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## **The Impact of Living and Working Longer on Pension Income in Five European Countries**

**Estonia, Finland, Hungary, the Netherlands and Poland**

# The impact of living and working longer on pension income in five European countries: Estonia, Finland, Hungary, the Netherlands and Poland<sup>1</sup>.

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August 2014

## Abstract

Life expectancies are rapidly increasing and uncertain in all countries in Europe. To keep pension systems affordable, policy reforms are to be implemented which will encourage individuals to work longer and that adjust pension systems such that if life expectancy increases without adjustments in the retirement age, the pension income level decreases. In this paper we analyze the impact of working and living longer on pension incomes in five European countries and assess the impact of these policy reforms on the financial well-being of the elderly in these countries. The paper shows the diversity of the policy measures taken in the various countries. Furthermore, we analyze the financial incentives to work longer and to postpone claiming pension benefit in the five countries and we address the question, how attractive these options are. Moreover we analyze how increases in life expectancy and survival probabilities affect pension incomes.



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<sup>1</sup> This paper is a result of the EU project MOPACT. MOPACT has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 320333.

## 1. Introduction

Life expectancies are rapidly increasing and uncertain in all countries in Europe. To keep pension systems affordable, policy reforms are to be implemented which will encourage individuals to work longer and that adjust pension systems such that if life expectancy increases without adjustments in the retirement age, the level of pension income decreases, .

In this paper we analyze the impact of working and living longer on pension incomes in five European countries. We assess the impact of these policy reforms on the financial well-being of the elderly in these countries. The paper shows the diversity of the policy measures taken in the various countries and outlines a number of lessons that can be learned from the experience in other European countries.

The paper focusses on adjustments in the pension system due to the increased life expectancy and the uncertainty about further increases in life expectancy in five European countries: Estonia, Finland, Hungary, the Netherlands and Poland. These five countries have rather different pension systems and differ markedly in the (planned) reforms due to increased life expectancy. Hungary, to take one extreme example, has recently returned to a purely PAYG system where pension income for the elderly is fully paid for by the current population. The statutory retirement age will increase in the coming years, but it is left to future political decision making how increases in life expectancies, that are faster or slower than projected, will be dealt with. There are hardly any tax incentives for individuals to accumulate lifelong retirement income to provide an additional insurance against the financial risks of getting very old and top of the first pillar pension income. In Finland and the Netherlands on the other hand, the statutory retirement age for basic (first pillar) pension income is linked to estimates of life expectancy and funded components in the pension system provide additional lifelong pension income. The macro longevity risk (the risk of increases in the average life expectancy) in these annuities is shifted more and more to individuals.

Table 1 provides more information on life expectancies and healthy life expectancies in the five countries analyzed in this study and in the European Union overall. Life expectancy at the age of 65, which is the most relevant number when discussing adequacy and sustainability of pension systems, has increased by about two years in the seven year period between 2005 and 2012 in all five countries, both for men and women. According to these Eurostat numbers, healthy life expectancy has decreased in some countries rather than increased in this period which seems to be at odds with the evidence presented in many other studies.

**Table 1. Summary statistics of life expectancies and healthy life expectancies in Estonia, Hungary, Poland, Netherlands and Finland**

	<b>Estonia</b>	<b>Hungary</b>	<b>Poland</b>	<b>Netherlands</b>	<b>Finland</b>	<b>EU-28</b>
Life expectancy at birth, men						
in 2002	65.6	68.3	70.3	76	74.9	<b>74.5</b>
in 2012	71.4	71.6	72.7	79.3	77.7	<b>77.5</b>
Life expectancy at birth, women						
in 2002	77.2	76.7	78.8	80.7	81.6	<b>80.9</b>
in 2012	81.5	78.7	81.1	83	83.7	<b>83.1</b>
Life expectancy at 65, men						
in 2002	12.8	13.2	13.9	15.6	15.8	<b>15.8</b>
in 2012	14.8	14.3	15.4	18	17.8	<b>17.7</b>
Life expectancy at 65, women						
in 2002	17.4	17	18	19.3	19.8	<b>19.5</b>
in 2012	20.3	18.1	19.9	21	21.6	<b>21.1</b>
Healthy life expectancy at birth, men						
in 2005	48.3	52.2*	61.2*	65.4*	51.7	<b>61.1</b>
in 2012	53.1	59.2	59.2	63.5	57.3	<b>61.9</b>
Healthy life expectancy at birth, women						
in 2005	52.4	54.3*	66.9*	63.5*	52.5	<b>62.5</b>
in 2012	57.2	60.5	62.9	58.9	56.2	<b>62.7</b>
Healthy life expectancy at 65, men						
in 2005	3.4	5.1*	8.4*	10.5*	6.3	<b>8.6</b>
in 2012	5.4	6.4	7.4	10	8.4	<b>8.7</b>
Healthy life expectancy at 65, women						
in 2005	3.6	5*	10.2*	11.1*	6.6	<b>8.9</b>
in 2012	5.5	6.4	7.8	10.1	9	<b>8.9</b>

*Source: Eurostat; \* = data for healthy life expectancy at birth and at 65 for both men and women in 2005 is not comparable for Hungary, Poland and Netherlands; for healthy life expectancy at birth and at 65 for both men and women EU 27 is used and the second year is 2010.*

In this paper we analyze the financial incentives to work longer and to postpone claiming pension benefit in the five countries. We address how attractive these options are and whether or not they are actuarially fair. Moreover we analyze to what extent individual longevity risk is insured in these five countries, using adequate financial products and how increases in survival probabilities affect pension incomes.

The plan of this paper is as follows. In the sections 2 – 6 we briefly characterize the pension systems in Finland, Estonia, Hungary, Poland and the Netherlands. In section 7 we summarize and compare the evidence in the early sections, on the financial incentives to work longer and on the consequences for pension incomes of increases in life expectancy according, to the current legislation and address the sustainability of the current rules of the game in the five countries. Section 8 summarizes the evidence on the impact of increases in life expectancy on average replacement rates and the risk of poverty for specific groups. Section 9 concludes.

## 2. The impact of living and working longer on pension incomes in Finland

### *The Finnish pension system*

The Finnish statutory pension system consists of two main pillars. The first pillar is an earnings-related pension scheme which is financed through employer and employee contributions. This earnings-related pension scheme includes disability pensions. The second pillar is a residence-based national pension scheme which is financed with tax revenues. There is also a so called guarantee pension income that ensures minimum security. The role of voluntary pensions is very small.

The last major pension reform came into effect in 2005. The reform introduced a longevity adjustment which cuts monthly pensions as lifetime expectancy increases. The reform also introduced measures to encourage people to work longer. In this note, we briefly discuss how these reforms, together with increasing life expectancy, can be expected to influence pension adequacy in the future.

### *Current pension adequacy*

In terms of typical replacement rates, the Finnish pension system currently scores relatively well. The average pension of persons who retired on an old-age pension in 2012 was about 1800 euros a month (Finnish Center for Pensions, 2013). The average pension of all persons receiving some pension (including e.g. disability pensions) was about 1400 euros. At the same time, the average wage of all full-time workers was about 3200 euros a month (Statistics Finland, 2013). Due to progressive earnings taxation, the net replacement rates are somewhat higher than those based on these gross incomes. On the other hand, the poverty rate is somewhat elevated among the older population. In 2010, the income poverty rate in Finland was about 7 percent for the whole population, when the poverty threshold is defined as 50 per cent of median household disposable income. For those aged over 65, the rate was about 13 percent. The poverty rate is especially high for women over 75 who live alone (OECD 2011).

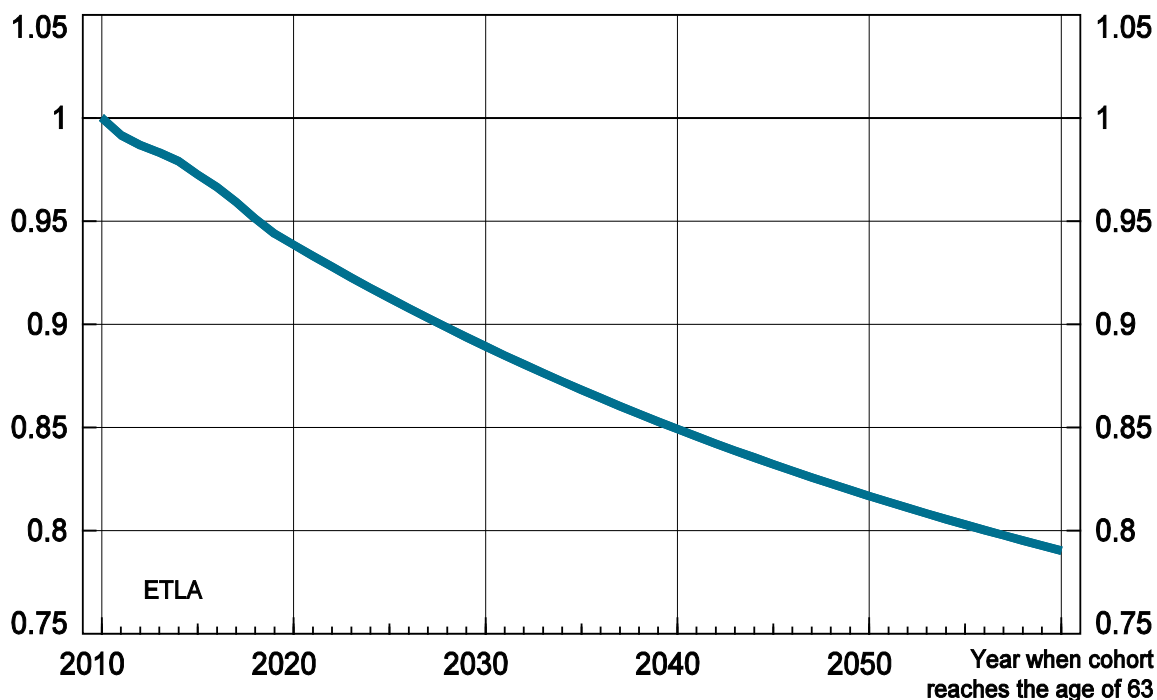
The guarantee pension, which was introduced in 2011, should already have diminished old age poverty rates compared to these figures. The guarantee pension currently provides a minimum income of about 740 euros a month. Another mechanism that should improve the situation in the coming years is the maturing of the earnings-related pension system together with the increased labor force participation rate of women.

### *Longevity adjustment and benefit accrual*

Roughly speaking, the longevity adjustment adjusts monthly pension benefits from the funded part of the system so that at the age of 62, the present value of pension payouts remains constant even if life expectancy changes. When computing the longevity adjustment, life time expectancy is computed based on standard life tables, rather than mortality forecasts.

Figure 1 shows the expected evolution of the longevity coefficient. It is computed based on Statistics Finland's most recent demographic forecast. A longevity coefficient equal to 0.9, for instance, means that monthly pensions are cut by 10 % compared to what they would have been in 2009 (the adjustment was first applied in 2010).

**Figure 1: Expected evolution of the longevity coefficient**



*Source: Statistics Finland, 2014*

Every year's earnings directly affect the future pension. The accrual rate is 1.5% per year between the ages of 18 and 53 and 1.9% between the ages of 53 and 62. The age of 63 is also the eligibility age for old-age pensions. Between the ages of 63 and 68, the accrual is 4.5% per year conditional on not withdrawing pensions. This creates an incentive to work longer for individuals that have high wage relative to previously accrued pension rights. For those withdrawing pensions, the accrual rate is still only 1.5% a year.

As can be seen from figure 1, in 2030, the longevity coefficient is expected to cut pensions by about 12 percent or so. In principle, people who turn 62 in 2030, can compensate for the effect of the longevity adjustment by postponing retirement by about 2,5 years after the age of 63, benefiting from the high accrual rate of 4.5 percent. However, that would require postponing the withdrawal of pension benefits. Recent empirical evidence suggests that the high accrual rate after age 63 has not worked to lengthen working careers substantially (Uusitalo and Nivalainen, 2013).

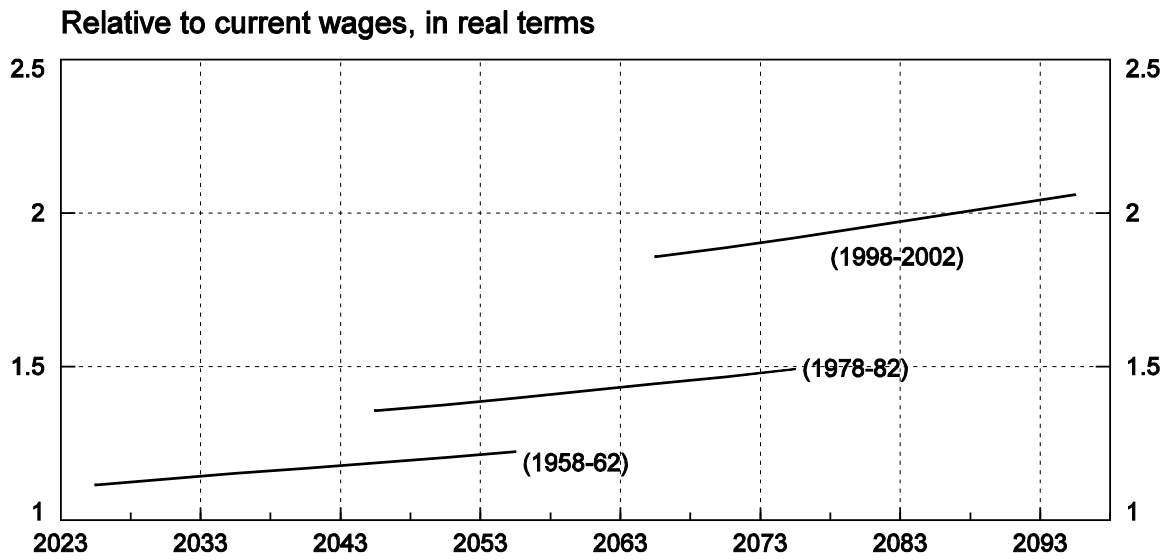
### *Future pension adequacy*

As discussed above, there are certain reasons to believe that in terms of poverty relief, pension adequacy in Finland is going to improve in the future. The longevity adjustment is unlikely to change this because it is not applied to the (unfunded) national pensions and guarantee pensions and because it is only partially applied to disability pensions. These pension schemes are the most important ones in preventing old-age poverty.

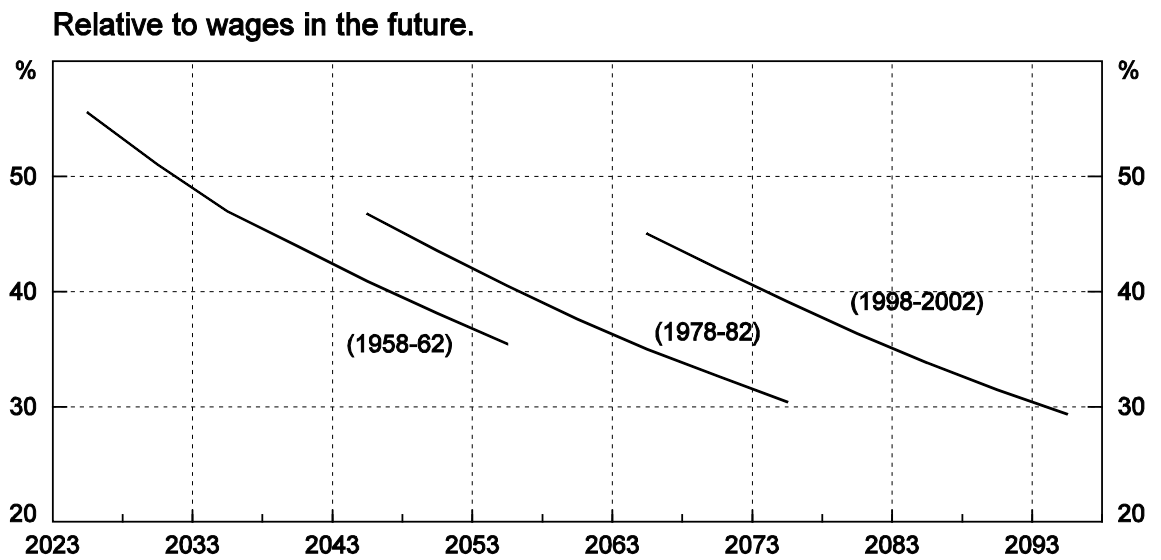
As long as there is sustained labor productivity and wage growth, monthly pensions will increase over time in real terms, assuming the benefit rules will be maintained. However, relative to the average wage level in the future, average monthly pension is expected to decline. There are two main reasons for this. First, as mentioned above, it seems that workers are not postponing retirement enough to compensate for the effect of the longevity adjustment on monthly pensions. Second, during retirement, pensions are index-linked with 20 and 80 weights on wages and consumer prices, respectively. As a result, as a person gets older, the value of her pension usually declines relative to the average wage level in the future. Moreover, despite the longevity adjustment, even the earnings-related pension system is not yet fiscally sustainable in the face of population aging. This increases the risk that benefits will be cut in the future.

Figure 2 shows the expected evolution of pensions for three cohorts born between 1958-1962, 1978-1982, and 1998-2002 assuming that the current benefit will be maintained. The figure is based on results from a standard general equilibrium overlapping generations model that includes a detailed description of the Finnish pension system (see e.g. Lassila and Valkonen, 2007). As can be seen from the lower part of the figure, relative to wages in the future, the average pension of very old people is likely to be quite low on a 50 to 100 year horizon.

Figure 2. The expected evolution of pensions for three cohorts born between 1958-1962, 1978-1982, and 1998-2002



The average pension in age group 65-69 in period 2013-17 is normalized to one.



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Source: Lassila and Valkonen (2014).



### 3. The impact of living and working longer on pension incomes in Estonia

#### *The Estonian pension system*

The Estonian pension system consists of three pillars: a state pension insurance scheme (a pay-as-you-go system with defined benefit); a compulsory funded pension scheme (defined contribution scheme); and a voluntary funded pension scheme (defined contribution scheme). The state pension insurance provides protection against the risks of old age, disability and losing parents or spouse and counts two separate tiers: employment-based old-age, work incapacity and survivors' pensions, and flat-rate residence-based national pensions. The purpose of the national pension is to guarantee a minimum income for those who are not entitled to the employment-based pension, i.e. have less than 15 years of employment, or whose work incapacity pensions or survivor's pensions end up below national pension. In addition to common old-age pensions, there are rules for special pensions and pensions under favourable conditions (e.g. pensions for the police, military, judges, artists, miners etc.), which allow retirement under special conditions.

#### *The Estonian first pillar*

The coverage of the state pension insurance system (I pillar) is practically universal. Old-age pensions are comprised of three components: the flat rate base amount, the pensionable length of service component, covering periods up to 1998, and the insurance component that is based on individual social tax payments to the state pension scheme, covering periods from 1999 onwards. Each year individual social tax payments are converted into points using comparison with the average payment of the pension insurance part of the social tax<sup>2</sup>. Work incapacity pensions and survivor's pensions depend on the same three components, but also on the per cent of person's work incapacity and on the number of dependants, respectively.

Both the base amount and the cash value of one year of pensionable service and the pension insurance coefficient are indexed annually. The pension index is a weighted average of past consumer price indices and past growth of social tax revenues to the pension insurance system (in a 20-80 proportion). Since 2007, a differential indexation of the flat rate base component and the pensionable service/insurance component is applied. The index is 10% higher for the

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$$^2 I_{it} = Wage_{it} \times (0.20 - STRII_{it}) / (AWage_t \times 0.20)$$

where  $I_{it}$  – individual I pillar pension coefficient

$Wage_{it}$  – individual earnings taxable with social tax

$STRII_{it}$  – transfer rate to the II pillar from the social tax rate (either 0 or 0.04; temporarily values 0.02 and 0.06 were possible)

$AWage_t$  – average earnings taxable with social tax

base component and 10% lower for the cash value of one year of pensionable service and the pension insurance coefficient.

During the recent economic crisis in 2009-2013, a few ad hoc changes to the indexation rule of pensions were made. The changes allowed smoothing the value of nominal pensions during the crisis without having any long-term impact on the sustainability or adequacy of pensions.

### *Second pillar*

The pay-as-you-go (PAYG) state pension insurance scheme is supplemented by a compulsory funded defined-contribution (DC) scheme (II pillar) that was introduced in 2002 by diverting a portion of contributions from the statutory PAYG scheme into private funds and introducing additional contributions by employees. The contribution rate is 6% of gross wages – the employee pays 2% from the gross wage and the employer another 4% (as part of the total 20% pension insurance contribution). The amount of pension benefits depends on total contributions over the working career and yields of pension funds. The scheme covers the risk of old age, but not invalidity.

Participation in the scheme is mandatory for cohorts born in 1983 or later, whereas cohorts born in 1942-1982 had the option to join the scheme voluntarily. By the end of 2012, the scheme covers about 75% of the population aged 18 to 63 and 60% of the participants contributed. The funded scheme is run by private fund managers. By the end of 2012 the total value of assets in the compulsory funded scheme amounted only to EUR 1.47 billion (about 8.4% of GDP).

When people reach pension age they can withdraw their accumulated assets. Currently, the accumulated assets are rather small as the scheme has not matured yet. At the end of 2012, about 18,000 people had the right to collect benefits from the funded pension scheme. About one third had postponed withdrawal of their pensions. By the end of 2012, 51% of withdrawals had periodic payments from the pension fund without entering into an insurance contract. 39% of people had withdrawn their pensions in lump sum. Finally, only 10% had insurance contracts. Whether these generate periodic payments depends on the size of accumulated assets. If they are larger than certain amount, the person must take annuities. Remaining wealth if one passes away is inherited.

At the end of 2012 the average gross old-age pension comprised about 34% of the average gross wage of a full-time worker in January 2013. The average net replacement rate is about 38-43%, depending whether a pensioner is working or not at the same time.

### *Third pillar*

Voluntary funded pension scheme (the third pillar) plays a minor role in Estonia so far. The voluntary funded pension contracts can be made by acquiring pension fund units from fund managers or with life insurers as pension insurance. There are two types of pension insurance contracts: pension insurance with guaranteed interest and pension insurance with investment risk. The scheme had about 50,000 participants (6% of people aged 18–62) with assets about EUR 85 million (about 0.6% of GDP) at the end of 2012. There were additionally about 68,000 contracts in the form of life insurance at the end of 2012.

### *How working longer affects pensions in Estonia*

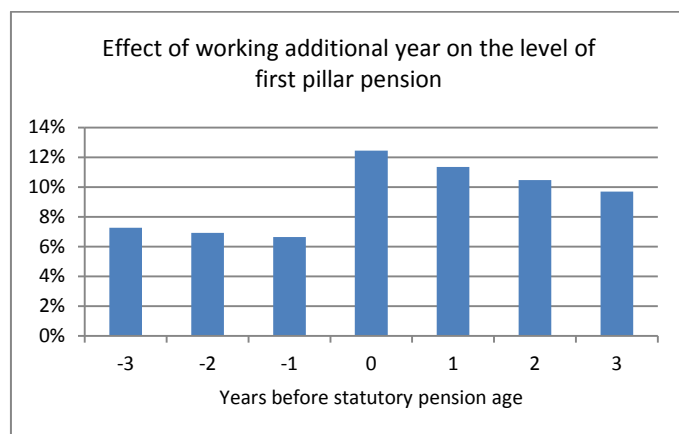
Working longer influences old-age pensions directly in Estonia. In the state pension scheme (I pillar) each additional contribution adds to the sum of person's insurance coefficients. The monetary effect depends on the relative monetary values of the insurance component and the base component. For example, each year of working with average wage (assuming that there are no contributions to the compulsory funded pension scheme) added 0.6% from average wage to the each month pension for the base case worker (worker 40 years) in 2013. As the base amount is indexed at a more rapid pace, every additional year of working contributes relatively less to pensions over time. An additional working year with average wage would add 1.5% to the average pension in 2013 and 1.4% in 2030.

Working longer has a non-linear effect around pension age. In 2013, the statutory retirement age was 63 years for men and 62 years for women. It will be equalised at 63 by 2016, and as from 2017 it will gradually increase to 65 by 2026. In the first pillar it is possible to retire up to 3 years earlier than the statutory pension age, but for each month, the pension is reduced by 0.4%<sup>3</sup>. Although the reduction is lower than actuarially fair rate, people are punished by not allowing to receive simultaneously labour earnings until they have reached the statutory pension age. It is also possible to defer retirement and for each month the pension is then increased by 0.9%, which is a higher rate than actuarially fair. The quantitative effects are shown in Figure 3. The results are gross (before income tax). The main assumptions here is a working career of 40 years with average wage pension parameters.

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<sup>3</sup> In the second pillar income can be withdrawn as of the statutory retirement age, In the third pillar it can be withdrawn earlier, but to pay lower income tax, not before age 55

**Figure 3. The effect of working an additional year and postponing retirement on the pension level from the first pillar in Estonia**



Source: own simulations, assumptions

Despite a high bonus for delaying retirement, it is used rarely. In 2012, 2.0% of pensioners who entered into the old-age pension scheme, had used the option to delay retirement. The share has been low also in previous years, but one can see a small trend of increase –0.95% in 2009, 1.0% in 2010, 1.4% in 2011, 2.0% in 2012.<sup>4</sup> There have been no studies on the reasons why the use of this option has been so low, and how this could influence the labour market participation.

The use of early retirement pension, on the other hand, is quite common – 19% of all people who entered old-age pension scheme used early retirement in 2011 and 2012.<sup>5</sup> As the duration of unemployment benefit is short in Estonia and work-incapacity pensions are low (about 60% of old-age pensions), people choose early retirement scheme as only available way to leave the labour force. The entry rate was higher during the recent crisis when unemployment increased– 25% in 2009, 24% in 2010. Leetmaa et al. (2004)<sup>6</sup> show that the majority of people who enter early retirement scheme come from unemployment or inactivity – about 80% of those have not had employment income before entering the early retirement scheme.

In addition to the state pensions, working longer directly impacts pensions from the funded pension schemes. There is no minimum guarantee neither on the return on investment nor on the minimum level of final pensions in the funded pension schemes.

<sup>4</sup> Estonian National Social Insurance Board, annual reports „Pensioners“, own calculations

<sup>5</sup> Estonian National Social Insurance Board, annual reports „Pensioners“, own calculations

<sup>6</sup> Leetmaa, R. Võrk, A., Kallaste, E. (2004). Older Workers in the Labour Market and Work Life. Working Paper 19/2004. Praxis Center for Policy Studies

### *How increased life expectancy affects pensions in Estonia*

Increased life expectancy directly influences pensions to be converted in annuities from the funded schemes as the annuity rate is determined by expected remaining lifetime. For funded pensions that are already converted to annuities there is no impact on the income level, this risk is with the annuity provider. Changes in life expectancy do not directly influence pensions from the first pillar, because neither the individual pension level nor the statutory pension age currently directly depends on life expectancy. However, increasing life expectancy will definitely put pressure on public finances which may result ad hoc increases of pension age or changes in the other parameters of the pension system.

Below we illustrate the impact of increased life expectancy and working longer on total pension from the state pension scheme and the compulsory funded pension scheme using numerical calculations of typical workers using four scenarios and four different levels of earnings:<sup>7</sup>

**Table 2. Effect of increasing life expectancy and employment on pensions**

Scenario	Earnings (proportion of average earnings)	2/3	1	1.5	2
Base scenario :		30.0	39.1	52.8	66.5
40 years of employment age (25-64), retirement at 65, 20 years life expectancy					
... 1 extra year of life expectancy (to 21)		29.7	38.6	52.0	65.4
... 1 extra year of employment (years 24-64)		30.4	39.7	53.7	67.7
... 1 extra year of employment (years 24-64) and 1 extra year of life expectancy (to 21)		30.1	39.2	52.9	66.6

Source: ??

*Notes: GRPL – gross relative pension level compared to average wage. Other assumptions: person born in 1983 (obliged to join the compulsory funded pension scheme), no children, in 2009 did not continue own payments to the second pillar, and did not increase contributions to the second pillar 2014–2017, macroeconomic forecasts for years 2013-2060 are based on the Estonian Ministry of Finance long-term economic forecasts<sup>8</sup>, annuities for the second pillar use 3% discount rate.*

The base scenario assumes 40 years of working (at age 25-64), retirement at normal age 65 and remaining life expectancy is 20 years. (In 2012 the average life expectancy at 65 was 17.3 years).

<sup>7</sup> We use the person born in 1983 (obliged to join the compulsory funded pension scheme), with no children, in 2009 did not continued own payments to the second pillar and also did not increased the payments to the second pillar 2014–2017 (as median Estonian).

<sup>8</sup> Makromajanduse näitajad 2000-2060 (01.10.2012).xlsx <http://www.struktuurifondid.ee/file.php?10146460>

We use gross relative pension level (GRPL), which compares the gross old-age pension with the gross national average wage, to measure level of pensions.

The person with average wage receives 39.1% of pension from retirement time average wage. When life expectancy increases by one year, which leads to lower pension from the funded pension scheme, the GRPL decreases by 0.55 percentage points (to 38.6%). On the other hand, if employment duration increases by one year (meaning that person must enter earlier into the labour market) the GRPL increases 0.61 percentage points. When both life expectancy and employment duration increase by one year then the total pension remains practically the same.

The higher the labor earnings the more sensitive are pensions to changes in employment duration and life expectancy<sup>9</sup>. Person with two-times average earnings lose or gain more than 1 percentage point of the replacement rate compared to the average wage. Persons with 2/3 of the average wage will be affected by less than half of percentage point. If the person postpones retirement after the normal retirement age then he receives higher pension due to the extra bonus for pension deferment, as discussed earlier.

For Estonia there are no proper microsimulation models to analyse the future distribution of the pensions. Jõgi (2013)<sup>10</sup> uses cohort microsimulation approach and shows with her analysis that recent reforms have considerably increased future inequality of pensions. While current Gini index of pensions is low (0.11 among men who retired 2010-2011), it could be around 0.32 from the first and second pillar for new generations (men retiring in 2045), as both variation of unemployment experience and lifetime earnings contribute much more to pensions than earlier. Therefore, the risk of poverty among pensioners could increase considerably in the future, especially for those with lower earnings and unemployment spells.

As both the level of earnings and the years of employment have direct effect on the future pensions in Estonia, the most vulnerable groups are low wage earners, parents with young children and people with long and multiple unemployment spells. To reduce the impact of wages on future pensions the flat rate part of the state pension is increasing slightly faster than the earnings related component. Unemployed people, either involved in passive or active unemployment policy measures, do not receive any pension credits and are therefore at the greatest risk. To reduce the impact of parenthood on pensions, a set of policy measures

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<sup>9</sup> High income earners are more sensitive to the length of working career and life expectancy because pensions include the base component (about 1/3 of average pensions), which is not affected by earnings and which is more important for low income workers.

<sup>10</sup> Jõgi, Evelin (2013). Eesti pensionisüsteemi reformide jaotuslike mõjude hindamine kohordisimulatsioonimeetodi abil. (Assessment of the distributional impact of Estonian pension reforms based on the cohort simulation method). Master Thesis. University of Tartu, Estonia, retrieved on 12 September 2013 at [https://dspace.utlib.ee/dspace/bitstream/handle/10062/31778/jogi\\_evelin.pdf](https://dspace.utlib.ee/dspace/bitstream/handle/10062/31778/jogi_evelin.pdf)

(referred to as parental pension – *vanemapension*) to increase the old-age pension of those who have raised children was modified recently.<sup>11</sup>

#### **4. The impact of living and working longer on pension incomes in Hungary**

##### *The Hungarian pension system*

The institutional structure of the Hungarian pension system is simple in international comparison. It is practically a single-pillar, universal pay-as-you-go scheme at a high degree of maturity offering near-full coverage to people both below and above the retirement age. The scheme has no financial reserves whatsoever. The experiment with building up a second, pre-funded pillar ended in a near-complete U-turn and led to an almost complete defunding (Simonovits 2011). Occupational pensions are non-existent and the supplementary voluntary funded scheme is marginal.

Retirement age is 62 years for both genders but various routes of early exit from the labor market result in lower effective retirement ages. In 2011, nearly 30% of beneficiaries, younger than the official retirement age took up 25% of benefits. The routes to leave the labor market were various. New regulations that came into effect on January 1, 2012 locked many of these ways and narrowed those that remained open, making retirement below the standard retirement age more difficult. Since most recipients whose benefits have been in payment kept their eligibility the effects will be felt gradually. The official retirement age will grow to 65 by increasing the age limit by half a year for each consecutive cohort. Accordingly, the transition period will end in 2022. Since 2011, pensions in payment are indexed by consumer prices. This ended a two-decade long struggle of consecutive governments to reduce the full wage-indexation to a price-indexation.

These three recent changes (fewer options to leave labor market early, increase in official retirement age and indexation to prices rather than wages) affect the length of the contributory and the retired career as well as the age-profile of benefits. The combined effect is a likely increase in entry pensions due to longer contributory periods and a detachment of pensions and wages in particular in long pensioner careers. The population particularly at risk in this respect are older women living alone.

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<sup>11</sup> Since 1 January 2013 for one parent of children who will be born after 1 January 2013 the state transfers 4% of the average taxable income to the compulsory funded pension scheme until the child reaches 3 years. For children born before 1 January 2013, one of the parents of children who were born between 31 December 1980 and 31 December 2012 receive a pension supplement equal to the value of two annual coefficients when retiring. As of 1 January 2015 one of the parents of all children who were born before 1 January 2013 receive additional pension supplement at the value of one annual coefficient.

### *The impact of living longer on pensions in Hungary*

Compared to other European countries, Hungarian mortality statistics are poor but improving. The working assumption among demographers is that the same way as East-German mortality caught up to the West in the course of two decades, East-European mortalities, including Hungary's, will catch up to the European average in the next decades. Life expectancy (LEXP) at birth in 2011 was 71 years for men and 78 years for women (see Table 3A); about 5 years lower than the EU average. See also Table 1 for the Eurostat numbers on 2002 and 2012<sup>12</sup>.

**Table 3A: Summary statistics of life expectancies**

	2006	2007	2008	2009	2010	2011
Life expectancy at birth, men	69.0	69.2	69.8	70.1	70.5	70.9
Life expectancy at birth, women	77.4	77.3	77.8	77.9	78.1	78.2
Health life expectancy at birth, men	54.7	55.3	54.7	56.0	56.4	na
Health life expectancy at birth, women	57.5	58.0	58.3	58.7	58.6	na
Life expectancy at 65, men	13.4	13.4	13.6	13.7	13.8	13.9
Life expectancy at 65, women	17.2	17.3	17.5	17.6	17.6	17.7
Health life expectancy at 65, men	5.0	5.3	5.7	5.9	5.4	na
Health life expectancy at 65 women	5.6	5.9	6.5	6.1	5.9	na

Source: Central Statistical Office

<sup>12</sup> Due to methodological differences in estimating life expectancies in higher ages the Hungarian Statistical Office regularly releases lower life expectancy figures than the Eurostat.



In the course of only five years between 2006 and 2011 it improved nearly a full year for women and almost two full years for men. This also reveals a diminishing gender gap, which, too, is relatively large in European comparison. Although much of the improvement occurred in the active or newly retired cohorts, the life expectancy at the age of 65 years also increased by half a year over the same period. Tendencies are similar, though less clear, in the case of healthy life expectancies with the important difference that the gender gap is smaller. This predicts longer periods of morbidity and disability for women.

### *Working longer*

By defunding the pre-funded pillar in 2011-2012 the opportunity to accumulate net wealth and reap the second demographic dividend<sup>13</sup> was missed. Instead, Hungary turned to the remedy of longer working lives as an alternative means for regaining the long-term fiscal balance. Forceful measures were taken in order to raise the effective retirement age. In 2011, nearly 30 percent of beneficiaries, younger than the official retirement age took up 25 percent of benefits. The routes to leave the labour market were various. New regulations that came to effect on January 1, 2012 locked many of these ways and narrowed those that remained open making retirement below the standard retirement age more difficult.

In 2012 recipients of disability pension had to go through a complex revision of health conditions unless their working ability was 100 percent lost or they were close enough to the standard retirement age. In effect this procedure led to only a limited number of benefit annulations but it effectively decreased the number of new entries. The other large group of early retirees were beneficiaries of a service-length-based early retirement, which offered benefits with no or just minor reductions. This route of early exit was closed down altogether. No new such benefits can be established any longer since January 1, 2012. Yet, another subgroup of old-age pensioners below retirement age worked as members of the armed forces or had dangerous and hazardous jobs. This exit route will also be phased out or limited.

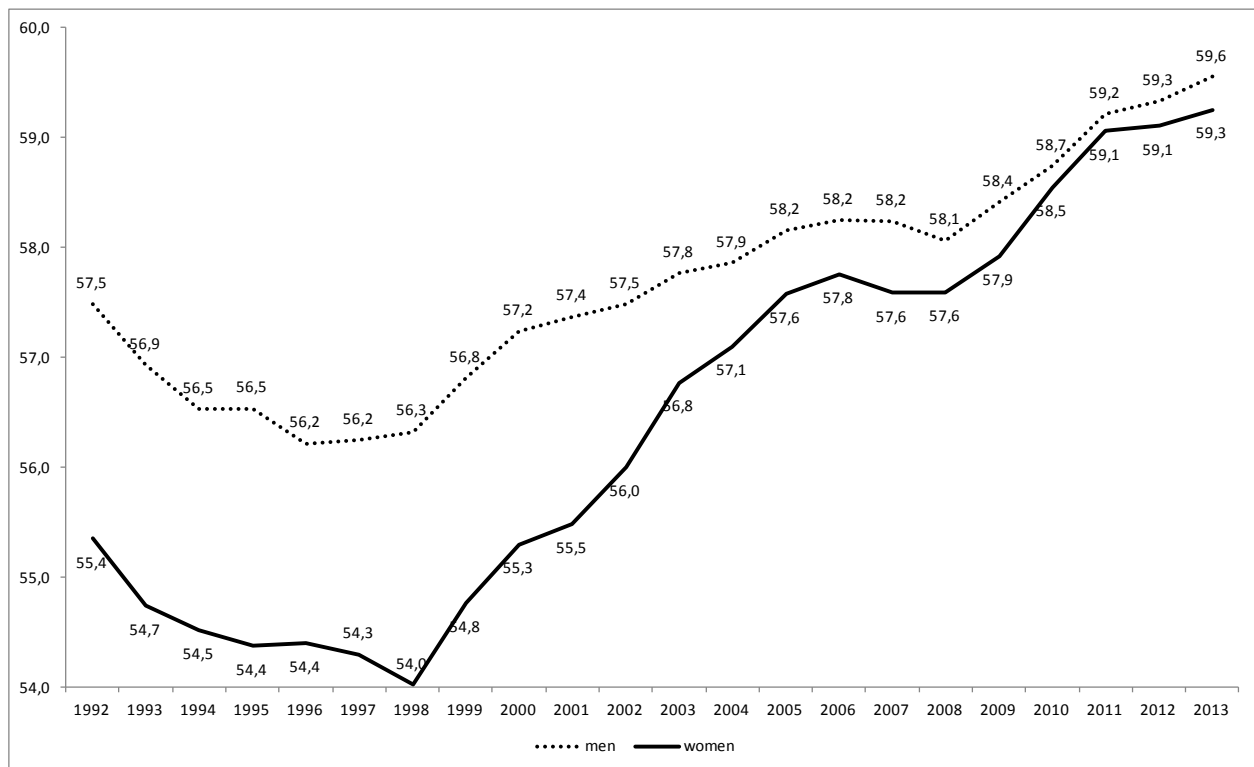
Due to the phasing out periods most recipients whose benefits have been in payment kept their eligibility and the effects will be felt gradually. However, this process has started before. Figure

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<sup>13</sup> The first demographic dividend is created, in the form of additional economic growth, by a relatively large generation going through the active section of their lifecycle. The same effect, however, hampers growth when the generation in question retires. If the ageing process of this generation is combined with increasing life expectancies and decreasing fertility, the demand for wealth increases. If this demand is realized in the form of additional savings the resulting capital deepening also adds to growth. This is called the second demographic dividend (Bloom et al. 2002; Lee et al. 2003). The demographic window of opportunity between the mid-1990s and the mid-2010s in Hungary offered a chance of building up net savings and reap the second demographic dividend later but the country missed this opportunity.

4 presents the time series of the effective retirement age by gender estimated as a weighted average age of leaving the labor force. It is still rather low in European comparison but it is increasing in particular in the last years. In the course of the five years between 2008 and 2013 the average exit age grew by 1.5 years for men and 1.7 years for women. Due to the phasing out of most early retirement options this figure is expected to grow even further although another new rule will likely limit this effect. In October 2010 the government opened up a new retirement channel for women independent of age but based exclusively on working years. Since then women are allowed to retire after 40 contributory years (including periods on maternal leave).

**Figure 4: Effective exit age from the labor market, Hungary, 1992-2013**



Source: Own calculation based on OECD labor statistics

### Benefit levels

The minimal service period for a full old-age pension is 20 years. The benefit formula is based on length of service and a proxy of contributions. Since the pension insurance administration does not yet have an electronic register on contributions paid by or on behalf of the insured a proxy is created from wages in and after 1988. Pensions are tax exempt for they are calculated from net wages (although what constitutes *net* wage was redefined in 2008). Pensions in payment

are indexed by prices. Neither the benefit formula nor any other components of benefit rules reflect changing life expectancies making the system vulnerable to the demographic transition.

The relative income position of Hungarian elderly is the most favorable in the European Union. The at-risk-of-poverty measure (AROP in the table) is the lowest both in the 65+ and the 75+ female populations and the 3<sup>rd</sup> and 2<sup>nd</sup> lowest, respectively in these two age categories among men (see Table 3B). The relative median income ratio (RMIR in the table, persons aged 65 years and older compared to persons aged less than 65 years) is the 3<sup>rd</sup> highest among the member states for both genders (in the case of men in a draw with France). Its value is above one for men meaning that the elderly in fact have a higher median income than those younger than 65 years.

**Table 3B: Poverty of the Hungarian elderly in European context**

			2011				HU 2012
			HU	NM12	EU28	HU rank	
AROP	65+	m	3.5	9.1	13.2	3rd	4.7
		f	5.0	16.5	18.1	1st	6.8
	75+	m	3.1	8.5	14.7	2nd	3.4
		f	4.9	18.0	20.2	1st	6.4
RMIR	65+	m	1.07	0.98	0.93	3rd-4th	1.01
		f	0.97	0.87	0.87	3rd	0.95

Source: Eurostat (ilc\_li02, ilc\_pnp2).

Notes: HU: Hungary, NMS12: new member states; m, f: male, female; HU rank: position of Hungary among the EU28 countries.

AROP: at-risk-of-poverty (threshold: 60% of median equalized income after social transfer); RMIR: relative median income rate (persons aged 65 years and over compared to persons aged less than 65 years).

### Existing research

The simple question of how pensions will be affected if the working career is extended by a year, if life expectancies at the retirement age increases by a year or if both happen simultaneously has not been addressed for Hungary so far.

The effect of the pension system on the labor supply of older workers has been analyzed by Cseres-Gergely (2008) who applied a method based on the option value theory. Kátay et al. (2009) decomposed the trend of the number of participants in the labor force. They derived conclusions on the effects of changing pension regulations on participation.

The simple cohort model currently used by the Ministry for National Economy is developed for the purposes of macro projections. Although in principle it can be applied to model typical careers, the administration does not work in that direction. The projects based on similar cohort models of the National Bank and the TARKI Research Institute are currently dormant.

The pension administration is currently working on a new dynamic microsimulation model, MIDAS\_HU. The model will have a demographic module combined with a marriage market (modelling processes of birth, household formation, marriage/cohabitation, divorce/split and death), a labor market module (modelling employment and wages) and a pension system module (modelling the accumulation of eligibilities, retirement and a pensioner career). It will be based on administrative data.

## **5. The impact of living and working longer on pension incomes in Poland**

### *The Polish pension system*

After the 1999 reform, the Polish pension system for employees and the self-employed consists of three pillars. The first pillar is a mandatory notional-accounts defined contribution (NDC) scheme. The notional interest rate is defined as 100 percent of the growth of the real covered wage bill, and no less than price inflation. The second pillar is a mandatory funded<sup>14</sup> defined contribution (FDC) scheme. Contributions paid into the second pillar are indexed with the rate of return on pension funds investments. After retirement, pension benefits are indexed annually by inflation and at least 20 percent of the real average wage growth. The third pillar consists of voluntary, private pension plans with rather weak tax incentives.

The new pension formula is to a large extent similar in the first and the second pillar. Benefits are equal to the accumulated capital from contributions (plus indexation) divided by life expectancy taken from the observed unisex period mortality tables<sup>15</sup>. Mortality tables are recalculated by the Polish Central Statistical Office every year.

Two recent reforms will have further impact on pension income in Poland. A first reform has shifted a part of contributions from the mandatory FDC to the NDC system since 2011, but

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<sup>14</sup> The new legislation that came in force in February 2014 made the second pillar voluntary, i.e. an insured person can pay the entire old-age pension contribution (19,2 %) to the first pillar only. Decision can be reversed every two years.

<sup>15</sup> This is actuarially fair if one assumes that the real interest rate is negligible.

assumes that the benefit formula will be very similar. If the rates of return in the FDC and NDC systems during the accumulation phase will differ, it may influence future pension incomes. The second reform will have a more important impact: the retirement age has been increased gradually to 67 for both men and women starting from 2013. Men will reach the new retirement age by 2020, and women by 2040.

First, we briefly indicate the impact of reforms on retirement incomes in Poland. Second, we present the simple estimates of the impact of working and living longer on future pensions in the Polish system.

### *The impact of reforms on pension incomes*

Current pensioners are relatively well off when compared to average incomes in the country. In 2011 the replacement rate i.e. pension income relative to the average wage level was 60 percent (ZUS, 2012). The risk of poverty of people 65+ is lower in Poland than in EU-27 countries. The percentage of the population aged 65+ with income below the at-risk-of-poverty threshold was 14.2 percent in Poland and 15.9 percent in the EU-27 (EC, 2012). Note that the risk-of-poverty-rate in Poland is substantially higher for women (16.8 percent) than for men (9.9 percent) due to shorter work careers, lower wages and longer life expectancy of women in Poland.

Older people, for whom a benefit from the first and second old-age pillars would be lower than the minimum pension, are entitled to the minimum pension. The eligibility criteria for the minimum pension include a minimum of 25 years of work experience for men and 20 years for women (this requirement for women will increase with a rise in the retirement age). Currently the minimum pension is equal to about 24 percent of the average wage. Under current rules of indexation the ratio of the minimum pension to the average wage is expected to decrease in the future. According to Chlon- Domińczak and Strzelecki (2013), the lack of changes in the current indexation method will result in the minimum pension falling below the International Labour Organisation (ILO) standard of the poverty protection of elderly by mid 2020s. Additionally, many people at retirement age might not meet the eligibility criteria, as around 30 percent of persons at retirement age<sup>16</sup> can have total work experience below the required level (Chlon- Domińczak and Strzelecki, 2013). As a result, the risk of poverty among people in the retirement age who are not eligible for the minimum pension increases.

The replacement rates are expected to substantially decrease in the future as a result of the 1999 pension reform and transition from the more generous and redistributive DB formula to

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<sup>16</sup> The authors assume retirement age before the reform i.e. 60 for females and 65 for males.

the DC formula. Poland exhibits one of the largest drops in the replacement rates among the EU-27 in the years from 2010 to 2050 (EC, 2012). Main factors that explain the expected decrease in replacement rates in Poland include: minimum pension guarantee is subject to strict eligibility criteria; pension benefits are adjusted to life expectancy; pension benefits are based on the life-time earnings while they were based on the highest earnings from 10 consecutive years in the old system. People with career breaks and short careers as well as low earners will receive lower benefits than they would receive in the old system because of a stronger link between contributions and benefits.

Jablonowski and Muller (2013) project that replacement rates (RR) for median contributors will shrink from 40-60 percent to 15-18 percent in the period from 2015 to 2060<sup>17</sup>. Twenty percent of the above reduction in RR is due to the increase in life expectancy (Jablonowski and Muller, 2013). For the lower income quartiles and the group of self-employed the reduction in RR would be larger than for higher earnings groups and employees (Jablonowski and Muller, 2013).

Pension benefits will vary across cohorts. According to Jablonowski and Muller (2013), initial pension cohorts born after 1980 base would correspond to 15 percent RR upon retirement around 2045. The RR are visibly higher for older cohorts, who retire around 2030 (Jablonowski and Muller, 2013). The differences in pension benefits can be explained by the following factors: relatively generous estimation of initial capital of older cohorts, decreasing real wage growth and higher life expectancy. The cohorts born between 1965 and 1985 will have lower pension benefits than the cohorts born before 1965. According to Leifels et al. (2010), an average female born in 1955 will be able to maintain 50 percent of her pre-retirement consumption, while a representative female born in 1976 will be able to maintain only 35 percent.

#### *Simple estimation of the impact on living and working longer on future pensions*

Below we present results of simple estimates of a hypothetical impact of working and living longer on future pensions in the Polish system. We analyze a hypothetical individual who starts working in 2013 and retires at age 60, 65 or 67. We consider two cases: short and long professional careers. We define *short career* as 25 years of work and *long career* as 45 years of work. For simplification, we assume no inactivity periods or unemployment spells in the careers. Pension contribution rate equals to 19.52 percent. We also assume that annuities calculated from the capital accumulated both in the first and the second pillars are calculated in the same

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<sup>17</sup> Jablonowski and Muller (2013) assume here no shift of contributions from the FDC to the NDC and no changes to the retirement age. The authors assume that the unisex life expectancy at retirement will increase by about 4 years from 2010 until 2060

way using period life tables. In the Polish case being a man or a woman is not relevant in the pension formula as unisex life tables are used in the calculation of the pension benefit.

Other assumptions are:

1. *Changes in life expectancy.* There is no consensus on future trends in life expectancy (LE). So we assume the same annual increase as on average between 2008 and 2013. Life expectancy at age 60 in this period raised by 9,9 months, at age 65 by 9,5 months and at the 66 by 9,3 months. That represents a 0.81 percent annual increase at age 60, 0.94 percent at age 65 and 1 percent increase at age 67. In the base scenario we use the 2013 life tables and assumed that LE increases from 0,81% to 1% (depending on retirement age).
2. *Wages.* Age wage profiles are increasing, real individual wage rises 2% every year.
3. *Indexation of the pension capital.* In the long run we assume the same indexation or rate of return on contributions paid into both pillars based on the real growth of the contribution base, equal to 2 per cent.

Results are summarized in the tables below.

**Table 4a. Hypothetical pension benefit (PB) in relation to the base scenario (in %)**

Age at retirement	PB with an increase in life expectancy	PB with an additional year of work	PB with an increase in LE and an additional year of work
Short career - 25 years			
60 years	99,2	109,9	109,0
65 years	99,1	110,4	109,4
67 years	99,0	110,7	109,6
Long career - 45 years			
60 years	99,2	108,0	107,1
65 years	99,1	108,5	107,5
67 years	99,0	108,8	107,7

Source: own calculations

**Table 4b. Hypothetical replacement rates (RR) in different scenarios (in %)**

Age at retirement	RR at base scenario	RR with an increase in life expectancy	RR with an additional year of work	RR with an increase in LE and an additional year of work
	Short career - 25 years			
60 years	22,9%	22,8%	24,5%	24,5%
65 years	27,6%	27,3%	29,6%	29,6%
67 years	29,9%	29,6%	32,1%	32,1%
	Long career - 45 years			
60 years	41,3%	41,0%	43,4%	43,4%
65 years	49,7%	49,2%	52,3%	52,3%
67 years	53,9%	53,3%	56,9%	56,9%

Source: own calculations

Under our assumptions, an additional year of full-time work adds to the level of pensions between 9.9 and 10.7 percent for people with short careers and between 8.0 and 8.8 percent for people with long careers (see Table 4a). This is due to longer indexation of the pension capital, additional contributions paid into the individual pension accounts and lower remaining life expectancy at (respectively) 61, 66 or 68 years. The gain from working one year longer is much higher than the possible loss due to a one year increase in life expectancy. Therefore, working longer and living longer has a positive impact on the accrual rate.

An additional year of work results only in small gains in replacement rates because it has two opposite effects: on the one hand an additional year of work increases the monthly pension benefit, on the other hand the denominator increases as well because we assumed a 2 percent annual increase in wages (see Table 4b).

#### *Alternative scenario on life expectancy*

We could also make an alternative assumption that life expectancy increases more, i.e. by 1 extra year at ages 60, 65 and 67 respectively in comparison with life tables for 2013. Results for hypothetical change in benefits and replacement rates are summarized in the tables below.



**Table 5a. Hypothetical pension benefit (PB) in relation to the base scenario (in %)**

Age at retirement	PB with an increase in life expectancy	PB with an additional year of work	PB with an increase in LE and an additional year of work
Short career - 25 years			
60 years	95,5%	109,9%	104,8%
65 years	94,6%	110,4%	104,3%
67 years	94,2%	110,7%	104,0%
Long career - 45 years			
60 years	95,5%	108,0%	103,0%
65 years	94,6%	108,5%	102,5%
67 years	94,2%	108,8%	102,2%

Source: own calculations

**Table 5b. Hypothetical replacement rates (RR ) different scenarios (in %)**

Age at retirement	RR at base scenario	RR with an increase in life expectancy	RR with an additional year of work	RR with an increase in LE and an additional year of work
Short career - 25 years				
60 years	22,9%	21,9%	24,5%	23,6%
65 years	27,6%	26,1%	29,6%	28,2%
67 years	29,9%	28,2%	32,1%	30,5%
Long career - 45 years				
60 years	41,3%	39,4%	43,4%	41,7%
65 years	49,7%	47,0%	52,3%	49,9%
67 years	53,9%	50,8%	56,9%	54,0%

## 6. The impact of living and working longer on pension incomes in the Netherlands

### *The Dutch pension system*

The Dutch pension system consists of three pillars. A flat base pension income (AOW) that roughly provides the minimum wage arranges insurance against poverty. Employees accrue a funded pension income linked to their average wage. Finally the voluntary third pillar is important primarily for non-employees such as the self-employed and for employees who did not work full time for many years and therefore accrued less benefits in the second pillar.

The first and second pillar of the Dutch pension system have recently been adjusted to accommodate changes in life expectancy and to encourage people to work longer. The third pillar is likely to be adjusted within soon. We briefly analyze these reforms and indicate their impact on retirement incomes in the Netherlands.

Note that the older population is currently rather well off in the Netherlands. Knoef et al. (2013) computed that only a few percent of the older population has an income below the minimum income level. These must be inhabitants who do not qualify for full AOW benefits. The main criterion to apply for full benefits is to have lived in the Netherlands as of the age of 15 until the age of 65. Immigrants, often from countries like Marocco and Turkey, are the main group that does not meet this criterion. If they lived in the Netherlands e.g. for 30 years before retirement they are eligible for  $30/50 = 60\%$  of the regular benefits.

Not only absolute retirement income is important though. In the Netherlands the social norms are based on the replacement ratio, i.e. on pension income relative to the average wage level over the years. Knoef et al. (2013) report that approximately 50% of the Dutch population receives pension income of more than  $2/3$  of their final income. Here the self-employed are the main group at risk, as they often have not contributed voluntarily to the third pillar pension products that are offered by insurers. The probability to reach this replacement ratio is higher for low income workers which rely primarily on AOW income.

### *First pillar adjustment to the increases in life expectancy*

In 2012 the Dutch government decided to relate the eligibility age for the first pillar pension to observed life expectancy. The eligibility age for this pension benefit has been at the age of 65 ever since its introduction in the nineteen-fifties. A gradual increase in the eligibility age was implemented so that it will reach the age of 67 in 2024. As of 2024 the eligibility age will be linked to the observed life expectancy, implying that it is quite likely to increase further. The automatic link that is established aims to add to the sustainability of the government budget while reducing future political controversies, as increases in the retirement age are likely to

remain unpopular with the electorate. Note though, while in 2010 few people supported the increases in the retirement age, this reform is now widely accepted.

A relevant point to note is that the government decided to link the retirement age to observed life expectancy rather than to projected life expectancy, i.e. to use period rather than cohort tables. The difference between the two can be substantial. Projected life expectancy is arguably the more fair measure, but requires consensus among actuaries on the adequate projection. Observed life expectancy is computed from observed current survival rates per cohort, ignoring their likely future improvements.

The group that will be most affected by the current adjustment in the first pillar retirement age is the group of workers that retired early in the early-retirement schemes that were financially very attractive and widely used until recently. These workers will not have predicted the change in policy and can be left without an income for several months as the early retirement schemes stop paying at the age of 65. Once the measure has been fully implemented the increased eligibility age for AOW pension of course implicitly assumes that people will work longer and that the actual retirement age will increase.

A relevant question is also whether beneficiaries can claim AOW pensions before the statutory age (of 67 or more as of 2024). Such adjustments can in theory be implemented in an actuarially fair way although actual implementations can imply non-trivial value distributions (see Sanders, de Waegenaere and Nijman 2013). The option to claim AOW early would be attractive for workers in physically demanding jobs or with otherwise reduced human capital. After several changes in the proposed law the final outcome is (for now) that such options are not offered, enhancing the income risks of vulnerable older workers with often reduced life expectancies.

### *Second pillar adjustments and their impact*

For new accruals the formal eligibility age for the supplementary work related second pillar pensions has been adjusted in line with the AOW adjustments. Note that there is marked difference in the impact of increased life expectancy in the funded second pillar versus the PAYG first pillar. In the first pillar pension income is affected directly because participants simply receive their benefits at least two years later (as of 2024). In the second pillar new accruals are based on the new eligibility age but existing benefits as of retirement age 65 are actuarially fairly converted to the new eligibility age. As current older workers will already have accrued almost all benefits, their second pillar pension income is hardly affected by the adjustments.

Second pillar pension benefits are accrued on the net income after adjusting for the level of AOW. Low income workers will therefore receive only a small portion of their total income as second pillar pension. They rely primarily on the first pillar and are therefore more significantly affected by the adjustments in the eligibility ages.

On top of the changes in the eligibility ages also the level of second pillar pension incomes will be affected by changes in (projected) life expectancies. The labor unions and employer organizations that are responsible for second pillar pensions have agreed that increases in the present value of the liabilities due to changes in survival rates will lead to income cuts in real terms (usually implying less compensation for inflation), where shocks are smoothed over a ten year horizon. Note that consistently here projected life expectancies rather than observed life expectancies are important.

Changes in life expectancies can thus affect the (purchasing power of) the second pillar income even of very old people. The annual adjustments in the actuarial value of liabilities of pension funds are usually not too sizable (say less than 2%) and will be smoothed over a ten year period.

### *Third pillar adjustments and their impact*

The pay-out phase of third pillar products is to take the form of annuities<sup>18</sup>, that is of lifelong income streams, like in the first and second pillar. In the third pillar these annuities have to be nominally guaranteed euro amounts, i.e. the income streams and date as of which they are received do not depend on investment returns during the decumulation phase nor on changes in life expectancy or survival probabilities. The risk of changes in life expectancy is therefore fully on the insurers. This makes these products costly for the individual. Currently there is a policy discussion going on in the Netherlands to allow variable annuities in the third pillar where the periodic income would depend on (investment returns and) changes in some objective index of life expectancy, e.g. the one published by Statistics Netherlands.

### *The impact on pension income of delayed benefit claiming and/or working longer*

As discussed before, first pillar benefits cannot be claimed earlier or later than the date as which one is entitled to receive them. Second pillar pension wealth can be used though to generate a flat income profile as of a date before the date as of which one is eligible for first pillar benefits. The level of second pillar income in future years will then be adjusted in an actuarially fair way. For the average worker first pillar and second pillar income are roughly contributing evenly to retirement income and one can easily claim benefits before the AOW eligibility age. Low income workers though might have insufficient second pillar wealth to do so. A worker who initially planned to retire at the age of 63 but decides to retire one year later will have to take less actuarially equivalent wealth out of the second pillar. Claiming one year later therefore increases pension income in retirement by some 8%.

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<sup>18</sup> Recently one exception was introduced, so called “bank saving products“ which require an income stream of at least 20 years.

Working longer does not generate additional first pillar pension benefits, as this pillar is purely based on residence. In the second pillar one typically accrues 2% of income for every working year, so the total effect of working longer on pension income is 1% for those for whom both sources of pension income are equally important. Accruals in later years (just before retirement) are subsidized using the so called uniform accrual and contribution mechanism (“doorsnee systematiek”). Young and old workers pay the same contribution for the same accrued pension income as of retirement, which ignores the impact of discounting on the value of the accrual. This affects pension contributions, but not pension income after retirement.

#### *The impact on pension income of a one year increase in life expectancy*

The eligibility age for first pillar income is linked to life expectancy in the Netherlands, as discussed before, but the level of the first pillar income is not. In the second pillar, an increase in life expectancy affects the estimated value of the liabilities of the pension fund, reduces the so called funding ratio (value of asset over liabilities) and subsequently implies that pension benefits will de facto be cut with approximately the same percentage as the increase in the liabilities. This can be because of less compensation for inflation or even by cutting nominal benefits<sup>19</sup>. An increase of life expectancy of one year increases the value of the liabilities of a typical pension fund by say 5%. If we assume that individuals compensate the later eligibility for first pillar entitlement by using second pillar pension wealth (see before) the total impact on pension income will be  $0.5 * (5\% + 8\%) = 6.5\%$ .

## **7. Comparison of the impact of living and working longer on pension incomes in the five countries**

Table 6 summarizes the evidence in the previous sections on the impact of living and working longer on pension incomes in the five countries. All five countries have taken policy measures to adjust the statutory retirement age to keep the pension system sustainable, given the clear and universal increase in life expectancy. As a consequence of this and of policy measures that make early retirement financially less attractive, the actual average retirement ages have already increased sharply in most countries.

The countries differ in the way the inherent uncertainty about future life expectancy is handled. In some countries future adjustments in the retirement age are simply left to future political decision making. Other countries (the Netherlands, the Scandinavian countries including

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<sup>19</sup> The cuts in nominal benefits that had to be implemented by many Dutch pension funds in 2013 were substantially affected by the adjusted predictions of future survival probabilities of the Dutch Actuarial Society in 2010 which increased the value of the liabilities of the average pension fund by some 7%.

Finland) have taken one step further and already announced how deviations in future projected or observed life expectancies from current estimates will affect the eligibility age for pension income or its level. Although future political decision making can of course adjust the currently announced rules, such a mechanism has the important advantage that new (unpopular) political decisions are not required if life expectancies increases further which supports the sustainability of the system. While the level of pension income is linked to the (also uncertain) levels of price and wage inflation in countries like Poland and Estonia (Notional Defined Contribution, NDC) a link with estimated life expectancy is lacking. Note also that whenever eligibility ages or level of pension incomes are linked to estimates of life expectancy, one has to make the important decision whether or not to use period life tables which are based on currently observed death rates or projections of futures death rates. The former has the advantage to be objective while the latter requires subjective modelling by actuaries. But the former is implicitly based on the unrealistic assumption that e.g. the death rates for the current 70 year olds will still be the same when the current 20 year olds reach that age. Different countries have chosen different mechanisms here.

Table 7 compares and summarizes estimates of the impact of working or living longer on pension income in four of the five countries (for Hungary unfortunately these numbers are not available). The numbers that are reported are rough estimates for average workers, the precise impact will typically depend on all kinds of characteristics of the individual that are omitted in this table. The comparison suggests that the impact of an increase in life expectancy on pension income is strikingly different in the five countries, while the financial incentives to claim benefits later or to work longer are roughly similar.

To start with the first issue, the costs of an increase in life expectancy are primarily taken by the next generation in Estonia as the income level of the retirees is under the current rules hardly affected (-0.5%) by such an increase. In Finland, Poland and the Netherlands the income of retirees that do not adjust their labor supply (work longer) or claim benefits later is much more substantially affected by an increase in life expectancy, with estimated impacts of -3.5% to -6.5% for the 'average' person. The pension systems in these countries are more sustainable, because a substantial part of the costs of increases in life expectancy is not shifted to future generations but imposed on retiree income.

The impact of working longer on pension income depends on two components: additional pension income because pension benefits are claimed later and additional accrual of pension rights because of an additional year of work. Starting with the first component, the second row in Table 7 shows that in all four countries the annual income during retirement increases substantially if one starts claiming benefits later. The increase for the average worker is approximately actuarially fair because depending on exact assumptions on interest rates and

survival probabilities the annuity factor for a flat annuity income after retirement is somewhat above 10.

As for the second component, in Finland older workers accrue 4.5% additional pension income to stimulate longer working lives. Such mechanisms are absent in the other three countries<sup>20</sup>. Nevertheless the financial incentives to work longer and claim benefits later are sizable nowadays in all four countries, as reflected in the third row of Table 7.

**Table 6: The impact of living longer on pension incomes in five European countries**

	Finland	Estonia	Hungary	Poland	Netherlands
Increase in statutory retirement age upcoming years	No	Yes	Yes	Yes	Yes
Automatic link life expectancy and eligibility age PAYG pensions	No	No	No	No	Yes
Automatic link level of funded pensions to life expectancy	Yes	No	No <sup>21</sup>	Yes	Yes

**Table 7: The quantitative impact of living and working longer on pension incomes in five European countries**

	Finland	Estonia	Poland	Netherlands
Relative impact on retirement income at the age 70 if the life expectancy in the population increases by one year and benefits are still claimed at the age of 63 and one leaves the labour force at the age of 63 ?	<b>-3.5%</b>	<b>-0.4%</b>	<b>-5%</b>	<b>-6.5%</b>

<sup>20</sup> In the Netherlands pension accrual is more generous in later than in earlier years because of the so called uniform contribution and accrual mechanism (see section 6). This affects the contributions to be paid rather than the accrual and does therefore not affect the numbers in the table.

<sup>21</sup> Of course this applies only to the very small fraction that still has a funded pension

Relative impact on retirement income at the age 70 if a worker decides not to claim benefits at the age of 63 but at the age of 64 (and does not adjust his/her labour supply)	<b>9%</b>	<b>10%</b>	<b>7%</b>	<b>8%</b>
Relative impact on retirement income at the age 70 if a worker does not only claim benefits at the age of 64 rather than at the age of 63 and also quits the labour force one year later, at the age of 64 rather than at the age of 63 ?	<b>9%</b>	<b>12%</b>	<b>9%</b>	<b>9%</b>

## 8. Concluding remarks

In this paper we analyzed the impact of working and living longer on pension incomes in five European countries. The paper shows the diversity of the policy measures taken in the various countries. All countries stimulate people to leave the labor force and claim benefits at a later age. In some countries the financial costs of living longer are primarily imposed on the retirees themselves, while in other countries the next generation will have to cover according to the current rules of the retirement system. The financial incentives to work longer and postpone claiming pension benefit in the four countries for which we could quantify them are roughly similar.



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