other features of the old-age pension system (the statutory and early retirement age, benefit formula, indexation of pensions etc), the long term goals of the pension system and projected changes in population (especially mortality). Stemming from the importance of mortality, when discussing the most important features of an old-age pension system and incentives that it provides, often actuarial concepts are used, mainly in reference to actuarial neutrality and benefit equality.

The aim of this study is to elaborate proposals for development of the state-funded old-age pension scheme in Estonia. The specific focus of the study lies on the adjustments of pension benefits in relation to early and deferred retirement and the incentive to retire these adjustments impose on individuals.

The paper consists of four main parts. In the next part of the paper the relevant factors related to the benefit adjustments – actuarial neutrality and benefit equality – are introduced and the relevant problems discussed.

In the third section, the theoretical benefit adjustments to achieve actuarial neutrality and benefit equality for Estonia are calculated. Comparing the theoretically correct benefit adjustments to benefit adjustments stated in the current legislation yields possible incentives for workers to stay on the labour market or to move to inactivity that current legislation imposes. For that reason a measure of incentive to retire is elaborated. Also the effects of ongoing reforms on statutory retirement age are viewed. Section 4 concludes.

2. Actuarial neutrality and benefit equivalence in a defined-benefit pension scheme

2.1 Considerations regarding the definition of actuarial neutrality

Actuarial neutrality is often a confusing term, while two different concepts can be entitled this way. Desmet and Jousten (2003: 3-4) distinguish between actuarial neutrality *on the average* and actuarial neutrality *on the margin.* Actuarial neutrality on the average is achieved when the (present) value of pension benefits received during retirement is equal to the (present) value of contributions paid during the working life. It is very often also used as a definition of *actuarial fairness,* while the latter is realised as actuarial neutrality in later studies. However, Oksanen (2005: 5-8) uses actuarial neutrality in the first sense, requiring the present value of pension contributions to equal the present value of pension entitlements of the households. In this paper we follow the definition of marginal actuarial neutrality.

Actuarial neutrality, as defined here, requires that pension wealth for retiring a year later is the same as pension wealth when retiring today plus whatever pension is accrued during the additional year of work. Actuarial neutrality therefore relates to the pension already accrued at the beginning of the year and not to the extra pension earned during the year. (Queisser and Whitehouse 2006: 13). Therefore the actuarial neutrality concept is not the best indicator of the incentives to retire that are imposed by the pension system in the case when acquiring new pension rights is possible while deferring retirement. However, for the majority of modern pension systems it is impossible to compile a measure that would also take into account the new contributions (*Ibid*: 14). Therefore actuarial neutrality is the best indicator for broad cross-country comparison. Other concepts are either based on actuarial neutrality or closely related to it. Therefore it is useful to first calculate the benefit adjustments that ensure actuarial neutrality and then move to other indicators.

Formally, actuarial neutrality of pension benefit adjustments is defined as follows (*Ibid*: 16):

$$PW_{t|t+1} = PW_{t|t} + \delta \qquad (1)$$

where $PW_{x|y}$ is pension wealth measured at time x, conditional on retiring at time y.

This means that the pension wealth that has already accrued by time t remains the same if retiring is deferred. Pension wealth at any time t can be calculated by multiplying the pension entitlement p_t with the annuity factor A_t :

$$PW_{t|t} = p_t A_t \tag{2}$$

The annuity factor represents the present expected value of the sum of future pension receipts. Present expected value of future pension flows are calculated by increasing the present benefit due to indexing of pensions, discounting the benefit to present value and multiplying the benefit by the probability of the recipient living to receive pension in the future. Therefore the annuity factor is the sum of present values of future pension flows:

$$A_t = \sum_{i=t}^{T} s_i \left(\frac{1+u}{1+z}\right)^{(i-t)} = \sum_{i=t}^{T} PVPF_i \tag{3}$$

where s_i is the survival function of a representative individual, i.e. the probability of this individual being alive at time i, conditional of being alive at the time the annuity is calculated (t), u is the growth rate of pensions and z is the discount rate in real terms. T is the maximum life span which is taken to equal 100 in this study.

Duggan and Soares (2002: 2-3) use the same definition[3] and point out possible undesirable effects of a pension scheme that is not actuarially neutral. Schemes that are not actuarially neutral alter the retirement incentives and therefore might distort benefit acceptance definitions. These distortions may have effects on several levels stated as follows (*Ibid*: 3-4).

- First, any policy decision taken that affect retirement behaviour also affects long-run costs of old-age pension systems. This would not be the case if the system was actuarially neutral.
- Secondly, pension systems that are not actuarially neutral create a distortion at the labour market – they create an incentive to retire at a time that is different from optimal time of retirement stemming from the preferences of the individual.
- Third, adjustments to benefits that are not actuarially neutral create some redistribution of benefits that might not be intended.

Actuarial neutrality at the margin is always a question of which subgroups are considered (as are various other indicators based on this concept, i.e. benefit equality). A pension system that is actuarially neutral *over the whole population* is most likely not actuarially neutral for different sub-groups with different mortality assumptions, i.e. by gender, income, occupation, time of birth etc. Therefore the question of actuarial neutrality depends on the interests of the desired group. For example if the financial sustainability of the whole old-age pensions system is considered, the reference group is the whole population (or at least part of the population that is covered by state pension insurance[4]).

---

[3] However, in their paper the concept is entitled as „actuarial equivalence“

[4] In Estonia for example, almost 100% of population is covered with the state pension insurance

But one can also address this issue from the viewpoint of equality between genders (as men and women have different mortality rates, especially at older ages), generations (as different birth cohorts tend to have different mortality rates in the lights of increasing longevity) or general income inequality (as individuals with higher income tend to also have higher life expectancy).

The most important limitations to different angles of analysis are available data sources. Most population projections offer mortality data for men and women separately. Therefore it is possible to conduct gender-specific analysis of actuarial neutrality. Cohort specific analysis is also possible, considering that different mortality assumptions are used for different birth cohorts in population projections.

2.2 Calculation of actuarially neutral adjustments to benefits

In defined benefit schemes as i.e. pay-as-you-go scheme, actuarial neutrality is an important issue only when penalties for early retirement and compensation for late retirement is considered. In order for the system to be actuarially neutral, the increments of pension benefits for retiring a year later have to compensate for three components of revenue loss (Disney and Whitehouse 1999: 25):

1) First, the effect from the annuity factor that captures the loss in total pension due to shifting pension payments one year to the future, decreasing the life expectancy at the moment of receiving the pension.
2) Secondly, the compensation for the risk of dying during the year for which the retirement is deferred
3) Third, the discounting of the pension wealth back to the moment of decision.

Formally, the calculation of actuarially neutral compensation rate is calculated as follows (Queisser, Whitehouse 2006: 26)[5]:

$$\alpha = \frac{A_t}{A_{t+1}} \frac{PVPF_t}{PVPF_{t+1}} - 1 \qquad (4)$$

where A_t and $PVPF_t$ are the annuity factor and the present value of future pension flows respectively as stated in equation (3).

Here, the first requirement made by Disney and Whitehouse (1999: 25) is respected in the first member of the equation on the left hand side (the quotient of annuity factors) and the other two in the second member (the quotient of present value of pension flows).

[5] For a detailed derivation of this formula, see Box 6 and additional explanations on page 25-26 in Queisser and Whitehouse (2006: 25-26)

2.3 A step further – benefit equivalence

As stated earlier in this paper, actuarial neutrality of benefit adjustments is not the only factor influencing the incentive that an old-age pension system gives on time of retirement. Often contemporary old-age pension systems are built in a way that career-long contributions are taken account for in the calculation of pension benefits (rather than requiring a fixed minimum contribution period, for instance 40 years). In this kind of systems, by deferring retirement by one year, an individual is not only receiving pension entitlements already accrued (may they be adjusted in an actuarially neutral way or not), but is also earning new pension rights.

Therefore, when it is possible to earn additional pension entitlements by working longer, deferring retirement might still be meaningful, even if the increments in existing entitlements due to deferring retirement are not actuarially neutral. This has turned the attention from actuarial neutrality of benefit adjustments to adjustments that guarantee benefit equivalence.

Benefit equivalence is ensured if the pension wealth (the present value of pension entitlements) does not change regardless of when people retire. The adjustments for early and late retirement that ensure benefit equivalence keep the pension wealth constant even when new pension entitlements are earned during the year. Lifetime benefits are constant regardless of when workers retire. (Queisser, Whitehouse 2006: 36)

To derive a formal notation of the rate of benefit adjustment to reach benefit equivalence, one has to consider the change of entitlements due to accrual of new pension rights. Therefore, the change in pension entitlements from year to another becomes:

$$p_{t+1} = p_t(1+\beta)(1+\pi) \qquad (5)$$

where π is the additional pension accrued during the year and β is the benefit adjustment that ensures benefit equivalence.

Using this notation in equation (4), the benefit adjustment to reach benefit equivalence becomes:

$$\beta = \frac{A_t}{(1+\pi)A_{t+1}}\frac{PVPF_t}{PVPF_{t+1}} - 1 = \frac{(1+\alpha)}{(1+\pi)} - 1 \qquad (6)$$

where α is the actuarially neutral rate of compensation defined in equation (4).

Note that this is the case only when additional pension accrued (π) is constant in real terms. In case of variable π, equation 6 becomes more complex[6].

[6] See authors modifications in order to use variable growth rate on page 9 (equations (7) and (8)). The logic for applying the variable accrual rate is similar.

The adjustments to benefits for deferring retirement that are required to guarantee benefit equivalence equal those that are actuarially neutral in case earning additional pension rights is impossible (π equals 0). Any other arrangements of entitlement accumulation lead to smaller adjustments in case of benefit equivalence than actuarial neutrality. Therefore the benefit equivalence can be viewed as a more general term. It is also more useful indicator analytically. First, it sets the lifetime benefit expenditure per person to be same, regardless when they leave the labour market (Queisser and Whitehouse 2006: 36-37). This is a very important feature when considering the long-term costs of the pension scheme. Secondly, it is rather rational to believe that retirement decisions on an individual level are based on the absolute pension wealth, not only the pension wealth already accrued till the time of the decision.

3. Analysis of the incentive to retire in Estonian state old-age pension system

3.1 Current legislation and stylised facts

The Estonian state-managed old-age pension scheme is a defined benefit (DB) type pay-as-you-go scheme. It is financed by social contributions paid by employers (which constitute 20% of gross salary for those not contributing to the privately managed 2nd pillar and 16% for those who are contributing to 2nd pillar.

The statutory retirement age for men is 63. For women, the statutory retirement age is gradually rising to be equal to men by 2016. In 2010, women were able to retire in the age of 61. Starting from 2017, the statutory pension age will gradually rise to 65 by 2026 for both men and women.

Earlier retirement is possible within the old-age pension system. For every month of earlier retirement, the pension benefit is reduced by 0.4% (4.8% *per annum*). The maximum possible early retirement is 3 years prior to the normal pension age. Thus retiring at a youngest age possible (i.e. in the age of 58 for women and 60 for men in 2010) would result in the pension benefit being 14.4% (36 times 0.4%) smaller than it would be at normal retirement age. For every month that retirement is deferred, the pension benefit is increased by 0.9% (10.8% *per annum*). There is no upper limit set to postponing the retirement. The OECD average decrement of pension benefits for early retirement in 2006 stood at 5.08% *per annum* and the average increment for deferred retirement stood at 6.19% *per annum* (Queisser and Whitehouse 2006: 28-30).

The option of early retirement and deferred retirement came into force in 2001. Early retirement is slowly becoming more popular, with about 6 per cent (or 17000) of all old-age pensioners receiving their pension under the terms of early retirement in 2010. However, this is still far less than in some old EU member states where the proportion of early retirees is often near half of all retirees or even higher (Kühntopf and Tivig 2008: 3). A legal obligation to quit working while receiving early pension is one of most probable explanations for this.

The deferred pension is received only by a marginal number of retirees with only some 636 old-age pensioners receiving their pension under the terms of deferred retirement in 2009 (Sotsiaalkindlustusameti… 2011). However, this figure can be misleading while it does not cover the individuals who are currently deferring retirement – who have already reached the statutory retirement age but have not yet drawn pension. Nevertheless, the figure has shown an extremely modest increase over 2007-2010, which implies that deferring retirement is not a very popular choice in Estonia.

The average effective age of withdrawal from the labour market for Estonia lies slightly above the statutory pension age. In 2008, the average age of withdrawal from the labour market was 62.1 years in Estonia (Country profiles of Joint Pension Report 2010: 35). Since pension can be drawn in combination with salary in Estonia, the age of withdrawal from the labour force is generally higher than the age when the pension is first drawn. This fact also contributes to the relatively high participation rates among older workers in Estonia. In 2009, the employment rate among the age group 55-64 was 60.4% in Estonia, while the EU average stood at 46% (*Ibid:* 35).

3.2 Data and methodology

Since it is interesting to know the effects of ongoing reforms of the statutory retirement age (in addition to the situation at the present moment), it is important to calculate the actuarially neutral rates of compensation for at least 3 points in time.

Therefore we have calculated the actuarially neutral compensation rates for deferring retirement separately for men and women for 2011, 2016 (when both men and women have a statutory retirement age of 63) and 2026 (when the planned rise in statutory retirement age to 65 has been fully implemented). In doing this, besides changes in legislation also changes in mortality had to be taken account of. The mortality assumptions used in this study are based on the Europop 2008 main[7] scenario for Estonia.

In addition to that, we have used variable real income growth rate projections (as proposed by The Ageing Report of European Commission and Ageing Working Group) instead of a constant growth rate suggested by Queisser and Whitehouse (see equation (3)). Therefore, the calculation of annuity factors in this paper is conducted according to:

$$A = \sum_{i=R}^{T} s_i \frac{g_i}{(1+z)^i} \qquad (7)$$

where $$g_i = \prod_{i=R}^{i} (1+u_i) \qquad (8)$$

[7] This is the convergence scenario that foresees a convergence in EU demographic indicators by 2150. The scenario also takes into consideration the effects of migration. However these are very minor for Estonia, especially in the older age groups which are relevant for this study.

This allows taking account of growth convergence in the EU in the long run and the effects of the transient economic downturn on the wages in the short run, thus allowing staying as close as possible to the most likely course of events. In the short run (2011-2014) the growth rate from the Ministry of Finance latest (Rahandusministeeriumi 2010: 35-37) forecast is used. For 2015-2060, the variable growth rate projections from the Ageing Report (2008: 104-109) are used. In the base scenario a 3% real discount rate[8] is used and sensitivity analysis is conducted using a range of discount rates from 1 to 5 per cent.

3.3 Results and discussion

In 2011 the statutory pension age for women is 61 years and the youngest women eligible for early retirement are 58 years old. For men, the statutory and the early retirement age are 63 and 60 years respectively. The **actuarially neutral** adjustment factors for relevant age cohorts in 2011 (individuals born in 1943-1953) are presented in table 1.

A woman at the age of 61 deferring the pension by one year (until 2012, when she is 62) would have the same pension wealth as retiring immediately, if the pension was increased by 8.8 per cent. A man at the same age would require a more substantial increase – his pension should rise by 12.3 per cent in order to keep the pension wealth the same regardless on which of the two years he retires.

Table 1. Actuarially neutral benefit adjustment factors by age and sex in 2011,%

age	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**
women	8.1	8.3	8.5	8.8	9.0	9.3	9.7	10.0	10.4	10.8	11.2
men	na	na	11.9	12.3	12.8	13.3	13.8	14.4	15.1	15.8	16.5

Source: Authors' calculations.

A woman at the age of 61 deferring the pension by one year (until 2012, when she is 62) would have the same pension wealth as retiring immediately, if the pension was increased by 8.8 per cent. A man at the same age would require a more substantial increase – his pension should rise by 12.3 per cent in order to keep the pension wealth the same regardless on which of the two years he retires.

As can be seen from the table, the actuarially neutral benefit adjustment is not constant – it varies with gender (while statistically the mortality of men at older ages substantially exceeds the mortality of women) and tends to grow exponentially with age (while the mortality rates rise at older ages). This implies that in any case the constant benefit adjustment as stated in current legislation must not be actuarially neutral for at least some age groups.

[8] A 3 per cent real interest rate roughly corresponds to long term average government bond rates.

In order to evaluate the possible effect of assumptions, a sensitivity analysis of the benefit adjustment rates was conducted.

Table 2. Sensitivity of theoretical benefit adjustments at age 63 to discount rate, %

discount rate	**1%**	**2%**	**3%**	**4%**	**5%**
women	5.9	7.6	**9.3**	11.1	12.9
men	9.6	11.4	**13.3**	15.2	17.1

Source: Authors' calculations.

As expected, the more one discounts the future (the less one values money to be received later compared to money received today), the more he or she has to be compensated to not take the benefit today but a year later.

Table 3. Sensitivity of benefit adjustments at age 63 to pension indexation, %

indexation	**100:0**	**80:20**	**50:50**	**0:100**
women	8.89	**9.33**	10.02	11.21
men	12.78	**13.26**	14.00	15.25

Source: Authors' calculations.

Here the colums refer to different indexation formula compositions. The first one comprises a situation where pensions are fully indexed to growth in average wage income, the last one a situation where pensions are indexed only to consumer price index. The column for 80:20 indexing refers to current legislation.

An important issue in the development of actuarially neutral benefit adjustment rates is the role of reforms of the pension system. In Estonia there is an ongoing reform designed to raise the statutory pension age for women to equal that of the men (63) by 2016. Since the availability age of early retirement is defined as being 3 years lower than the statutory retirement age, this will also change and equal 60 years for both men and women in 2016. This will raise the actuarially neutral rates of benefit adjustment. On the other hand, the mortality rates for the cohorts retiring at 2016 will be lower than those retiring at 2011, which will lower the rates of benefit adjustment.

The effect of increased longevity seems to be somewhat stronger than the effects of pension reforms – the actuarially neutral benefit adjustment rates for average women at age of 60 in 2016 are substantially lower than for women at the age of 58 in 2011. This is also the case for all subsequent ages. Note that for men, the statutory pension age is not reformed between 2011 and 2016, meaning that the fall in their actuarially neutral benefit adjustment rates can be fully attributed to predicted decrease in mortality after the age of 60.

Table 4. Actuarially neutral benefit adjustment factors by age and sex in 2016, %

age	60	61	62	63	64	65	66	67	68	69	70
women	6.4	6.6	6.8	7.1	7.4	7.6	8.0	8.4	8.7	9.2	9.8
men	9.3	9.7	10.1	10.5	11.0	11.5	12.1	12.7	13.4	14.2	15.0
total	7.5	7.8	8.1	8.4	8.7	9.1	9.5	9.9	10.4	10.9	11.6

Source: Authors' calculations.

The statutory retirement age will be further raised to 65 for both men and women by 2026. During 2016-2026 the mortality of both men and women at older ages will fall further, with men benefiting more. This will contribute to lower benefit adjustment rates at both the statutory and early retirement age, in spite of the rise in retirement age by 2 years.

Table 5. Actuarially neutral benefit adjustment factors by age and sex in 2026, %

age	62	63	64	65	66	67	68	69	70	71	72
women	6.0	6.2	6.4	6.7	7.0	7.3	7.6	8.0	8.4	8.9	9.5
men	8.5	8.9	9.3	9.7	10.2	10.7	11.3	11.9	12.7	13.4	14.3
total	7.1	7.3	7.6	7.9	8.2	8.6	9.0	9.4	10.0	10.5	11.2

Source: Authors' calculations.

In case of Estonia the standard definition of actuarial neutrality is less important, for there is an opportunity to earn additional pension entitlements while working even at relatively high age. This is induced by the fact that lifelong earnings are the basis of the calculation of pension benefits. Therefore it is important to measure the incentive that the old-age pension system imposes on retirement decisions by using another term that is very closely related to actuarial neutrality – **benefit equivalence** (see verbal and formal definition at page 6-7, equation (6)). In this study, a variable pension wealth accrual factor (π) was used. The π value depended on age group and gender. The reason for a variable accrual factor was the fact that older workers tend to earn lower wages than the whole population on the average. In addition to that, gender specific accrual factor is used due to the fact that although the average wage for women is lower than for men, it shows a smaller drop in older age groups than the wage income for men. The age specific wage coefficients that the calculation of accrual factor is based on are shown in Appendix 1.

The benefit adjustments that lead to benefit equivalence were calculated separately for men and women and also for different stages of the reform – the current (2011) situation, 2016 when the statutory retirement age for men and women equalises at 63 and 2026 when the rise of the statutory retirement age to 65 has finished.

Table 6. Benefit adjustment factors that lead to benefit equivalence by age and sex in various stages of the pension reform, %

age	2011		2016		2026	
	women	men	women	men	women	Men
58	6.5	-	-	-	-	-
59	6.7	-	-	-	-	-
60	7.0	10.5	4.9	7.9	-	-
61	7.3	10.8	5.2	8.2	-	-
62	7.6	11.3	5.5	8.6	4.7	7.1
63	8.0	11.9	5.7	9.2	4.9	7.6
64	8.3	12.5	6.0	9.7	5.1	8.0
65	8.8	13.1	6.4	10.2	5.5	8.5
66	9.3	13.8	6.9	10.9	5.9	9.0
67	9.7	14.6	7.3	11.6	6.3	9.7
68	10.2	15.4	7.8	12.3	6.7	10.3
69	10.9	16.4	8.4	13.2	7.1	11.0
70	11.5	17.4	9.0	14.2	7.7	11.8
71	12.3	18.5	9.7	15.1	8.3	12.6
72	13.1	19.7	10.3	16.2	8.8	13.6
73	14.0	21.0	11.1	17.4	9.5	14.6
74	15.0	22.5	12.0	18.6	10.2	15.6
75	16.2	24.2	13.0	20.2	11.1	17.0

Source: Authors' calculations.

As expected in the case of positive π value, all benefit adjustments leading to benefit equivalence are somewhat smaller than actuarially neutral adjustments. The effect that the decreasing mortality among older age groups has on benefit adjustment rates is clearly evident – benefit adjustments that lead to benefit equivalence are substantially lower in 2026 compared to similar age cohorts at 2011.

The effect is more significant for men (since the expected decrease in mortality of men is greater). For example, a 65 old woman in 2011 would expect her lifetime pension to be raised 8.8 per cent if she postponed retiring by one year. In 2026 this adjustment for a woman in the same age would only have to be 5.5 per cent, constituting a fall in benefit adjustment rates of 3.3 percentage points. The same figures for a man of the same age group would be 13.1 and 8.5 respectively, constituting a fall of 4.6 percentage points.

Moreover, the fall in adjustment rates is not entirely offset by the reforms in statutory retirement age. Both for men and women, the benefit adjustment rates at statutory pension age in 2026 (being 5.5 and 8.5 per cent for women and men at the age of 65 respectively) are lower than in 2011 (7.3 for women at their statutory pension age of 61 and 11.9 for men at the age of 63). This implies that in case the benefit adjustment rate stated in the current legislation is not changed, the incentive to continue working at older age will grow more than the simple rise in the statutory retirement age suggests.

Therefore, any study that expects the effective retirement age to rise exactly in line with statutory retirement age is bound to underestimate the behavioural incentives that benefit adjustment rates higher than needed for benefit equivalence impose. The expected replacement rates and overall pension system costs would also be underestimated in this case.

Next, to try to quantify the effects of deviations from the benefit equivalence of the current legislation an **index of incentive to retire (*ITC*)** was formulated. This measure represents the ratio of adjustments that lead to benefit equivalence to the ratio of adjustments stated in current legislation and is calculated according to the following:

$$ITC_t = \frac{\beta_t}{\omega_t} - 1 \qquad (12)$$

where ω_t is the annual benefit adjustment as it is stated in the current legislation, i.e. 4.8% for early retirement and 10.8% for late retirement.

In case of benefit adjustments that lead to benefit equivalence, *ITC* should be zero at all time. A positive value denotes an increased incentive to retire, a negative value denotes that staying on the labour market increases the expected future wealth of the individual. The ITC for different age groups of the total population are presented on figure 1[9]

During the 3 years prior to the statutory retirement age, there is a large discrepancy between the legally set decrease in benefits for early retirement (4.8% annually) and the adjustment that would bring along the benefit equivalence[10]. This results in a rather high ITC at the ages where early retirement is possible. However, as seen from statistics of early retirement, there are relatively few estonians compared to other OECD countries, who have chosen to retire early.

[9] Note that the figure of 2011 is missing on this figure, while the statutory retirement age is different for men and women at 2011, which makes the presentation of a total impossible. See Annex 2 for a separate presentation of incentive to retire for men and women.
[10] Kühntopf and Tivig (2008: 13-15) argue that since the mortality is rates of the individuals retiring earlier seem to be higher, the benefit adjustments should also reflect that. Assuming this, the decrements for early retirement should be even larger to compensate for the higher mortality of the early retirees compared to those who choose to work longer.

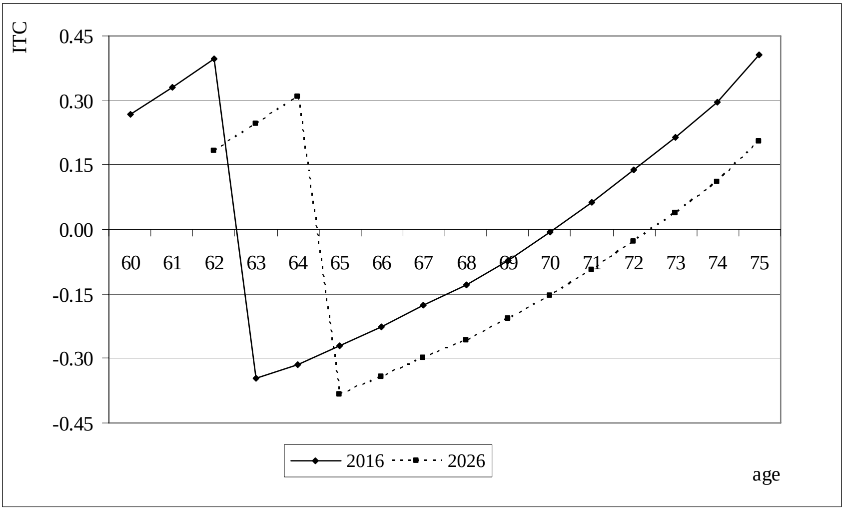


Figure 1. ITC of total population for different ages in 2016 and 2026.

There are three possible drivers behind the low rates of early retirement in Estonia. First, there is a restriction that early retirement can be claimed only when the individual is not employed, while after reaching the statutory retirement age, one can draw a pension and work at the same time. This means that an individual still at the labour market would have to give up working in order to receive an early pension. This provides an incentive to not retire early for workers, that by far compensates for effects of benefit inequivalence. Secondly, the replacement rates that the state pay-as-you-go system offers, are rather low, being the lowest in EU in 2008 (Joint Report...2010: 35). Further lowering ones expected pension income by retiring early would very often mean accepting a retirement spent below poverty line (*Ibid*: 35-36). Thus one would imagine decisions being made based on an absolute rather marginal income change at this perspective. Third, the ITC only measures the true incentive to retire at any given moment in time, conditional that at all other moments the benefit equivalence is granted. This is not the case for Estonia, while there is a strong incentive to postpone retirement after the statutory retirement age.

The first claim seems to be confirmed by an earlier empirical study of early retirement in Estonia.Uudeküll and Võrk (2004: 7) have found that the large majority of applicants of early pension have not had any work related income 14 month prior to retirement.

Therefore, the rather small decrements of benefits for early retirement seem to serve another purpose than assuring benefit equivalence – they provide a smaller reduction for the low-income or discouraged workers, thus reducing the number of elderly living in poverty. The social role of a smaller than actuarially neutral benefit reductions for early retirement increase the costs of early pensions (compared to the situation when benefit equivalence is respected). However, at the same time it lowers the costs of other social insurance and social protection programs by reducing the number of elderly claiming disability pension (Börsch-Supan *et al* 2003: 13-14, Uudeküll and Võrk 2004: 6 for Estonia), unemployment benefit (Uudeküll and Võrk 2004: 6) or subsistence allowance. The benefit non-equivalence of decrements of pension benefits for early retirement can be accepted as a social agreement and not be a very important cost driver due to other aforementioned constraints and externalities.

However, this is not the case for non-equivelance of increase of benefits for deferred retirement. As can be seen from figure 1, there is an incentive for an average individual past the statutory retirement age to postpone retirement to the age of 70 in 2016 and 72 in 2026[11]. Assuming rational behaviour, the rise in the age of drawing the pension should exceed the rise in statutory pension due to behavioural effects. This would result in higher replacement rates for future retirees, but also in higher overall costs of the old-age pension system.

The possible effects are opposite to those that are haunting the old-age pension systems of developed countries – individuals would stay on the labour market for too long time because they are compensated too generously for working longer. This can be seen as a favourable solution to a problem of tight labour market[12], but it also constitutes a welfare loss due to distorted labour-leisure choices. Therefore the choice of any benefit adjustment rate different from those ensuring benefit equivalence should bring along welfare gains in other parts of the society.

4. Conclusion

The aim of this study was to elaborate proposals for development of the state-funded old-age pension scheme in Estonia with the specific focus on the adjustments of pension benefits in relation to early and deferred retirement and the incentive to retire these adjustments impose on individuals. The adjustments for early and deferred old-age pension were analysed from the point of view of actuarial neutrality and benefit equivalence. Thereafter a quantitative measure of discrepancy between the benefit adjustments that theoretically ensure benefit equivalence and adjustments purported in the current law is elaborated. This measure captures the incentives that the benefit adjustments impose on the retirement behaviour. All the mentioned calculations were conducted for 3 different time frames – in addition to current (2011) situation, the two other important dates (2016 when the statutory retirement age of women has been raised to 63 to equal that of the men and 2026 when the statutory retirement age for both men and women will have risen to 65) for ongoing reforms in old-age pension system were taken into account.

---

[11] There is heterogeneity across gender in these figures, see Appendix 2 for separate presentation of ITC for men and women.

[12] And a possibility to raise the effective age of retirement without making the (politically inconvenient) choice of raising the statutory retirement age.

It can be concluded that neither the decrements for early retirement nor increments for late retirement stated in current legislation ensure benefit equivalence.

The decrements for early retirement seem to be somewhat smaller than are needed for them to ensure benefit equivalence in all years. This results in higher costs on early pensions than would be the case if the benefits were on the level of benefit equivalence. However, the effects these deviations impose on retirement behaviour are rather limited, for there are other restrictive factors that limit the use of early retirement, most important of which being the need to quit ones job to receive early pension. The costs imposed by benefit non- equivalence of early pensions are somewhat offset by the reduced costs of other social insurance and social protection programs. However, those positive externalities should be taken account for in any study concerning the long term sustainability of old-age pension system in Estonia.

The increments for deferred retirement seem to be higher than it would be necessary to assure benefit equivalence. This is not offset by the reforms of the statutory retirement age, while the mortality of elderly age groups (especially men) is expected to decrease even more. Therefore there is less incentive to retire at the statutory retirement age both for men and women if the present legislation concerning increments of pension benefits for deferred retirement is not amended. This could result in adverse effects for the expected replacement rates and overall costs of the state old age pension system. The distortions in leisure-labour preferences would lead to welfare losses.

The increased costs and welfare losses could be justified; provided that they were offset by welfare gains elsewhere in the society (i.e. when they provide a solution to shortage of labour that produces gains of the same magnitude in welfare). However, viewed only from the perspective of the sustainability of old-age pension system, the benefit increases for the deferred retirement should be reduced over time to reflect adjustments that provide benefit equivalence. Another option to control overall expenditures of the system would be to set an age cap to deferred pension, or to establish differentiated benefit adjustment rates that would work as a *de facto* age cap on deferred retirement.

References

1. **Blöndal, S.; Scarpetta, S.** The retirement decision in OECD countries, OECD Economics Department Working Papers, no. 202, 1999, 106 p.
2. **Boldrin, M.; Jiménez-Martin, S.** Evaluating Spanish Pension Expenditure under Alternative Reform Scenarios, Universitat Pompeu Fabra, Department of Economics and Business, Economics Working Papers no. 652. 2003, 49 p.
3. **Börsch-Supan, A.; Kohnz, S.; Schnabel, R.** The Budget Impact of Reduced Early Retirement Incentives on the German Public Pension System. Social Security Programs and Retirement around the World: Fiscal Implications of Reform, 2007, pp.201-252.

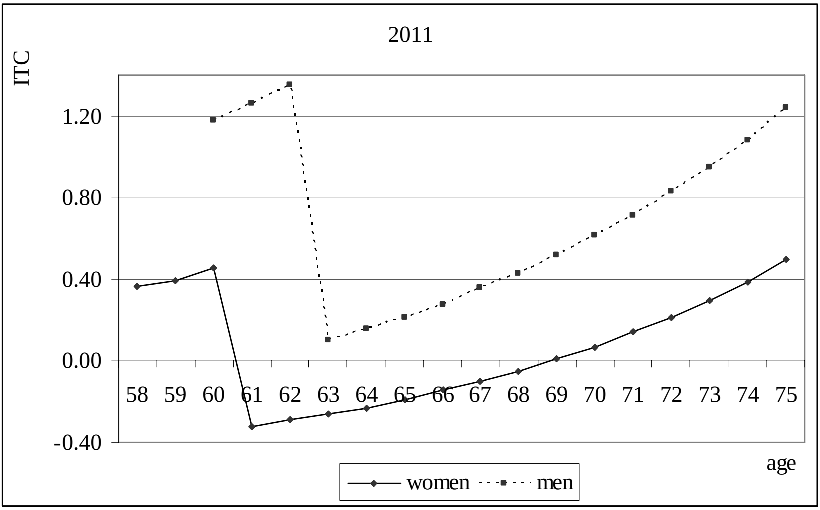
4. **Brugavini, A.; Peracchi, F.** Fiscal Implications of Pension Reforms in Italy. CEIS Research Paper no. 67, 2005, 49 p.
5. **Disney, R.; Whitehouse, E.** Pension Plans and Retirement Incentives, Pension Reform Primer series, Social Protection Discussion Paper no. 9924, 1999, 45 p.
6. **Duggan, J.E; Soares, C.J**. Actuarial Nonequivalence in Early and Delayed Social Security Benefit Claims, Public Finance Review,2002, pp. 188-207
7. **Duval, R.** The Retirement Effects of Old-Age Pension and Early Retirement Schemes in OECD Countries, OECD Economics Department Working Papers, 2003 No. 370, 37p.
8. Eurostat Population Projections. Europop 2008. Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=proj_08c2150p&lang=en . 09.02.2011
9. **Gruber, J.; Wise, D.A.** Social Security Programs and Retirement around the World: Fiscal Implications, Introduction and Summary, NBER Working Paper no. 11290, 2006, 60 p.
10. Joint Report on Pensions. Progress and key challenges in the delivery of adequate and sustainable pensions in Europe. Country profiles. European Commission, 2010, 164 p.
11. **Kühntopf, S.; Tivig,T**. Early Retirement in Germany: Loss of income and lifetime? University of Rostock, Institute of Economics,Thünen Series of Applied Economic Theory, no. 85, 2008, 23 p.
12. **Oksanen, H.** Actuarial Neutrality Across Generations Applied to Public Pensions Under Population Ageing: Effects on Government Finances and National Saving, CESifo Working Paper no 1501, 2005, 28 p.
13. **Palme, M.; Svensson, I.** Financial Implications of Income Security Reforms in Sweden, Social Security Programs and Retirement around the World: Fiscal Implications of Reform, 2007, pp. 413-458
14. **Queisser, M.; Whitehouse, E.** Neutral or Fair? Actuarial Concepts and Pension-System Design.OECD Social Employment and Migration Working Papers, no. 40, 2006, 42 p.
15. Rahandusministeeriumi 2010. aasta suvine majandusprognoos. Rahandus-ministeerium 25.08.2010. Available at http://www.fin.ee/?id=263. 09.02.2009
16. **Romans, F.** The transition of women and men from work to retirement. Eurostat Statistics in Focus, Population and Social Conditions, no. 97, 2007, 8 p. Available at: http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-07-097/EN/KS-SF-07-097-EN.PDF. 09.02.2011
17. Sotsiaalkindlustusameti 2009. aasta statistiline aruanne pensionäride kohta. Sotsiaalkindlustusamet. Available at http://www.ensib.ee/public/statistika_ja_eelarve/pensionarid2009.xls. 09.02.2011
18. The 2009 Ageing Report: Underlying Assumptions and Projection Methodologies for the EU-27 Member States (2007-2060). European Economy, 2008, Vol. 7, 223 p.
19. **Uudeküll, K.; Võrk, A.** (2004). Ennetähtaegne vanaduspension ja selle seos tööturukäitumisega Eestis. In *Eesti majanduspoliitilised väitlused XII. Discussions on Estonian Economic Policy XII*, Berlin-Tallinn: Berliner Wissenschafts-Verlag ja Mattimar OÜ, pp. 278-287.

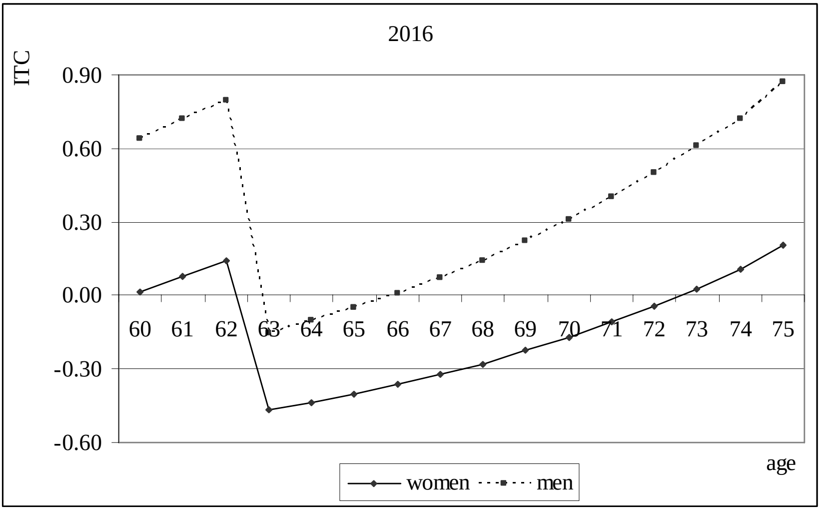
Appendix 1. The ratio of the wage income of specific age group to the gender average

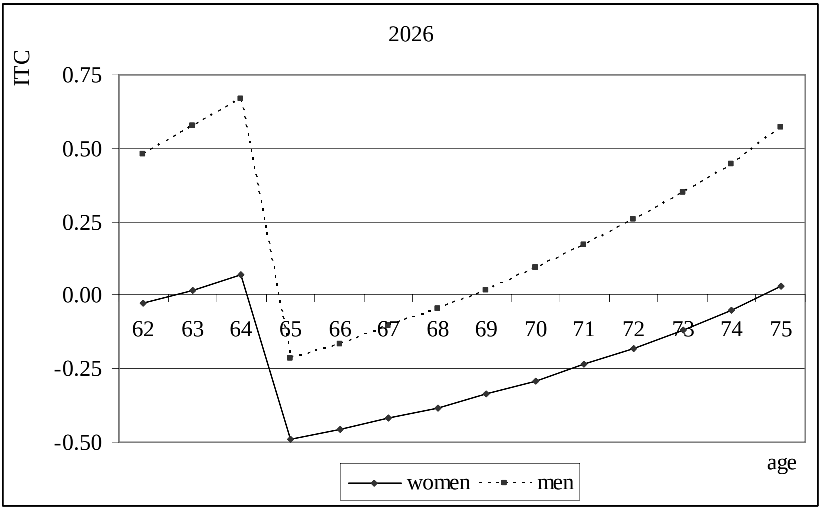
age	women	men	total
58	103.1	91.2	95.4
59	108.9	92.9	99.4
60	103.2	91.3	96.2
61	96.8	92.9	94.0
62	91.8	94.7	93.0
63	89.4	87.4	88.0
64	87.7	84.9	85.6
65	80.3	81.5	80.3
66	72.0	78.3	74.9
67	66.7	70.0	67.7
68	63.1	66.8	64.5
69	55.3	60.2	57.6
70	51.6	54.7	52.9
71	43.8	50.8	47.3
72	42.5	43.8	43.0

Source: Authors calculations based on data presented by Estonian Social Insurance Board

Appendix 2. Gender specific ITC for different ages in 2011, 2016 and 2026






2026
ITC
0.75
0.50
0.25
0.00
-0.25
-0.50
62
63
64
65
66
67
68
69
70
71
72
73
74
75
age
women
men