



MINISTRY OF ECONOMY AND FINANCE  
DEPARTMENT OF GENERAL ACCOUNTS

2018-ROUND OF EPC-WGA PROJECTIONS - ITALY'S FICHE ON PENSIONS<sup>(\*)</sup>  
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# Chapter 1 - The legal-institutional framework of the Italian pension system

## 1.1 An overview

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The Italian pension system is basically public, mandatory and financed on a pay-as-you-go basis. It covers the whole resident population and, after a transitional phase, applies the same rules across all participants, with the exceptions of minor pension schemes. Such general rules envisage: i) the adoption of Notional Defined Contribution (NDC) scheme, with periodic revision of the implicit accrual rates, ii) eligibility requirements for old age and early pension both linked to changes in life expectancy and iii) indexation of pension to price inflation.

The minor pension schemes which are allowed to deviate from the general rules, mainly concern professional funds. Altogether, they account for about 4% of the insured to the public pension system and 2,2% of the total public pension expenditure. However, some of them have already opted for the application of the NDC scheme.

Private, funded pillars also exist, which are set up on voluntary basis to supplement the public pension system in ensuring adequate income protection to the elderly, especially when the NDC scheme is fully phased in.

Following law 214/2011, only one social security institute (*Istituto Nazionale di Previdenza Sociale* - INPS) is envisaged which runs all public pensions schemes, for the private and public sectors, with the exception of professionals' funds mentioned above.

In 2016, the public pension expenditure accounts for 15.6% of GDP<sup>1</sup>, gross of tax revenues on pensions. Discarding the social assistance component, the aggregate is composed of old age, early and disability pensions for 84% and of survivors' pensions for the remaining 16%. Sector analysis shows that about 58% of public pension expenditure refers to private employees, 27% to public employees and 15% to the self-employed (artisans, shopkeepers and farmers) and professionals' funds.

The legal-institutional framework of the Italian pension system has been greatly reformed since 1992. The measures that have contributed most to improving the financial sustainability, already embodied in the 2012 and 2015-AWG pension projections, may be summarized as follows:

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<sup>1</sup> In 2016, the ratio actually accounts for 15,5%, on the basis of the latest NA estimates of GDP released by Istat (National Institute of Statistics) at the end of September, 22<sup>nd</sup>.

- the elimination of indexation to real wages (law 503/1992);
- the introduction of the NDC method and the periodic update of the transformation coefficients (accrual rate) to changes in mortality rates (law 335/1995 and law 247/2007);
- the tightening of the eligibility requirements for old age, early, and social assistance pensions (law 503/1992, law 335/1995, law 449/1997, law 243/2004, as modified by law 247/2007, law 214/2011);
- the alignment of the statutory retirement age of women to that of men, thus eliminating the previous 5-year gap (law 122/2010, law 214/2011);
- the indexation of the eligibility requirements to changes in life expectancy for old age, early, and social assistance pensions (decree law 78/2010 and law 214/1995).

Since the 2015-round of projections, based on legislation in force at the end of 2014, only minor interventions have been introduced through the Budget law for 2017 (law 232/2016). Such interventions are mainly aimed at increasing lower amount contributory pensions and facilitating earlier access to retirement for workers so-called “precocious” or involved in arduous works. Besides, measures facilitating earlier exit from the labour market, without affecting pension expenditure, have also been introduced, on temporary basis (up to 2018)<sup>2</sup>.

The process of pension reforms has also concerned the private, funded pillar. The first interventions approved in 1993 (legislative decree 507/1993) and 1995 (law 335/1995), introduced a legislative framework to regulate private, supplementary, funded schemes. Thereafter, additional measures were adopted in order to increase the number of the insured. In particular, law 243/2004, legislative decree 252/2005, and law 296/2006 provided important changes in terms of fiscal incentives to join private pension funds. More recently, the Budget law for 2017 has foreseen, under given conditions, the faculty for the insured to utilize part of the capital accumulated in private pension funds to finance income provision before retirement<sup>3</sup>.

## 1.2 The public pension system

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### 1.2.1 Calculation rules

With the 1995-pension reform (law 335/1995), the Italian pension system adopted the NDC scheme, based on an actuarial equivalence between contributions paid and pension payments after retirement. The previous Defined Benefit (DB) scheme still applies pro-rata to contributions accrued until 1995 (until 2011 for workers with at least 18 years of contribution at the end of 1995).

**Old age and early pensions.** Under the NDC scheme, the pension is calculated as a product of two factors: the total lifelong contributions, capitalized with the nominal GDP

<sup>2</sup> For details and financial effects, see paragraph 1.4. A more in-depth analysis is reported in Annex 7

<sup>3</sup> For details see paragraph 1.4 and Annex 7.

growth rate (five-year geometric mobile average) and the transformation coefficient, the calculation of which is mainly based on the probabilities of death, the probabilities of leaving a surviving spouse, and the average outliving period<sup>4</sup>. As a consequence, the pension amount is proportional to the contribution rate and directly correlated to the contribution period and the age of retirement.

Until the end of 2012, the transformation coefficients were foreseen only for the age bracket 57-65. For retirement ages below (i.e. disability pensions) or above the range, the lowest and the highest coefficients were respectively applied. As of 2013, the upper limit of the age range has been extended to 70 and then further, in line with the increase in the eligibility requirements brought about by changes in life expectancy (see §. 1.2.2).<sup>5</sup>

According to current legislation, the transformation coefficients are subject to periodic revisions according to changes in mortality rates. The next update is foreseen in 2019 and then every two years. The revision procedure is automatic insofar as it falls entirely under the administrative sphere of competence<sup>6</sup>.

Under the previous Defined Benefit (DB) regime, which still applies pro-rata to contributions accrued until 1995<sup>7</sup>, the pension is calculated as a percentage of the reference wage, obtained multiplying 2% by the years of contribution, up to a maximum of 80%. The reference wage is an average of wages/labour income related to the last part of career, indexed to prices up to the year before that of retirement. The number of annual wages involved varies depending on sector, time period to which the contribution is referred and retirement age.

**Disability pensions.** General calculation rules, as described above, also apply to disability pensions. Plus, an additional contribution period is granted to those with 100% of disability degree, corresponding to the remaining years to reaching the Statutory Retirement Age (SRA), up to a maximum contribution period of 40 years<sup>8</sup>.

**Survivors' pensions.** Survivors' pensions account for 60% of the deceased's pension. When the deceased is a contributor, the amount of pension is calculated according to the general rules as described above. Survivor's pensions cannot be cumulated with other income sources for 25%, 40% or 50% of their amount if the survivor's total income exceeds, respectively, three, four or five times the minimum pension.

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<sup>4</sup> For formula and parameters, see Annex 2. The transformation coefficient is approximately the inverse of the average number of years for which a pension are expected to be paid to the pensioner and their surviving spouse, the latter weighted with the reversibility rate.

<sup>5</sup> The transformation coefficient may be somewhat higher for women in relation to children they have given birth (transformation coefficient corresponding to an age 3 months higher than that of retirement for each child up to a maximum of 1 year).

<sup>6</sup> In accordance with the administrative procedure laid down by law 247/2007, the 2013 and 2016 revisions of the transformation coefficients were adopted by the directorial decrees of the Ministry of Labour and Social Policies of 14<sup>th</sup> May 2012 and of 22<sup>nd</sup> June 2015, respectively.

<sup>7</sup> It also applies to contributions paid until to 2011 of the insured with at least 18 years of contributions at the end of 1995. However, most of them are already retired and the others will be in the next few years.

<sup>8</sup> In fact, the maximum degree of disability is considered incompatible with any kind of work.

## 1.2.2 Eligibility requirements

The Italian pension system basically foresees two ways for retirement (see table 1 and figure A2.1):

- the **old age retirement** which requires the SRA and at least 20 years of contributions;
- the **early retirement**, at an age below the SRA, which requires high contribution periods.

**Statutory Retirement Age (old age pensions).** In 2016, the SRA is 66 years and 7 months for men (all sectors) and female employees in the public sector. It is temporary lower for female employees in the private sector (65 years and 7 months) and the female self-employed (66 years and 1 month), though rapidly increasing, catching up the SRA of other workers as of 1<sup>st</sup> January, 2018. In the same year, the minimum age requirement to be entitled to the old age allowance (*assegno sociale*, or *social pension* if awarded before 1996) will be increased by 1 year and then fully aligned to the SRA (§. 1.2.3).

According to a specific legislative provision, the SRA must be at least 67 in 2021. Based on the latest official demographic projections<sup>9</sup>, such a target may be achieved in advance with the next update of the eligibility requirements, in 2019 (see below).

**Early pension retirement.** There are two possibilities to access early retirement: one applies to all workers regardless of their entering the labour market and the other one only to those enrolled in the pension system after 1995 (i.e. those completely under the NDC). More specifically:

- all workers may retire before the SRA on the basis of a minimum contribution requirement, regardless of age. In 2016, such requirement accounts for 42 years and 10 months, for men and 41 years and 10 months, for women.
- besides, workers enrolled after 1995 may retire up to a maximum of three years earlier than the SRA, as long as they have 20 years of contributions and a pension not inferior to 1,200 euro per month in 2012 (which corresponds to 2.8 times the old age allowance, in 2012), indexed with the five-year mobile average of nominal GDP.

**Indexation of the eligibility requirements.** Starting from 2013, an indexation mechanism (every three years up to 2019 and every two years thereafter) is applied, linking the eligibility requirements to changes in life expectancy at 65, as measured by the National Institute of Statistics (Istat) over the preceding three-year period (two years as of 2021). Such a mechanism applies to:

- the minimum age requirement for old age pensions (SRA) and old age allowances;
- the minimum contribution requirements for early pensions, regardless of age;
- the minimum age requirement for early pensions, under the NDC scheme.

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<sup>9</sup> Istat (2017), [demo.istat.it](http://demo.istat.it) and Ministero dell'economia e delle finanze - RGS (2017), *Rapporto n. 18*, p. 214-215.

As expressly foreseen by law, the updating procedure of the eligibility requirements falls completely within the administrative sphere of competence, thus assuring the effectiveness of the periodic revision as well as the compliance with the scheduled dates<sup>10</sup>.

Such an automatic mechanism is fully consistent with that foreseen for the update of the transformation coefficients to changes in mortality rates (law 247/2007), in terms of administrative procedures and the timing of revisions.

**Disability pension.** To be entitled to a disability pension, 5 years of contributions are required, 3 of which accrued in the last five years before retirement.

**Survivor's pension.** Survivor's pensions are granted to the spouse and/or children of the deceased either pensioner or contributor<sup>11</sup>. As for the latter, 15 years of contributions are required or, alternately, 5 years, 3 of which accrued in the last five years before the decease.

### 1.2.3 A safety net: the old age allowance and additional social assistance sums

The Italian pension system provides a safety net for the elderly on low income, regardless of contributions. The safety net consists of two kind of social assistance benefits: the old age allowance (5,825 euro per year, in 2016) and social assistance additional sums (hereafter 'social additional sums' - *maggiorazioni sociali*). Both are means-tested and subject to a minimum age requirement of 65 years and 7 months in 2016, increased by 1 year in 2018, and linked to changes in life expectancy<sup>12</sup>.

The old age allowance is granted to the elderly with personal income not exceeding the benefit itself and, if married, with couple's income non-exceeding twice the benefit.

Social additional sums are foreseen to supplement the old age allowance to given income thresholds, depending on age and marital status (single/married). For the 70 and older, the income thresholds account for 8,298 euro (personal income) and 14,123 euro (couple's income), in 2016<sup>13</sup>.

Only under the DB and mixed regimes, besides the old age allowance, a means-tested, topping-up mechanism to the minimum pension (6,525 euro per year, in 2016) is foreseen, subject to the fulfilment of the eligibility requirements for an old age pension.

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<sup>10</sup> The 2013 and 2016 indexation of the eligibility requirements were adopted by a directorial decree of the Ministry of Economy and Finance of 14<sup>th</sup> December 2011 and 16<sup>th</sup> December 2014, respectively. The next update, which comes into force as of 1<sup>st</sup> January 2019, will be finalized by the end of 2017.

<sup>11</sup> Survivors' pensions can also be entitled to children up to 18 years old (or 26 years, if students).

<sup>12</sup> Under certain income conditions, further integration (about 40 euro per month) may be provided to the elderly by the so-called social purchase card (*carta acquisti*) (art. 82, decree law 112/2008, converted into law 133/2008).

<sup>13</sup> For those who have contributed to the pension system, the age threshold of 70 is reduced by 1 year for every five years of contributions and social additional sums are somewhat higher.



#### 1.2.4 Indexation of pensions

Pensions are indexed to price inflation, unlike the rule applied before 1992, which also foresaw partial indexation to real wages for the private sector pensioners<sup>14</sup>. According to current legislation, the percentage of indexation to prices is differentiated by pension brackets. Such a percentage is 100% of the inflation rate for the amount of pension up to three times the minimum pension, 90% for the amount between three and five times the minimum, and 75% for the part above five times the minimum<sup>15</sup>.

#### 1.2.5 Accumulation of pension and labour income

**Old age and early pensions.** According to law 133/2008, old age and early pensions can be cumulated in full with labour income. The previous legislation laid down some restrictions, especially in the case of employees.

**Disability pensions.** The possibility of accumulation is fully allowed only with 40 years of contributions. Otherwise the pension is subject to a withdrawal of 50% of the amount exceeding the minimum pension. In any case, the pension amount is first reduced by 25% or 50%, depending on whether the pensioner's full income, including the pension itself, exceeds four or five times the minimum pension.

**Survivor's pensions.** The accumulation without any curtailment is allowed as long as the pensioner's income, including the pension itself, lies below 3 times the minimum pension. For higher incomes, a reduction of 25%, 40% and 50% is foreseen for income amounts falling in the brackets: three to four, four to five and more than five times the minimum.

#### 1.2.6 Financing of the public pension system

Public pension expenditure is financed through contributions and public budget transfers, mainly covering social assistance provisions.

Contribution rates are differentiated by sector, as below:

- **private and public employees:** 33%, of which about 1/3<sup>rd</sup> is paid by the employee and 2/3<sup>rd</sup> by the employer;
- **the self-employed (artisans, shopkeepers and farmers):** gradually increasing from around 23.1% in 2016 to 24% in 2018;
- **atypical workers:** from 28% in 2014 to 33% in 2018. Such percentages are reduced to 22% and 24% (as of 2016), respectively if they are pensioners or contributors to other public pension schemes<sup>16</sup>.

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<sup>14</sup> Since then pensions, including minimum pension (paragraph 1.2.3), have been indexed only to price inflation.

<sup>15</sup> For the period 2014-2018, indexation to price inflation is reduced by the following percentages which apply to the total pension amount: 95% for pensions in between 3 and 4 times the minimum, 75% for pension in between 4 and 5 times the minimum, 50% for pensions in between 5 and 6 times the minimum, 40% (45%, in 2015-2016) for pensions above 6 times the minimum. For 2014 alone, the pension quota above 6 times the minimum is not indexed.

<sup>16</sup> With the exception of professionals not enrolled in professional funds, for which the contribution rate is 27% in 2016 and reduced to 25% as of 2017.

The difference in contribution rates between employees and the self-employed is actually lower than it may appear, if expressed in terms of a homogeneous definition of the contribution base. In fact, the contribution base includes the total contributions in the case of the self-employed, and only the 1/3<sup>rd</sup> paid by the worker, in the case of employees. As for the latter, the inclusion of contributions paid by the employer in the contribution base would reduce the contribution rate from 33% to about 27%.

### 1.2.7 Taxation of pensions

Pensions are taxed as labour-income, allowing for deductions inversely correlated to income levels. Pension income below 7,500 euro per year is tax-exempt (no tax-area).

In 2016, total revenue on public pensions accounts for about 18,7% of total expenditure which corresponds to nearly 2.9% of GDP.

Contributions paid to the public pension system are fully deductible from the taxable income.

## 1.3 The private funded pillar

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The reforms passed in 1992-1993 and 1995 introduced a new legislation on private, supplementary, funded schemes. During the 1990's, other interventions were progressively adopted to regulate financial markets and reform taxation on returns from financial assets. Towards the end of the decade, additional measures were approved aiming to increase the amount of savings invested in pension funds (law 133/1999 and the related legislative decree for fiscal treatment of contributions paid to private funds).

Despite the legislative intervention mentioned above, the number of workers enrolled in private pension funds remained low. For this reason, the 2004-pension reform (law 243/2004 and the related legislative decree 252/2005) and law 296/2006 introduced further measures to foster the development of the second pillar. Two interventions thus came into force as of 2007: i) higher fiscal incentives, and ii) for the new workers, silence-as-assent for the transfer to pension funds of severance pay in the private sector employees. According to the latter, the annual flow of severance pay was transferred to private pension funds unless workers communicate their refusal. Nevertheless, enrolment in private pension funds remained on a voluntary basis.

More recently, law 124/2017 has removed the obligation for the new workers to transfer to pension funds the whole amount of their severance pay, with the aim of increasing the number of participants.

Table 20 gives some statistical information about the development of the private component of the pension system in Italy during the period 2000-2016, in terms of coverage, contributions paid, and financial assets.

## 1.4 Pension reforms since November 2014

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Law 214/2011 was the last major pension reform of the Italian pension system and was already embodied in the 2012 and 2015 rounds of projections<sup>17</sup>.

Since the last round of EPC-WGA projections there have been only minor changes to the legal framework. The main interventions, somewhat related to the pension system, have been adopted with the Budget Law 2017 and may be summarized as follows.

**Measures increasing pension amount.** The so-called 14<sup>th</sup> payment ("*quattordicesima*") already granted to pensioners with a personal income up to 1.5 times the minimum pension (monthly payment of 750 euro) has been increased by 30%. Furthermore the same provision, at its original amount, is also granted to pensioners with a personal income in between 1.5 and 2 times the minimum pension (monthly payment from 750 to 1,000 euro).

**Measures to facilitate earlier access to pension.** Lower requirements to access early retirement have been introduced in favour of:

- workers so-called 'precocious' (with at least 1 year of actual work before the age of 19) lowering the contribution requirement regardless of age. Compared to the general rule, such reduction accounts for 1 year and 10 months for males and 10 months for females. Such a facilitation is only granted to given categories of workers under particular disadvantageous conditions;
- workers involved in arduous works (*lavori usuranti*);
- the insured safeguarded from the eligibility requirements foreseen by law 214/2011 for whom a temporary extension of the programme (the so-called 8<sup>th</sup>-safeguard) has been foreseen in order to bring it to a conclusion.

Such privileges are allowed within the limit of a given amount of planned resourced, and subject to constant monitoring. In case of possible overruns, the advantage in terms of lower retirement age is correspondently reduced.

Finally, the insured with contribution periods accrued in different funds are allowed to sum them all free of charge in order to fulfil the contribution requirements to retire<sup>18</sup>.

**Measures to facilitate earlier exit from the labour market.** Temporary measures (up to 2018) have been also foreseen to facilitate earlier exit from the labour market (however not before the age of 63), through the following interventions:

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<sup>17</sup> The interventions adopted in the three-year period 2012-2015 mainly concerned: i) short term cuts to pension indexation, ii) an increase of workers safeguarded from the higher eligibility requirements foreseen by law 214/2011 and iii) the alignment of the atypical workers' contribution rate that of employees (33% in 2018). For details and financial effects, see *2015-round of EPC-WGA projections: Italy's fiche on pensions*.

<sup>18</sup> According to the previous legislation, free of charge accumulation of contributions in different funds was only allowed in case the minimum contribution requirement for an old age pension had not been achieved in any of the funds.

- the so-called '*APE sociale*' consisting of social public assistance benefits (which are not pensions, though included in public expenditure) granted before retirement to workers in disadvantageous conditions stated by law;
- the so-called '*APE di mercato*' consisting of a loan granted by the bank sector and guaranteed by pension entitlements. The loan (not included in public expenditure) is to be repaid by beneficiaries in 20 years after retirement;
- the so called '*RITA*' which is linked to the *APE di mercato* for the acceding prerequisites, though benefits (not included in public expenditure) are financed through part of the capital accumulated by workers in their private, funded pension schemes."

A detailed description of the above mentioned interventions and their financial effects are reported in Annex 7. As shown in figure 3, the upward revision of pension expenditure to GDP ratio accounts for 0.06 in 2017 and 0.1 in 2018, then it settles in between 0.13-0.14 until 2035 and slightly declines thereafter.

## 1.5 Actual 'constant policy' assumption used in the projection

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According to the current legislation, social pensions and old age allowances are indexed to price inflation. Furthermore, additional social sums, granted to the low income elderly, are constant in nominal terms. In these cases, the application of the indexation rules as laid down by law would imply, de facto, the disappearance of social assistance provisions in the long run, which play an important role within the public pension system. In fact, in the past years improvements to social assistance benefits within the public pension system have been repeatedly legislated. The same considerations apply to the minimum pension, which is only foreseen in the transitional phase for the insured before 1996. For these reasons, the pension model assumes that social assistance benefits, including additional social sums are indexed to nominal GDP per capita, in the mid-long term. However, in the short term up to 2020, pension projections fully comply with the indexation rules foreseen by current legislation.



## Chapter 2 - Overview of demographic and labour forces projections

### 2.1 Demographic development

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According to the latest Eurostat demographic projections, with 2015 as the base year, total population is expected to decrease by about 10% over the entire forecasting period (Table 3). Such a decrease mainly depends on the demographic transition (the ageing of the baby boom generations) to which add the adoption of conservative assumptions on the demographic parameters, especially concerning migration flows.

More specifically, over the forecasting period, life expectancy at birth increases by 6.2 years for women and 5.6 for men moving from 80.7 to 86.9 and from 85.3 to 90.9, respectively; life expectancy at 65, which better approximates the age of retirement, rises by 4.6 for men and 4.5 for women. The fertility rate moves from 1.34 in 2015 to 1.66 in 2070. The net annual flow of migration averages on around 190 thousand over the forecasting period with an increasing trend up to 2040, where it reaches 218 thousand units, and a subsequent decline towards 2070, where it settles on 164 thousand units.

The transition of the baby boom generations, longevity gains, and low fertility rates are responsible for the relevant ageing of the population, as shown in figure 1 which compares changes in the age structure between the base year and the end of the forecasting period. More specifically, the old age dependency ratio increases from 33.7% in 2015 to 60,3% in 2070, signaling a potential strong impact of the ageing population on age-related expenditure items and the relevance for the pension system to be provided with automatic mechanisms to counteract this pressure.

The demographic prospects, as described above, look much more worrying than those foreseen in the 2015-round of projections. All assumptions have been revised for the worse especially that on net migration. In fact, compared to the previous demographic projection (Europop 2013) i) the starting level of the fertility rate is significantly lower, ii) life expectancies of both genders are somewhat higher, and iii) the average net flow of migration has been dramatically downsized: over the first 25 years it has been reduced from an average annual level of 360 thousand to 190 thousand<sup>19</sup>. As a result, in 2060, the total population is 9,5 million lower (-14,3%) and the elderly dependency ratio 8 p.p. higher.

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<sup>19</sup> It's worthwhile noting that the set of Eurostat demographic projections is affected by serious technical and procedural shortcomings. As for the former, the annual average net migration flows, observed for Italy over the last 20 years, is significantly higher than the 2020 value assumed in the projections (242,253 against 161,150) notwithstanding in the Eurostat's technical note they refer to "an intermediate point value estimated for the year 2020, obtained as the average of the net migration observed in the last 20 years (1996-2015)". As for the procedure, the endorsement by the National Statistical Offices (European Statistical System Committee - ESSC), originally foreseen in the ECOFIN mandate, failed to materialized.

## 2.2 Labour forces

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Labour forces are projected to decrease by 13% over the forecasting period. This mainly depends on the decline in the working age population. In fact, the total participation rate in the age bracket 20-74 is significantly increasing from 60% in 2016 to 65% in 2070. Such a trend is fully explained by the evolution of older workers' participation rates, which are greatly affected by changes in the eligibility requirements. In particular, participation rates rise from 53.4% in 2016 to 73,1% in 2070, in the age-class 55-64, and from 6.9% to 31.3% in the age-class 65-74, against a slight decrease of 1.3 pp in the age-class 20-54. The latter is mainly due to male prime-age activity rates which are projected to decline in the age-class 36-44<sup>20</sup>.

As shown in tables 5, the average effective exit age increases in line with the periodic updates of the eligibility requirements, which adds to the alignment of the SRA of female in the private sector to that of other workers, in 2018. At the end of the forecasting period, the average effective exit age, as calculated by the CSM, is 67.8 for males and 69.1 for females.

Notwithstanding the steady increase in the effective exit age, in a decade or so, the labour market will face a rapid and relevant contraction in the labour force mainly caused by the demographic transition. In this context, the rise of female and older workers' activity rates are not sufficient to compensate for the reduction in the working age population. From 2027 to 2046, the employment is projected to reduce at an average annual rate of about 0.5%, and such negative dynamics go on until the end of the forecasting period, though at a lower rates.

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<sup>20</sup> This outcome is no explained by retirement legislation or past evidence of workers' behaviour. It just results from an extrapolation of a temporary impact of the economic crisis on labour forces.

## Chapter 3 - Pension projection results

### 3.1 Extent of the coverage of pension schemes

Pension projections cover the total pension expenditure for old age, disability and survivors' pensions related to contributions paid to the public pension system plus the old-age allowances and social additional sums because of their close relation with ageing. In fact, the latter are only granted to the elderly on low income.

The aggregate of pension expenditure utilized in the projections is just a bit smaller than that of Eurostat (ESSPROS statistics). The difference, which accounts for about 0.7% of GDP (Table 6), is due to:

- benefits entitled to survivors and the disabled (0.6 percentage points in terms of GDP) which are related neither to pension contributions nor to ageing (benefits paid to the disabled below the SRA, war pensions, work injury annuities and merit awards);
- supplementary pensions provided by private pension funds (0.1 percentage points in terms of GDP) which fall outside the perimeter of the public pension system.

The exclusion of private pension schemes is mainly motivated on the grounds that the State runs no risk on the financial returns. Such a statement is based on the following:

- private pension funds are never mandatory, regardless of their being occupational pension schemes or not;
- private pension funds never replaces the coverage of the public pension system, which is compulsory for all workers (no opting out);
- a quota of the capital accumulated in private pension funds (up to 50%) may be withdrawn as a one-off reimbursement at the retirement (or even before, to finance particular expenses, such as home purchasing);
- private pension funds play a supplementary role to the public pension system providing a minor fraction of elderly income. This implies that workers, who join private pension funds on voluntary basis, accept all the risks concerning the financial returns, since the public pension system in any case provides them with an adequate pension income.

#### 3.1.1 Pension expenditure to GDP ratio

Table 7 shows the projected ratio of pension expenditure (gross of tax revenues) to GDP obtained on the basis of the AWG baseline scenario and in accordance with the pension legislation in force in September 2017. Reported values refer to the end-year of each decade of the forecasting period. Graphs based on annual values are given in figure 4.



In the three-year period between the current base year of projections (2016) and that of the 2015-round (2013), the ratio of pension expenditure to GDP has been reduced by about 0.2-0.3 pp, passing from 15.9% in 2013 to 15.6% in 2016<sup>21</sup>. Such a decrease (-1,9%) results from a GDP growth of 4.2% against an expenditure growth of 2.6%.

As of 2016, the ratio stays more or less stable up to 2020 and then it rises dramatically to its peak of 18.7% in 2040. Thereafter, pension expenditure declines rapidly in terms of GDP, reaching 17.3% in 2050, 15.1% in 2060 and 13.9% in 2070.

The stability of the ratio over the first five years of the forecasting period, is mainly due to the tightening of the eligibility requirements for old age and early pensions, and particularly the alignment of the SRA of women in the private sector to that of other workers by 2018.

The steep trend of the ratio after 2020 is caused by the low productivity growth, well below its convergence level in 2045<sup>22</sup>, and the transition of the baby boom cohorts to old age, which raises the ratio of pensions to employees, despite the containing effects exerted by the tightening of the eligibility requirements. In this phase, the pressure of demographic factors exceeds the declining trend in the benefit ratio that comes about from the gradual introduction of the NDC scheme.

The transition for the DB to the NDC scheme is shown in figure 5, where the new pensions are broken down in three components referring, respectively, to workers almost fully covered by the DB scheme (at least 18 years of contributions in 1995), workers under the mixed, pro rata scheme (less than 18 years of contributions in 1995) and new entrants after 1995. As can be seen, old age and early retirements of the first group will be almost over as of 2020-2021, when retirements of the second group, whose pensions are increasingly calculated with the NDC method, become preponderant and goes in parallel with the demographic transition up to 2040-2045, thus mitigating its financial impact. As expected, for disability pensions the transitional process is somewhat accelerated, due to lower contribution records at retirement.

The rapid contraction in pension expenditure to GDP ratio over the final part of the forecasting period is determined by full application of the NDC scheme<sup>23</sup>, which runs in parallel with the stabilization and subsequent decline in the ratio of pensions to employees. The latter mainly arises from the gradual exit of the baby boom generations flanked by the operating of the automatic adjustment of eligibility requirements to changes in life expectancy.

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<sup>21</sup> The latter is substantially in line with the ratio forecasted in the previous round of projection (15,6%).

<sup>22</sup> The low productivity growth in this period depends on the initial growth rates (T+10 forecast), almost nil, and the year of convergence of total factor productivity growth rate which has been postponed to 2045, with respect to 2035 of the previous round.

<sup>23</sup> Full application of the NDC scheme implies, amongst the others, that the implicit reference wage is calculated over the whole career thus reflecting wage and GDP (valorization factor) dynamics over a quite a long period back. Given the poor performance of both variables in the first part of the forecasting period, this contributes to the containment of the average pension dynamics in the following decades (Fig. 4.b).

However, the pension expenditure to GDP ratio at the end of the forecasting period is still significantly above (about 0.9 pp.) its theoretical steady state level. As shown in Annex 6, the ratio stops declining after 2070 for some fifteen years, before converging to around 13% in the very long run.

### 3.2 Tax revenues on pensions

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Tax revenues on pensions, reported in Table 7, have been projected following the same rule adopted in the previous round of projections, which states that tax revenues as a share of pension expenditure stay constant over time. Such an approach, though extremely simplistic, has the merit of guaranteeing cross-country comparability, since both income tax systems and pension models vary considerably from country to country. According to the rule, the tax revenues on public pensions are projected to move from 2.9% of GDP in the base year to 3.5% around 2040 and then settle on 2.6% towards the end of the forecasting period.<sup>24</sup>

### 3.3 Pension expenditure by scheme/sector

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Table 8 shows that old age and early pensions, including disability pensions above the SRA, cover the largest part of pension expenditure. The incidence passes from 81.3% in 2016 to 85.2% in 2070. In the same period, the weight of survivors' pensions declines slightly from 16.2% to 12.8%, while the quota of disability pensions, below the SRA, increases from 2.5% to 2.1%.

Table 8 also gives the projected pension expenditure distributed by sector. Discarding old age allowances and the social additional sums, private sector employees, including atypical workers, account for about 57.3% of the total pension expenditure in 2016, and their relative weight increases up to 72.9% in 2070. Correspondingly, the quota of the public sector employees and that of the self-employed is reduced from 25.9% to 14.3% and from 14.9% to 10.2%, respectively.

Changes in the distribution of pension expenditure by sector are only partly explained by the composition of the insured, which follows the same pattern. An important contribution comes from the containing effects brought about by the introduction of the NDC method, which mainly affects public sector employees and the self-employed. The former depends on the DB calculation method which was more generous for the employees in the public sector than those in the private one. The latter depends on the self-employed contribution rate which is lower than that of other workers (24% instead of 33%).

Finally, the expenditure for social pensions and old age allowances is projected to increase in terms of GDP, moving from 0.3% in 2016 to 0.4% in 2070. Such a trend is driven by

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<sup>24</sup> Information concerning the incidence of income tax on pensions in the base year is important in order to assess the real burden of public pension expenditure in terms of GDP, and make it comparable amongst countries.

both the number of beneficiaries and the average amount of pension. The former mainly depends on the ageing population and the decreasing quota of the elderly with only survivor's pension entitlements; the latter is due to the more favourable indexation rule assumed under the constant policy scenario (§.1.5).

## 3.4 Main driving forces behind pension projections

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### 3.4.1 Benefit ratio and economic dependency ratio

Based on the decomposition reported in table 9.a and 9.b, the demographic transition and the expected increase in life expectancy will exert a strong negative impact on the dynamics of pension expenditure to GDP ratio. Such an effect (measured by the old age dependency ratio) accounts for 10.2 pp over the entire forecasting period and is mainly concentrated in the period 2020-2040.

However, in the long run, the potential deterioration of the sustainability of the pension system, driven by the adverse demographic perspectives, will not materialize thanks to the compensating effects brought about by the substantial pension reforms adopted in the past, which are reflected in the projected evolution of i) the benefit ratio (-3.96 pp), due to the introduction of the NDC scheme and the indexation of pension to price inflation alone; ii) the coverage ratio (-4.54 pp), because of the increase in the eligibility requirements and their linkage to changes in life expectancy and iii) the employment ratio, mainly boosted by the postponement of retirement age.

The decomposition of pension expenditure to GDP ratio as a product of the 'benefit ratio' (the ratio of average pension to labour productivity) and the 'economic dependency ratio' (the ratio of pensions to employees) allows for a better analysis of the driving forces behind the baseline pension projection (Figures 4.b and 4.c).

The economic dependency ratio shows an initial declining path which lasts until around 2021, followed by a substantial stability over the subsequent five years. Such a downward trend is mainly due to the tightening of the eligibility requirements and the contextual increase in the employment rate. Thereafter, over the following two decades, the ratio of pensions to employees begins to rise steeply because of the demographic transition, when the baby boom generations are expected to move from the working age (denominator) to the old age classes (numerator), while the employment rate stops increasing. In the last part of the forecasting period, the economic dependency ratio first stabilizes and then declines because of the exit of the baby boom generations.

The benefit ratio, instead, increases steadily up to 2027 before stabilizing for some years. In that period, in fact, the increasing quota of pensions calculated according to the NDC method does not compensate for the low productivity growth assumed in the transitional phase. In the subsequent period, however, when the productivity growth approaches its structural level, the benefit ratio decreases significantly because of the phased-in process of the NDC scheme.

As reported in Figure 6, the dynamics of the benefit ratio strongly depends on the dynamics of old age and early pensions. In turn, the latter is largely explained by the reduction in the replacement rate which reflects the evolution of new old age and early pensions.

### 3.4.2 Average replacement rates

As noted above, the reduction in the benefit ratio is mainly due to normative reasons. Besides the indexation of pensions to price inflation alone, an important role is played by the gradual shift from the DB to the NDC scheme, enforced by the revision of transformation coefficients in accordance with mortality assumptions.

The latter effect, due to regulatory factors, is much more apparent from the projected evolution of the average replacement rate reported in Table 10.a and in Figure 6, in comparison with the benefit ratio. As can be seen, up to around 2020, the average level of new pensions is stable and significantly higher than that of total pensions, both expressed in terms of economy wide average wage, because of the endurance of the DB calculation rules. Thereafter, the replacement rate starts to decline mainly due to the gradual shift from the DB scheme to the NDC one, to which adds a reduction in the contributory period of male workers in the decade 2021-2030.

As long as the replacement rate stays significantly above the benefit ratio, the latter tends to rise. As the difference becomes gradually smaller, the benefit ratio first stabilizes, around 2025-2030, and then declines in parallel with the replacement rate up to about 2050.

In the last two decades of the forecasting period, the average replacement rate diverges again from the benefit ratio due an increase in the average contributory period (about 3 years) flanked by the fully phased-in application of the NDC. In fact, changes the average level of new pensions take quite a long time be fully reflected into the average level of total pensions.

Table 10.b shows the evolution of the ratio between the average pension (new old age and early pensions), and the gross average wage/labour income at retirement. This indicator remains substantially stable around a value of 65% until 2021, because of the endurance of DB calculation rules as well as the increase in the individual contribution records thanks to the tightening of the eligibility requirements. All this is accompanied by low dynamics of productivity, which is substantially nil, in real terms, over the period concerned.

With the gradual consolidation of the NDC calculation method, flanked by a recovery in productivity growth, the ratio starts to decline, settling on its minimum of about 45% around 2050 and then increases again up to close to 50% at the end of the forecasting period. It is interesting to note that, during the transitional phase, the indexation of pension to price inflation reduces the gap between the older pensions, calculated with the

more generous DB rules, and the new ones which are correlated with current earnings (Table A2.1 and Fig. 6).

Table 10.b also reports the replacement rate at retirement net of supplementary pensions, which approximates the replacement of new pensioners. Such an indicator is obviously more informative for cross country comparison, given that the ratio between pensions and pensioners may vary considerably among member states<sup>25</sup>. As expected, the replacement rate referring to new pensioners is higher than that referring to new pensions, the difference settles on 2.2 pp towards the end of the forecasting period.

The replacement rate calculated in terms of average final wages does not allow to assess the relative size of new pensions in terms of average labour compensation. In this regard, Table 10.b also reports the replacement rate expressed in terms of the average economy wage. Compared to replacement rate based on final wages, it settles on 10 pp above, on average.

Although useful to measure the impact on pension amount due to changes in calculation rules, gross replacement rates are insufficient to assess whether the pension system can guarantee an adequate income to the elderly after retirement. In this regard, the analysis should be complemented with further information concerning the distributive effect of the pension rules, the presence of a safety net, the disposable income of the pensioner before and after retirement, and additional income sources provided by private, funded pillar (Annex 2)<sup>26</sup>.

### 3.4.3 Old age and economic dependency ratio

Figures 4.d-4.f provide more information about the evolution of pensions to employees ratio (economic dependency ratio), which is projected to increase significantly less than the elderly dependency ratio. Apart from the counteracting effect brought about by the increase in the employment rate (Figure 4.e), the more contained dynamics of the economic dependency ratio mainly depend on the incidence of pensions to the population 70+, which is projected to decline considerably over time (Figure 4.d). The reason for that is to be found in the evolution of survivors' pensions entitled to the over 70 and the earnings-related pensions paid to the under 70.

As for the former, it should be noted that changes in life expectancy, while significantly affect the number of the elderly, are more or less neutral to the evolution of survivors' pensions. In fact, higher life expectancy does not increase, for the widow or widower, the average period of outliving their spouse.

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<sup>25</sup> Supplementary pensions are public old age pensions based on contribution records not utilized for the calculation of the main pension. Therefore, they are generally very small. Without them, the number of new pensions coincides with the number of new pensioners and, consequently, the average amount of pension increases, as well as the average number of contribution years.

<sup>26</sup> In this regard, Annex 2 provides a micro-level analysis of gross and net theoretical replacement rates, i.e. the ratio between the initial, annual pension and the last annual wage, for different typologies of career.

As for the latter, it is worth mentioning that the incidence of pensions to people under 70, expressed in terms of the elderly (70+), will be reduced not only for the increase in the eligibility requirements, but also, and to a large extent, for a simple composition effect due to changes in the demographic structure. In fact, the quota of population in the age bracket 50-69 (where the relevant part of pensions under 70 is placed) on that of people 70+ is projected to fall relevantly, being responsible for two-fifth of the total reduction in ratio. This means that the number of pensions under 70 would be reduced even if the take-up ratio were constant.

#### 3.4.4 Pensioners and elderly population

Tables 12.b and 13.b report in total and for women, the incidence of pensioners in terms of population. As expected the percentage of the retired tends to shrink over time for all the age brackets characterized by a remarkable increase in the eligibility requirements, namely from 60 to 69. Instead, such a reduction is much lower in the age bracket 70-74 where changes in the eligibility requirements are limited and will materialize only towards the end of the forecasting period.

Looking at the elderly above 70, the incidence of pensioners is slightly decreasing. Apart from the reduction in the age bracket 70-74, mentioned above, this is mainly due to the presence of non-resident pensioners in the base year. In fact, the definition of population underlying the demographic projections refers to resident persons, while pensions are also paid to the non-resident. As can be seen at the bottom of the table, taking out non-resident pensioners at the beginning of the forecasting period leads to such a reduction disappearing. This means that the number of 70+ pensioners is projected to evolve fully in line with the population in the same age bracket, thus confirming the demographic consistency of pension projection.

Furthermore, it should be considered that immigrants over 60 are likely to bring with them pension rights matured in their own countries or, alternatively, they are not able to mature pension rights in the host country. Analogously, elderly people leaving the country are likely to take their pension entitlements away with them. If the two group numbers were the same there would be a sort of compensation: non-resident pensioners would be counterbalanced by the resident without pension rights due to their entering the country at an advanced age. In the case of Italy, the latter tend to exceed the former during the forecasting period, according to the assumptions on net migration flows<sup>27</sup>. If we took out the quota of the elderly deriving from net migration flows above 60<sup>28</sup>, which accounts for 0.7-0.8 pp in the second half of the forecasting period (0.9 for female alone), the incidence of pensioners to population would be correspondingly higher.

The same conclusions may be drawn from the analysis of the incidence of pensioners in terms of inactive population, reported in table 12.a and 13.a.

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<sup>27</sup> At the beginning of the forecasting period, however, non-resident pensioners do not have any appraisable compensation, as Italy has only recently moved from being a net sending country to a net receiving one.

<sup>28</sup> Such a component is significantly lower than it was in the previous round of projections due to the downward revision of the assumption on migration flows.

### 3.4.5 Old age and system dependency ratios

The Old age Dependency Ratio (ODR) expresses a demographic concept of dependency which is based on the population age structure (§. 2.1). In fact, it compares the elderly above a given age threshold (generally 65), supposed economically dependent, with the working age population (generally 20-64), supposed economically active. However such a decomposition does not correspond to an economic concept of dependency. In fact, an elderly person might be still active and contributing to the pension system, while an adult might be inactive and receiving pension benefits. On top of that, the age thresholds which separate dependent people (elderly and young) from the working age population are not clearly defined and may vary over time in relation to possible changes in individual behaviours and legislative frameworks regulating pension and educational systems.

Diversely, such aspects are reflected in the economic dependency ratio, defined as the ratio between pensioners and employees, regardless of age. This indicator, labelled as 'Pension System Dependency Ratio (SDR)' in Table 11, emphasizes the contribution brought about by changes in the legal framework of the pension system.

The ratio between the SDR and ODR provides a measure of what can be roughly labelled as 'System Efficiency', being aware that many factors may affect it other than the pension system regulation. As shown in table 11, such an indicator undergoes a large reduction over the forecasting period, from 1.9 in 2016 to 1.2 in 2070 signaling the effectiveness of the pension reform process described in chapter 1.

## 3.5 New public pension expenditure

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Tables 14.a-14.c illustrate, in total and for both genders, the projected expenditure for new pension and its decomposition in terms of pensions and their average amount. In turn, the latter have been broken down into three factors: the average contribution period, the average pensionable earnings, and the average accrual rate.

The evolution of the number of new pensions clearly reflects the impact of the transition of the baby boom generations. From an average annual level of about 430,000 over the first decade of the forecasting period, the number of new pensions increases to a level close to 700,000 in the middle of the forecasting period (2030-2040), and declines afterwards to about 510,000 units toward the last decade. Gender composition shows that new male pensions account for about 55-60% of the total.

The average accrual rate is a weighted average of the accrual rate explicitly foreseen in the DB calculation method (2%) and that implicit in the NDC scheme, defined as the product of the contribution rate times the transformation coefficient at the age of retirement. The former is constant, while the latter changes according to the contribution rate, the age of retirement and the periodic revision of transformation coefficients. The average accrual rate passes from 1.93%, characterized by the prevalence of pensions calculated on the basis of the DB method, to 1.70% around 2035, when the NDC method is largely

predominant, and then to 1.65% at the end of the forecasting period. The latter may be obtained by simply multiplying the average contribution rate (about 31%) by the transformation coefficient corresponding to the average retirement age, about 5.3% (Figure 7). Gender analysis highlights that the average accrual rate of females is a little higher than that of males by about 0.1. This signals that women will retire somewhat later than men under the NDC scheme being less probable for them to access early retirement due to generally lower contributions/pension rights. It also depends on the privilege of an augmented transformation coefficients granted to women in relation to the number of children (§. 1.2.1).

Figure 7 illustrates how and to what extent the indexation of the eligibility requirement to changes in life expectancy is able to compensate for the downward effects due to the revision of the transformation coefficients.

The average contribution period per pension increases by about 3.7 years reaching in 2070 a level of 38.4 (Figure 8). Such an increase accounts for about 60% of the corresponding increase in the average retirement age. The difference is mainly explained by the postponement of the entry age in the labour market observed for younger generations. Though the final value shows no visible gender differentiation, in the central part of the forecasting period the average contribution period of men exceeds that of women by a couple of years.

The overall increase in the average contribution period is basically concentrated in the last part of the forecasting period. The initial rise, up to 2020, is due to the elevation of the retirement age, also driven by the alignment process of the SRA of women in the private sector to that of the other workers.

Instead, in the central part of the forecasting period, the average contribution period stays almost stable, despite the indexation of the eligibility requirements. This outcome has basically two explanations. Firstly, the cohorts retiring in this period started contributing to the pension system somewhat later compared to their predecessors, as emerges from the database of the insured. Secondly, early retirement foreseen under the NDC scheme becomes gradually effective as of around 2030 and thus contributes to slowing down the increase in the average retirement age.

Both explanations also clarify gender differences in the contribution records. In fact, the probability for women to access early retirement under the NDC scheme is much lower than men, due to well-known gender gaps in wages and careers<sup>29</sup>. On top of that, the average entry age into the labour market of women is somewhat higher than that of men.

However, in the last 20 years of the forecasting period, the average contribution period grows again in line with the average retirement age, since both the above-mentioned factors cease to operate. In fact, the entry age into the labour market of the cohorts

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<sup>29</sup> As reported in §. 1.2.2 and Annex 1, a substantial minimum amount of pension is required (1,200 euro in 2012 indexed with the five-year mobile average of nominal GDP).



retiring in this period tend to stabilize<sup>30</sup> as well as the percentage of those retiring earlier than the SRA. The phased-in process of early retirement under the NDC scheme together with the most favourable assumptions on female employment rates over the first years of the forecasting period also explain the gradual narrowing of gender differences.

The average contribution period per pensioner follows the same path as that of pensions, though it is a couple of years higher, since supplementary, additional pensions are generally of a very small amount. Figure 8 compares the projected evolution of such a variable with that of the average contribution period per pension.

The average pensionable earnings should be actually interpreted as a weighted average between the explicit reference wage under the DB method and an implicit reference wage under the NDC one<sup>31</sup>. As expected, average pensionable earnings, if deflated with productivity growth, decline in the long run according to the gradual shift towards the NDC calculation rules. In terms of the average gross wage (national accounts figures), it passes from 110% of the first decade to around 90% of the last one.

In terms of GDP, the decline of pensionable earnings is less marked because of the negative evolution of employment over the entire forecasting period, except for the first decade<sup>32</sup>.

### 3.6 Pension contributions and contributors

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Contributors evolve substantially in line with employment over the whole forecasting period, allowing for minor adjustments by sector (Table 16)<sup>33</sup>. At the same time, the average labour income subject to contribution (contribution base divided by the number of contributors) are made to grow in line with productivity, according to the general rule agreed in the AWG for the mid-long term. As a consequence, the overall contribution base evolves in line with GDP growth. Therefore, the total pension contributions remain basically constant as a share of GDP, except for a slight increase up to 2018 due to the gradual elevation of the contribution rates foreseen for the self-employed and atypical

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<sup>30</sup> According to the methodology of the Cohort Simulation Model, the average entry age into the labour market is basically kept constant, even over the first two decades of the forecasting period.

<sup>31</sup> With regard to the former, the number of last annual wages involved in the calculation of the reference wage mainly depends on sector, contribution period and retirement age. As for the latter, the implicit reference wage is defined as an average of lifelong wages indexed with GDP growth (§. 1.2.1).

<sup>32</sup> Such an outcome is substantially in line with that of the 2015 round of projections. However, the difference between the growth rates of pensionable earnings and GDP is somewhat higher in the current round of projections, over the first 10-15 years of the forecasting period, and lower thereafter. This is mainly due to the valorization factor which actually is a mobile average of GDP growth rates over the previous five years. Therefore, when GDP growth rates are increasing, pensionable earnings grow less than GDP and, furthermore, the higher the increase the larger the difference. On top of that, in the three-year period 2013-2015, the cumulative GDP growth has actually turned out to be about 3% lower than that forecast in the 2015 round, affecting negatively the valorization factor over the following years.

<sup>33</sup> The probability of exiting from the labour market, as estimated by the Commission, does not guarantee in itself consistency with the probability of retiring that is endogenously calculated by the pension model on the basis of the fulfilment of contribution and age requirements. However, through a bilateral consultation, a satisfactory approximation of the exit probability was achieved in the mid-long run, allowing for some differences in terms of distribution by age, gender and time profile.

workers. Starting from the level of 10.7% in 2016, contributions to GDP ratio settles on 10.9% in 2020 and maintains this level up to 2070 (Table 7).

### 3.7 Sensitivity analysis

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Table 17 reports the deviations in the projection of pension expenditure to GDP brought about by the sensitivity tests agreed in the AWG. Figure A4.1, in Annex 4, also compares the deviations in public debt as a share of GDP in 2040 and at the end of the forecasting period.

However, notwithstanding the typology of indicator, any comparison with the baseline scenario should be taken with caution for the following two reasons: i) the magnitude of the projected deviations directly depends on the size of changes to demographic and macroeconomic parameters, which are fully discretionary, ii) the effects on pension expenditure brought about by changes in demographic and macroeconomic assumptions do not fully materialize within the forecasting horizon. The extent of the impact varies significantly depending on the sensitivity test concerned and the time profile with which the change is applied. In general, pension expenditure is scarcely affected by changes in fertility rates, even at the very end of the forecasting period, and partially affected by changes in productivity and migration flows, as long as they are applied permanently.

Since the current legislation already foresees a linkage between the eligibility requirements and changes in life expectancy (§. 1.2.2), the sensitivity test on 'policy scenario' is of no relevance in this setting.

**Life expectancy:** *2-year increase gradually achieved over the whole forecasting period.*

Assuming a 2-year increase in life expectancy, the elderly dependency ratio (people of 65+ to working-age population 20-64) settles at an increasingly higher level. At the end of the forecasting period, it is about 5 percentage points higher (65.5% vs 70.2%) than in the baseline. In fact, while the denominator (working-age population) tends to remain almost unchanged, the numerator strongly reflects differences in life expectancies. However, the increasing deviation in the elderly dependency ratio is counterbalanced by the containing effects exerted on the number of pensioners, by the indexation of the eligibility requirements, and on the average amount of pension, by the revision of transformation coefficients. The counteracting effects exerted by the automatic adjustment to changes in life expectancy overcome those brought about by demographic changes, until around 2050. Thereafter, the ratio of pension expenditure to GDP tends to increase a little more rapidly than that under the baseline assumptions until it settles 0.1 percentage points above, in the last 15 years of the forecasting period.

In order to explain the size and the time profile of deviations from the baseline, it is useful to recall that an increase in life expectancy, and then in the retirement age, produces a reduction in the number of new pensioners. Correspondently, the same change in life expectancy implies lower mortality rates for all ages (especially among the very elderly),

which gradually raise the number of total pensioners. The latter gradually compensate for the financial effect caused by the reduction of new pensioners. As expected, the transition of the baby boom generations emphasizes the saving effects in the central part of the forecasting period, as they retire, and the compensating effects in the last part, as they get older<sup>34</sup>.

**Productivity:** *0.4 pp higher/lower TFP growth as of 2045, linearly achieved from 2027.*

Under the capital stock rule, a symmetrical change in TFP growth of 0.4 pp, produces a symmetrical deviation in productivity and GDP growth of 0.6 pp. Consequently, the ratio of pension expenditure to GDP is lower/higher than that in the baseline. The deviation gradually increases till around 2060, where it accounts for 1.4 pp (lower TFP) and -1.2 pp (higher TFP). Afterwards the gap shrinks slightly towards the end of the forecasting period<sup>35</sup>.

As expected, the differences in the ratio of pension expenditure to GDP are explained by the diverse evolution of the benefit ratios. Instead, the ratio of pensions to employees and its decomposition are going to change imperceptibly. The latter depends on the NDC method, which also requires a minimum amount of pension to access early and old age retirement (Figure A5.8 e A5.9 in the Annex).

**Employment rate:** *2 pp higher/lower employment rate in the age bracket 20-64 as of 2035, gradually achieved from 2018 by changing unemployment rate.*

An upward/downward change in the employment rate immediately translates into a corresponding increase/decrease of GDP growth. This causes the ratio of pension expenditure to GDP to settle below/above the baseline. In fact, higher/lower employment levels result in a corresponding higher/lower number of pensions only after a long period. However, towards the end of the forecasting period, the ratio of pension expenditure to GDP tends to overlap the baseline projection. This is partly due to the replacement rates under the NDC regime, which are increasingly higher/lower than those in the baseline, due to higher/lower GDP growth rates utilized for the capitalization of the accrued contributions.

**Older workers' participation rate:** *10% increase of employment rates in the age bracket 55-74 as of 2030, gradually achieved from 2018.*

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<sup>34</sup> The positive deviation in the last part of the forecasting period is also explained by the specification of the sensitivity test assumptions provided by the Commission which do not envisage any change in employment rates compared to the baseline in the second half of the forecasting period, despite the increase in the average retirement age still driven by changes in life expectancy.

<sup>35</sup> When pensions are indexed only to price inflation, as in the case of Italy, an increase (decrease) in the growth rate of productivity will result in an increase (decrease) in the growth rate of GDP of the same size. Diversely, pension expenditure is only marginally affected at the beginning. In fact, productivity growth only impacts on new pensions, which are related to earnings. Generally, it takes two to three decades until the structural change in the growth rate of productivity is entirely transferred to pension expenditure evolution.

Current pension legislation already foresees a tightening of the eligibility requirements over the same period the older workers' participation rates have been increased according the sensitivity test assumptions. In this regard, prolonging working lives, further than that already assumed in the baseline scenario, has been achieved through two interventions: zeroing the probabilities of early retirement and increasing the propensity of working after the SRA. The pension model calculates the corresponding lower number of pensioners and the subsequent increase in the average amount of pension due to higher contributions accrued.

Ex-post, the increase in the employment rates of older workers brought about by changes in retirement assumptions has turned out substantially in line with that provided for, though some differences remain in terms of age and time profiles.

The reduction in pension expenditure to GDP ratio reaches its maximum value of about 1.9 percentage points around 2030. Such an outcome mainly reflects changes in employment (and GDP growth) and in the number of pensions during the first decades of the forecasting period. Moving towards 2070, these effects tend to be counterbalanced by an increase in the average pension due to longer working careers and, under the NDC system, higher transformation coefficients and capitalization rates. In the last decade of the forecasting period, the latter effect tends to equalize, in terms of financial effects, the reduction in the ratio of pensioners to employees.

**Migration:** *33% increase/decrease of net flows of immigrants.*

An increase in migration flows implies a reduction in pension expenditure to GDP ratio. Compared to the baseline scenario, the maximum difference of 0.7 percentage points is reached around 2050. Afterwards, it tends to shrink towards 2070, where it accounts for about 0.5-0.6 percentage points. Such a result is explained by higher GDP growth rates, due to increased numbers of employees. In particular, the decrease in the elderly dependency ratio is translated into the ratio of pensions to employees. The difference tends to stabilize as soon as the additional immigrants are transformed into elderly people and, consequently, pensioners. A further containing effect on pension expenditure is exerted by higher replacement rates, which come about from the more favourable capitalization rates, linked to GDP growth, under the NDC regime.

Projection results are symmetrical in case of an equivalent decrease of the net flows of immigrants.

**Fertility rate:** *20% decrease of fertility rate gradually achieved over the whole forecasting period.*

Any change in the fertility rate starts to turn into employment after some 20 years and it takes further 40-50 years to affect the number of pensioners. This means that no effect is produced on pension expenditure within the horizon of the forecasting period, apart from

that coming from disability pensions (actually negligible) and, to some extent, poorer replacement rates due to lower capitalization rates under the NDC system.

Therefore, a 20% reduction in the fertility rate would gradually increase the projected ratio of pension expenditure to GDP starting from around 2035. The deviation accounts for 0.6 in 2050, 0.9 in 2060 and settles on 1.2 pp at the end of the forecasting. As expected, such an outcome is greatly explained by a corresponding decrease in the number of employees, and GDP level, partially compensated for by lower pension amounts towards the end of the forecasting period.

**Risk scenario:** *TFP growth rate converging to 0.8.*

Such a scenario differs from the baseline only for the convergence level of TFP growth which settles on 0.2 pp lower in 2045. According to the capital formation rule agreed in the AWG, this implies a reduction in productivity growth of 0.3 pp. Therefore the results are substantially in line with those obtained with the sensitivity test on lower productivity growth.

### 3.8 Comparison with the previous AWG baseline projections

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Table 18 compares pension results in the 2018-round of projections and those of the previous round, where differences of pension expenditure to GDP ratio are decomposed according to the main driving factors. An in depth explanation of pension projections carried out in the previous rounds, as well as changes between subsequent updates, is reported in the pertinent fiches on Italian pension projections<sup>36</sup>.

Differences between 2018 and 2015-AWG pension projections are mainly explained by changes in the scenario assumptions, since the legislative framework has undergone only minor changes (see §. 1.4) and the starting level of pension expenditure to GDP ratio has turned out to be fully in line with that forecast in the previous round. In this regard, three aspects deserve to be pointed out (Figures 9 and 10).

**Pension expenditure to GDP ratio in 2016.** In the base year of the current round of projections, pension expenditure to GDP ratio account for 15.6%. Such a value is substantially aligned to that forecast for the same year in the previous round of projections. In nominal terms, pension expenditure and GDP are both lower (3.2% and 3.4% respectively) mainly because of the inflation rates in the three-year period 2014-2016, which has turned out to be lower than those assumed in the 2015 round of projections.

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<sup>36</sup> In particular, for the projection rounds 2001, 2006 and 2009, see Italy's fiche published in the third volume of the 2009-ageing report. Economic Policy Committee – European Commission (AWG), *Pension schemes and pension projections in the EU-27 Member States 2008-2060*, pages 192-195, Occasional Papers 56/October 2009. Italy's fiches related to 2012 and 2015 rounds of projections are available in the following web site:

[http://ec.europa.eu/economy\\_finance/publications/european\\_economy/ageing\\_report/index\\_en.htm](http://ec.europa.eu/economy_finance/publications/european_economy/ageing_report/index_en.htm)

**Pension reforms.** As already explained in paragraph 1.4, only minor interventions to the pension system have been adopted since the last round of projections, which were mostly included in the budget law for 2017. A detailed description of their financial effects is reported in Annex 7. As shown in figure 3, changes in pension legislation are responsible for an upward revision of pension expenditure to GDP ratio of 0.06 in 2017, 0.1 in 2018 and then for values in between 0.13-0.14 until to 2035 and slightly less thereafter.

**Changes in scenario assumptions.** Once rescaled for the small differences due to changes in pension legislation, the projected differences in the dynamics of pension expenditure to GDP ratio are fully explained by the revision of scenario assumptions, especially concerning migration flows and TFP. Such an effects is particularly huge around 2045, in the peak years, where it accounts for 2,9 pp and is gradually reduced toward the end of the forecasting period, settling on about 0.9 pp.

All in all, the relevant worsening of the baseline pension projection compared to the previous round greatly depends on the huge downward revision of potential growth prospects (denominator of the ratio), especially over the first 20 years of the forecasting period, which directly reflects changes in net migration and TFP growth assumptions (Fig. 10)<sup>37</sup>. Over the forecasting period, until 2060, the potential GDP growth has been halved from an average annual rate of 1.4 to 0.7. As expected such a reduction is much more relevant in the first 25 years of the forecasting period passing from 1.3 to 0.4.

As known, the deterioration of potential GDP prospects, causes immediately an increase in the ratio of pension expenditure to GDP, because of the denominator. It takes a few decades until lower GDP growth rates gradually translate into lower pension expenditure, through a reduced number of pensioners (related to migration), and the average amount of pension due to lower wages/labour income (related to productivity) and capitalization rates (related to GDP and then to migration and productivity). Therefore, compared to the baseline projection of the previous round, the deviation in pension expenditure to GDP ratio is rapidly increasing up to 2044, in line with to the huge difference in GDP growths. Thereafter, the deviation gradually shrink since the difference in GDP growths tend to disappear and pension expenditure reflect the lower GDP growth in the first part of the forecasting period.

Table 18 reports a decomposition of the change in pension expenditure to GDP ratio over the whole forecasting period (-1.75 pp) in terms the main driving forces. As expected, the dependency ratio exerts a huge negative impact on the ratio, which accounts for more than 10 pp. Such an effect is compensated for by the benefit ratio (-3,96 pp), the coverage ratio (-0,54 pp) and the employment rate (-1.42 pp).

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<sup>37</sup> The downside revision of productivity growth is due to a corresponding revision of TFP growth. The latter comes from the interaction of the following two circumstances: i) the current poor dynamics of TFP, which is reflected in the Commission short terms forecast (Spring forecast 2017), and the mechanical extrapolation until 2026 (T+10), ii) the postponement of the year of convergence of TFP growth rate towards a UE common level, from 2035 to 2045. As a results, the productivity growth is almost nil over the first decade of the forecasting period and stays at a low level in the following 20 years, during the convergence phase. Instead, the new assumptions on employment rates seem almost neutral to the baseline pension projection: the slightly negative impact produced by the structural unemployment rate, a bit higher than that in the 2015 round, is compensated for by a modest improvement in the activity rates.

The comparison with the 2015-AWG baseline projection, based on the same decomposition formula, is somewhat distorted because of the forecasting periods not fully overlapping<sup>38</sup>. Nevertheless, the differences in the contributions of the driving forces clearly confirm the outcome reported above: a substantial worsening of the dependency ratio compensating by a more or less equivalent effect brought about by the benefit ratio.

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<sup>38</sup> The 2015 EPC-AWG projections covered the period 2013-2016, while the current ones the period 2016-2070.

## Chapter 4 - The projection model

### 4.1 Updating and institutional utilization

As in the past, the projections of the Italian pension system for the 2018 round of EPC-WGA forecasting exercise have been run with the model of the Department of General Accounts (Dipartimento della Ragioneria Generale dello Stato – RGS), which covers the whole public pension expenditure, according to the definition given in paragraph 3.1.

The RGS pension model has been regularly updated since 1999 (yearly up to 2011 and twice a year thereafter). Ordinary updating procedures involve the setting of data and parameters for the base year, while demographic and macroeconomic assumptions are revised depending on the availability of new estimates and information. Methodological improvements have also been introduced over time.

Projections of the Italian pension system regularly made are made on the basis of two different baseline scenarios respectively based on national and EPC-AWG scenario assumptions. The latter are regularly presented as part of Italy's Stability Programmes, in the section devoted to the analysis of the mid-long term sustainability of public finances. The projection based on the national baseline scenario is also reported in the Public Finance Documents<sup>39</sup>.

Projection results, based on both scenarios, are illustrated in the RGS annual Reports which focus on the mid-long term prospects of public expenditure for pensions, health and long term care. Any changes to the projection model and scenario assumptions are also commented in the Report as well as the updating procedure. The RGS Reports also include an in depth sensitivity analysis of demographic and macroeconomic parameters. Since 2002, a standardized set of tables has been included in the Annex of the RGS Report, which encompass analytical results of projections in order to improve comparability through time and between different scenario assumptions..

The latest RGS Report refers to the 2017-update of projections and is based on the legislation in force in March 2017.<sup>40</sup> In this context, the EPC-WGA baseline scenario already incorporates, for the mid-long term, the new set of demographic and macroeconomic assumptions defined in the EPC-WGA for the 2018-round of age-related

<sup>39</sup> Such documents are prepared each year by the Ministry of Economy and Finance and presented to Parliament by the Government.

<sup>40</sup> Ministero dell'Economia e delle Finanze-RGS (2017), *Le tendenze di medio-lungo periodo del sistema pensionistico e socio-sanitario* (Mid-long term trends for the pension, health and long term care systems), Report no. 18, [www.rgs.mef.gov.it/Documenti/VERSIONE-I/Attivit--i/Spesa-soci/Attivita\\_di\\_previsione\\_RGS/2017/NARP2017-08.pdf](http://www.rgs.mef.gov.it/Documenti/VERSIONE-I/Attivit--i/Spesa-soci/Attivita_di_previsione_RGS/2017/NARP2017-08.pdf)



expenditure projections<sup>41</sup>. The latest projections, based on national and EPC-WGA baseline scenarios, was made in September for the Update of the Economic and Financial Document and the results will be also published in the Update of the RGS Report no. 18.

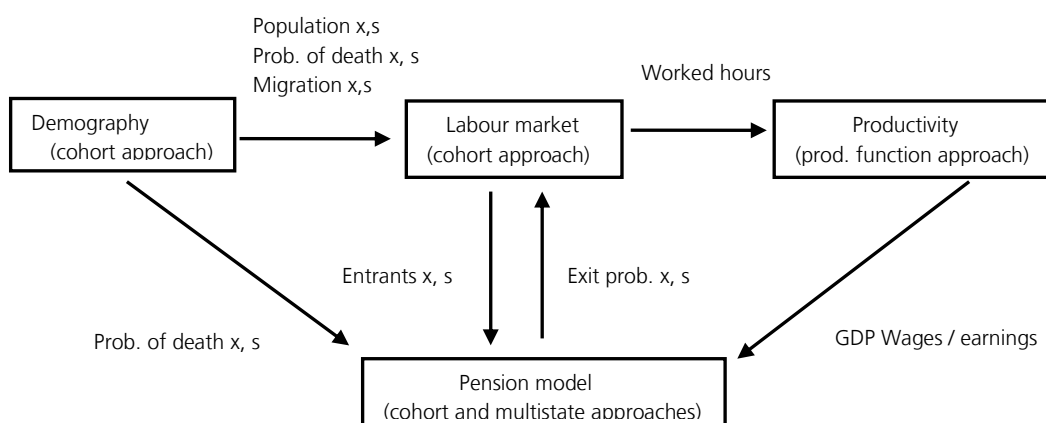
The RGS pension model has been constantly utilised to assess the financial effects of pension reform proposals and those actually passed. It has also been used at national and international levels within research programmes on the financial implications of ageing and pension reforms, as well as within institutional cooperation with the OECD and the IMF.

Compared to the previous 2015-AWG projections, the database of the insured covering the private and public sector employees, and the self-employed, has been updated to 2014. The legal framework is in line with the legislation in force at the end of September 2017 (§. 1.4).

## 4.2 Methodology

The RGS pension model reproduces accurately the main features of the legal-institutional framework, which has been extremely important in Italy in consideration of the several pension reforms enacted during the last two decades. At the same time, the model is provided with methodological solutions assuring consistency with demographic and macroeconomic scenario assumptions.

The pension model is composed of four modules: demography, labour market, productivity and pension. The pension module is strictly interrelated with the others as in the outline reported below:



**The demographic module** adopts the traditional cohort component approach according to which the number of people, by age and sex, is projected on the basis of probabilities of

<sup>41</sup> For the short term, generally the first three-four years, the macroeconomic assumptions are fully aligned to that underlying the Public Finance Documents.

death, total fertility rates, and net migration flows. The latter, in turn, is obtained as a difference between emigrants (based on the probabilities of emigrating) and immigrants<sup>42</sup>.

**The labour market module** is mainly based on a projection of the labour force, by age, sex and level of education, to which unemployment rates are applied. The labour force projection combines the dimensional effect of working age population and the cohort evolution of participation rates. The latter is obtained extrapolating the cohort trend in the propensity to enter the labour market on a permanent basis, estimated on labour force database. The extrapolation of past trends is adjusted to take account of further effects brought about by: i) the evolution of enrolment rates and related changes in educational achievements, and ii) the fulfilment of eligibility requirements for pension entitlement, which depends on pension legislation and worker distribution by age and contribution years.

Unemployment rates, distributed by age and sex, are assumed to change through time, converging on an average target value also taking into account the evolution of the working age population. The total hours worked are calculated on the basis of the incidence of part-time and full-time workers, and the corresponding average hours worked.

**The productivity module** bases its projection on a sum of two components: i) an exogenous assumption on the growth rate of total productivity factors, which is kept constant at its long term level after an initial adjustment, and ii) the additional contribution due to changes in the ratio of capital stock to employment (capital deepening). To this end, a Cobb Douglas production function is utilized.

**The pension module** adopts a multistate approach involving a large number of 'discriminating' variables, i.e. variables which are relevant for the pension rules to be applied. Such variables are divided into two groups: state and monetary variables.

The first group contains variables that identify distinct positions within the system, as reported in the table below.

State variables	Specifications
Fund (or group of workers)	13 in the private sector and 5 in public sector
Sex	Male, female
Age	[15-74]
Typology of contributor	Contributor, dormant, pensioner-contributor
Contribution years	[0-49] before retirement; [1-20] after retirement
Regime	Earnings-related, contribution-based, mixed
Typology of pension	Disability (2 types), old age, early retirement

<sup>42</sup> The national baseline scenario adopts the demographic projections elaborated by Istat (National Statistic Institute). The latest demographic projection, with 2016 as the base year, was published in May, 2017, <http://demo.istat.it>.

At any time, it is possible to identify members of the pension system in terms of their belonging to one of the possible combinations of the state variable specifications. The forecast of members is worked out according to the following general equation:

$$\underbrace{\mathbf{a}_{t,s,x,f}}_{\text{members}} = \underbrace{\mathbf{a}_{t-1,s,x-1f}}_{\text{members}} \underbrace{\varphi_{t-1,s,x-1f}}_{\substack{\text{probability} \\ \text{of surviving}}} \times \underbrace{\mathbf{T}_{t-1,s,x-1f}}_{\substack{\text{transition} \\ \text{matrix}}} + \underbrace{\mathbf{e}_{t,s,x,f}}_{\text{entrants}} \quad \forall s, f, 15 \leq x \leq \omega$$

where, for each sex  $s$ , age  $x$ , and fund (or specific group of workers)  $f$ ,  $\mathbf{a}$  indicates the row vector of the insured distributed by different states at the end of the year  $t$ ,  $\varphi$  is the probability of surviving,  $\mathbf{e}$  indicates the row vector of entrants to the pension system in the year  $t$ , and  $\mathbf{T}$  is a matrix of transition probabilities that serves to calculate changes in the states of members already insured at the end of the year  $t-1$  and still alive at the end of the year  $t$ . The general element  $t_{ij}$  of the transition matrix expresses the probability that a member belonging to state  $i$  at the end of the year  $t-1$  will transit to state  $j$  at the end of the year  $t$ .

New entrants, i.e. those insured for the first time in the pension system, are set equal to the cohort increase of employment, suitably transformed into new contributors. The number of entrants by age and sex are attributed to each fund, or other appropriate aggregations of workers, on the basis of specific distributions of probability.

Mean values of monetary variables, such as wages/earnings, pension etc., are associated with each of the possible combinations of the state variable specifications and supplemented with indexes of variability (the variation coefficient) and distribution functions<sup>43</sup>.

The number of survivors' pensions is determined by adding the new pensions to those of the previous year still being paid out. The new pensions are calculated by applying the probabilities of death and leaving a surviving spouse (or dependent children) to pensioners or contributors who have matured the requirements foreseen. Lastly, a permutation matrix is applied to attribute an age to the surviving spouse on the basis of the age of the deceased.

### 4.3 Internal consistency of the model

The consistency of the model with the legal-institutional framework is achieved by grouping the insured according to the state variables which have been devised to provide, dynamically, all information relevant to calculate the number of pensions and their amounts. Furthermore, the model is able to take on board data concerning workers already insured in the system at the beginning of the forecasting period, including dormant members who are no longer contributing but would later be able to claim a pension, on the basis of past contribution records.

<sup>43</sup> In particular, such an approach makes it possible to give adequate treatment to the topping up mechanism for the minimum pension under the DB and mixed regimes, the indexation of pensions by size bracket, and the eligibility requirement for retirement under the NDC regime.

The consistency of the pension module with the demographic and occupational ones is favoured by the cohort approach which is coherently applied to all of them. The most relevant mechanisms through which such consistency is sought may be summarized as follows:

- with regard to mortality, coherence is assured by applying the probability of death to all the insured (contributors, pensioners, etc.), those already in the system at the beginning of the forecasting period, and those entering afterwards;
- as for net migration flows and employment rates below 42, consistency is guaranteed through the calculation of workers joining the pension system as new contributors, which depends on the cohort profile of participation and unemployment rates, besides the dimension of demographic cohorts;
- consistency with employment in the age classes above 42 is also assured. In fact, the probabilities of exiting from the labour market are endogenously calculated by the pension module according to current legislation and retirement behaviour;
- net migration flows from 42 to 60 are also transformed into new contributors according to the employment rates forecast in the corresponding age classes. Immigrants above 60 are considered neither contributors nor pensioners entitled to an earnings-related pension;
- wages (or labour income in the case of the self-employed) are projected to increase over time by cohort, applying the dynamics of productivity and a further increase due to career progressions<sup>44</sup>. In this regard, consistency with macroeconomic assumptions is assured by targeting the career progressions to guarantee constancy through time of the ratio between the average contribution base of all workers (gross wages for the employees and gross labour income for the self-employed) and productivity.

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<sup>44</sup> The dynamic of wages is projected by cohort, consistently with the cohort evolution of labour force and contributors. In a very stylized way, for the various segments of the pension system (scheme, regime, category of workers etc.), the following algorithm is utilized:

$$w_{t,a,x} = w_{t-1,a-1,x-1} (1 + \sigma_t + \pi_t) (1 + \gamma_a) (1 + \varepsilon_t)$$

where:  $t$  = year;  $a$  = contribution years;  $x$  = age;  $\sigma$  = inflation rate;  $\pi$  = productivity growth rate;  $\gamma$  = additional wage growth rate due to career progression, which is applied as long as a further year of contribution is matured,  $\varepsilon$  stands for the percentage of change necessary to guarantee that the average wage grows in line with productivity.

**Table 1 - Statutory retirement age (SRA) and early retirement**

Years of contributions		2016	2020	2030	2040	2050	2060	2070	
Qualifying condition for old age retirement	<u>Old age retirement (SRA)<sup>(1)</sup></u>								
	Minimum retirement age (SRA) - men		66y+7m	67y+1m	67y+11m	68y+9m	69y+7m	70y+5m	71y+1m
	Minimum retirement age (SRA) - women <sup>(2)</sup>		65y+7m	67y+1m	67y+11m	68y+9m	69y+7m	70y+5m	71y+1m
	Minimum contributory period - men		20	20	20	20	20	20	20
Minimum contributory period - women		20	20	20	20	20	20	20	
Qualifying condition for early retirement	<u>Early retirement regardless of age (all regimes)<sup>(1)</sup></u>								
	Minimum contributory requirement - men		42y+10m	43y+4m	44y+2m	45y	45y+10m	46y+8m	47y+4m
	Minimum contributory requirement - women		41y+10m	42y+4m	43y+2m	44y	44y+10m	45y+8m	46y+4m
	<u>Early retirement under the NDC regime<sup>(1)</sup></u>								
	Minimum retirement age - men				64y+11m	65y+9m	66y+7m	67y+5m	68y+1m
	Minimum retirement age - women				64y+11m	65y+9m	66y+7m	67y+5m	68y+1m
	Minimum contributory period - men				20	20	20	20	20
	Minimum contributory period - women				20	20	20	20	20
Minimum amount of pension - men <sup>(3)</sup>		1,200 euro per month in 2012 (2.8 times the old age allowance, in 2012) indexed with the five-year average of nominal GDP							
Minimum amount of pension -women <sup>(3)</sup>		1,200 euro per month in 2012 (2.8 times the old age allowance, in 2012) indexed with the five-year average of nominal GDP							

(1) The age requirements (and contribution requirements for early retirement regardless of age) are indexed to changes in life expectancy at 65. The update is foreseen every three years until 2019 and then every two years. Changes in life expectancy are consistent with the mortality assumptions underlying the Eurostat demographic projection, with the 2015 as the base year. The 2013 and 2016 indexation of the eligibility requirements were adopted by a directorial decree of the Ministry of Economy and Finance of 14th December 2011 and 16th December 2014, respectively. The next update, which come into force as of 1st January 2019, will be finalized by the end of 2017.

(2) SRA of the female employees in the private sector equalizes that of men (and women in the public sector) starting from 2018. In 2016, the SRA of the female self-employed is 6 months lower.

(3) The minimum amount of pension is 1,200 euro per month in 2012 (which corresponds to 2.8 times the old age allowance, in 2012) indexed with the five-year average of nominal GDP.

**Tab. 2.a- Number of new pensions by age group - administrative data (year 2015) - Total**

Age group	All	Old age	Disability	Survivor	Other (including minimum)
0-49	29,325	113	16,198	13,014	:
50-54	26,599	5,039	13,478	8,082	:
55-59	127,114	98,530	16,271	12,313	:
60-64	179,127	148,307	12,242	18,578	:
65-69	138,711	108,290	1,106	29,315	:
70-74	44,397	7,777	54	36,566	:
75+	131,278	3,700	15	127,563	:
Other (supplementary and non-resident)	77,744	54,609	1,136	19,630	2,369
Total	754,295	426,365	60,500	265,061	2,369

**Tab. 2.b- Number of new pensions by age group - administrative data (year 2015) - Male**

Age group	All	Old age	Disability	Survivor	Other (including minimum)
0-49	13,668	100	9,841	3,727	:
50-54	15,537	4,750	9,305	1,482	:
55-59	62,302	49,071	11,331	1,900	:
60-64	85,973	74,363	8,839	2,771	:
65-69	96,276	91,334	881	4,061	:
70-74	11,028	5,938	29	5,061	:
75+	30,483	2,802	7	27,674	:
Other (supplementary and non-resident)	48,347	44,278	837	1,899	1,333
Total	363,614	272,636	41,070	48,575	1,333

**Tab. 2.c- Number of new pensions by age group - administrative data (year 2015) - Female**

Age group	All	Old age	Disability	Survivor	Other (including minimum)
0-49	15,657	13	6,357	9,287	:
50-54	11,062	289	4,173	6,600	:
55-59	64,812	49,459	4,940	10,413	:
60-64	93,154	73,944	3,403	15,807	:
65-69	42,435	16,956	225	25,254	:
70-74	33,369	1,839	25	31,505	:
75+	100,795	898	8	99,889	:
Other (supplementary and non-resident)	29,397	10,331	299	17,731	1,036
Total	390,681	153,729	19,430	216,486	1,036

**Table 3 - Main demographic variables evolution**

Demography	2016	2020	2030	2040	2050	2060	2070	Peak year
Population ('000)	60,763	60,705	60,334	59,955	58,887	56,835	54,859	2016
Population growth rate	0.0	0.0	-0.1	-0.1	-0.3	-0.4	-0.3	2017
Old-age dependency ratio (pop65/pop15-64)	34.5	36.4	45.0	57.9	62.5	61.04	60.28	2050
Ageing of the aged (pop80+/pop65+)	30.5	32.3	32.6	32.9	41.3	46.5	44.5	2060
Men - Life expectancy at birth	80.7	81.2	82.5	83.7	84.8	85.9	86.9	2070
Men - Life expectancy at 65	19.1	19.5	20.4	21.3	22.1	23.0	23.7	2069
Women - Life expectancy at birth	85.3	85.8	86.9	88.0	89.0	90.0	90.9	2070
Women - Life expectancy at 65	22.5	22.9	23.8	24.7	25.5	26.3	27.0	2070
Men - Survivor rate at 65+	89.6	90.2	91.5	92.6	93.6	94.4	95.1	2070
Men - Survivor rate at 80+	63.7	65.4	69.4	73.1	76.3	79.3	81.9	2070
Women - Survivor rate at 65+	94.0	94.3	95.1	95.7	96.3	96.7	97.1	2070
Women - Survivor rate at 80+	78.0	79.2	82.0	84.4	86.5	88.4	90.0	2070
Net migration ('000)	134.5	161	210	218	197	177	164	2039
Net migration over population change	-7.5	-6.7	-6.7	-4.3	-1.3	-0.8	-1.0	2017

Source: EUROSTAT and Commission Services.

**Table 4 - Participation rate, employment rate and share of workers for the age groups 55-64 and 65-74**

	2016	2020	2030	2040	2050	2060	2070	Peak year
Labour force participation rate 55-64	53.4	60.5	70.2	71.1	71.8	72.6	73.1	2070
Employment rate for workers aged 55-64	50.3	57.3	67.2	68.3	69.1	70.0	70.5	2070
Share of workers aged 55-64 on the total labour force	94.3	94.7	95.8	96.1	96.3	96.3	96.4	2070
Labour force participation rate 65-74	6.9	10.2	19.1	22.0	23.7	28.7	31.3	2068
Employment rate for workers aged 65-74	6.7	10.0	18.8	21.6	23.4	28.3	30.8	2068
Share of workers aged 65-74 on the total labour force	98.2	97.7	98.2	98.4	98.5	98.6	98.6	2068
Median age of the labour force	43.1	44.7	46.4	45.4	45.2	46.2	46.0	2029

Source: Commission Services.

**Table 5a - Labour market entry age, exit age and expected duration of life spent at retirement - Male**

	2017	2020	2030	2040	2050	2060	2070	Peak year
Average effective exit age (CSM)	63.9	65.9	66.1	66.3	66.9	67.6	67.8	2067
Contributory period	37.2	37.2	36.2	36.0	36.1	37.9	38.8	2070
Duration of retirement **	20.0	18.7	19.6	20.5	20.4	20.3	21.1	2070
Duration of retirement/contributory period	0.5	0.5	0.5	0.6	0.6	0.5	0.5	:
Percentage of adult life spent at retirement***	30.3	28.1	28.9	29.8	29.4	29.0	29.8	2017
Early/late exit****	3.9	1.9	1.3	2.7	3.4	3.7	3.2	2065

Source: Commission Services.

**Table 5b - Labour market entry age, exit age and expected duration of life spent at retirement - Female**

	2017	2020	2030	2040	2050	2060	2070	Peak year
Average effective exit age (CSM)	63.7	66.6	66.8	67.7	68.2	68.6	69.1	2067
Contributory period	31.7	33.1	33.9	33.8	34.5	37.2	37.8	2070
Duration of retirement **	23.5	21.2	22.0	22.0	22.7	22.6	23.3	2017
Duration of retirement/contributory period	0.7	0.6	0.6	0.7	0.7	0.6	0.6	:
Percentage of adult life spent at retirement***	34.0	30.4	31.1	30.7	31.1	30.9	31.3	2017
Early/late exit****	7.7	1.8	1.2	1.6	2.2	2.2	2.4	2017

Source: Commission Services.

\*\* Duration of retirement is calculated as the difference between the life expectancy at average effective exit age and the average effective exit age itself.

\*\*\* The percentage of adult life spent at retirement is calculated as the ratio between the duration of retirement and the life expectancy diminished by 18 years.

\*\*\*\* Early/late exit, in the specific year, is the ratio of those who retired and aged less than the statutory retirement age and those who retired and are aged more than the statutory retirement age.

**Table 6 - Eurostat (ESSPROS) vs. Ageing Working Group definition of pension expenditure (% GDP)**

	2007	2008	2009	2010	2011	2012	2013	2014
Eurostat total pension expenditure	14.0	14.3	15.5	15.5	15.5	16.1	16.5	16.5
Eurostat public pension expenditure [a]	13.8	14.1	15.2	15.3	15.3	15.9	16.3	16.3
Public pension expenditure (AWG) [b]	13.3	13.7	14.7	14.8	14.9	15.4	15.9	15.8
Difference [a] - [b]	0.5	0.5	0.5	0.5	0.4	0.5	0.5	0.5
Expenditure categories not considered in the AWG definition:								
- Benefits paid to the disabled and the deaf and dumb below 65 years old, war pensions, work injury annuities and merit awards	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
- Survivors' war pensions and survivors' work injury annuities	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
- Supplementary pensions paid by private pension funds	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Source: EUROSTAT and Member States.



**Table 7 - Projected gross and net pension spending and contributions (% of GDP)**

	2016	2020	2030	2040	2050	2060	2070	Peak year
<b>Expenditure</b>								
Gross public pension expenditure	15.6	15.6	17.2	18.7	17.3	15.1	13.9	2040
Net public pension expenditure	12.7	12.7	14.0	15.2	14.1	12.3	11.3	2040
<b>Contributions</b>								
Public pension contributions	10.7	10.9	10.9	11.0	11.0	11.0	10.9	2053

Source: Commission Services.

**Table 8 - Projected gross public pension spending by scheme (% of GDP)**

Pension scheme	2016	2020	2030	2040	2050	2060	2070	Peak year
Total public pensions	15.6	15.6	17.2	18.7	17.3	15.1	13.9	2040
<i>of which:</i>								
- Old age and early pensions	12.7	12.7	14.2	15.6	14.4	12.6	11.8	2042
- Earnings related <sup>(1)</sup>	12.4	12.4	13.9	15.2	14.0	12.2	11.4	2040
- minimum pensions and minimum income guarantees <sup>(2)</sup>	0.3	0.3	0.3	0.4	0.4	0.4	0.4	2049
- Disability pensions	0.4	0.4	0.4	0.4	0.3	0.3	0.3	2029
- Survivor's pensions	2.5	2.5	2.6	2.8	2.6	2.2	1.8	2041
<i>of which:</i>								
- private employees	8.9	8.9	9.8	11.5	11.9	11.1	10.1	2046
- old age, early and disability pension	7.3	7.2	8.1	9.8	10.1	9.5	8.8	2046
- other pensions (survivors)	1.6	1.6	1.6	1.7	1.7	1.6	1.3	2045
- public employees	4.1	4.2	4.7	4.4	3.0	2.0	2.0	2034
- old age, early and disability pension	3.5	3.7	4.2	3.8	2.5	1.7	1.8	2032
- other pensions (survivors)	0.5	0.5	0.6	0.6	0.5	0.3	0.2	2038
- self-employed	2.3	2.3	2.5	2.4	2.0	1.6	1.4	2032
- old age, early and disability pension	2.0	1.9	2.0	1.9	1.6	1.2	1.2	2032
- other pensions (survivors)	0.3	0.4	0.5	0.5	0.4	0.3	0.2	2036

Source: Commission Services and Member State.

(1) Includes disability pensions above the SRA.

(2) Old age allowance and additional sums.

**Table 9.a - Factors behind the change in public pension expenditures between 2016 and 2070 (in percentage points of GDP) - Pensions**

	2016-20	2020-30	2030-40	2040-50	2050-60	2060-70	2016-70	Average annual change
Public pensions to GDP	0.02	1.61	1.43	-1.39	-2.21	-1.21	-1.75	-3.4%
Dependency ratio effect	0.91	3.57	4.73	1.57	-0.32	-0.21	10.25	18.5%
Coverage ratio effect	-0.81	-1.52	-1.23	-0.12	-0.21	-0.65	-4.54	-9.0%
- Coverage ratio old-age	-0.43	-0.93	-0.65	0.14	-0.17	-0.65	-2.69	-5.1%
- Coverage ratio early-age	-3.41	-4.26	-3.08	-3.22	-2.18	-0.84	-16.99	-35.5%
- Cohort effect	0.37	-2.19	-5.62	-1.90	0.99	0.05	-8.30	-16.3%
Benefit ratio effect	0.62	0.94	-1.14	-2.66	-1.54	-0.18	-3.96	-7.0%
Labour Market/Labour intensity effect	-0.62	-1.15	-0.61	-0.08	-0.18	-0.19	-2.83	-5.7%
- Employment ratio effect	-0.47	-0.60	-0.19	-0.16	0.01	-0.01	-1.42	-3.1%
- Labour intensity effect	0.00	0.01	0.01	-0.01	-0.01	0.00	0.00	0.0%
- Career shift effect	-0.16	-0.57	-0.44	0.09	-0.18	-0.17	-1.43	-2.7%
Residual <sup>(1)</sup>	-0.07	-0.23	-0.31	-0.11	0.04	0.02	-0.67	-0.3%

Source: Commission Services.

(1) This residual is made by two components: the residual effect as defined in eq. [1] and the interaction effect.

**Table 9.b - Factors behind the change in public pension expenditures between 2016 and 2070 (in percentage points of GDP) - Pensioners**

	2016-20	2020-30	2030-40	2040-50	2050-60	2060-70	2016-70	Average annual change
Public pensions to GDP	0.02	1.61	1.43	-1.39	-2.21	-1.21	-1.75	-3.4%
Dependency ratio effect	0.91	3.57	4.73	1.57	-0.32	-0.21	10.25	18.5%
Coverage ratio effect	-0.88	-1.61	-1.01	-0.10	-0.29	-0.60	-4.49	-8.9%
- Coverage ratio old-age	-0.43	-0.94	-0.31	0.20	-0.24	-0.59	-2.32	-4.4%
- Coverage ratio early-age	-3.48	-4.17	-2.98	-2.96	-2.08	-0.83	-16.49	-34.4%
- Cohort effect	0.37	-2.19	-5.62	-1.90	0.99	0.05	-8.30	-16.3%
Benefit ratio effect	0.70	1.04	-1.36	-2.68	-1.46	-0.23	-4.00	-7.1%
Labour Market/Labour intensity effect	-0.62	-1.15	-0.61	-0.08	-0.18	-0.19	-2.83	-5.7%
- Employment ratio effect	-0.47	-0.60	-0.19	-0.16	0.01	-0.01	-1.42	-3.1%
- Labour intensity effect	0.00	0.01	0.01	-0.01	-0.01	0.00	0.00	0.0%
- Career shift effect	-0.16	-0.57	-0.44	0.09	-0.18	-0.17	-1.43	-2.7%
Residual <sup>(1)</sup>	-0.08	-0.24	-0.31	-0.11	0.04	0.02	-0.68	-0.3%

Source: Commission Services.

(1) This residual is made by two components: the residual effect as defined in eq. [1] and the interaction effect.

**Table 10.a - Replacement rate at retirement (RR), benefit ratio (BR) and coverage by pension scheme old-age earnings related (in %) - Pensions**

	2016	2020	2030	2040	2050	2060	2070
Public scheme (BR)	58.9	60.7	64.4	59.7	51.4	47.0	46.3
Public scheme (RR)	64.4	65.5	57.8	49.5	45.2	48.6	49.8
Coverage	100	100	100	100	100	100	100
Public scheme old-age earnings related (BR)	59.6	62.5	67.1	61.4	51.9	47.4	47.5
Public scheme old-age earnings related (RR)	64.4	65.5	57.8	49.5	45.2	48.6	49.8
Coverage	78.6	77.0	77.2	79.1	80.1	80.3	80.4
Private occupational scheme (BR)	:	:	:	:	:	:	:
Private occupational scheme (RR)	:	:	:	:	:	:	:
Coverage	:	:	:	:	:	:	:
Private individual scheme (BR)	:	:	:	:	:	:	:
Private individual scheme (RR)	:	:	:	:	:	:	:
Coverage	:	:	:	:	:	:	:
Total (BR)	58.9	60.7	64.4	59.7	51.4	47.0	46.3
Total (RR)	64.4	65.5	57.8	49.5	45.2	48.6	49.8

**Table 10.b - Replacement rate at retirement (RR), benefit ratio (BR) and coverage by pension scheme old-age earnings related (in %)**

	2016	2020	2030	2040	2050	2060	2070
Average pension / average wage at retirement (RR) - new pensions	64.4	65.5	57.8	49.5	45.2	48.6	49.8
Average pension / average wage at retirement (RR) - new pensioners	71.1	72.5	61.0	52.2	47.5	50.8	52.0
Average pension / average-wide economy wage (RR) - new pensions	78.0	77.5	64.7	57.6	52.7	58.8	59.0
Average pension / average wage at retirement (BR) - pensioners	59.6	62.5	67.1	61.4	51.9	47.4	47.5
Coverage	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Member States.

**Table 11 - System Dependency Ratio and Old-age Dependency Ratio**

	2016	2020	2030	2040	2050	2060	2070
Number of pensioners (I) ('000)	15,088	14,918	15,790	17,460	17,824	16,668	15,231
Employment (II) ('000)	22,803	23,526	24,105	22,781	21,625	21,198	20,722
Pension System Dependency Ratio (SDR) (I)/(II)	66.2	63.4	65.5	76.6	82.4	78.6	73.5
Number of people aged 65+ (III) ('000)	13,456	14,101	16,543	19,387	19,894	18,928	18,027
Working age population 15-64 (IV) ('000)	39,049	38,719	36,796	33,493	31,842	31,008	29,904
Old-age Dependency Ratio (ODR) (III)/(IV)	34.5	36.4	45.0	57.9	62.5	61.0	60.3
System efficiency (SDR/ODR)	1.9	1.7	1.5	1.3	1.3	1.3	1.2

Source: Commission Services.

**Table 12.a - Pensioners<sup>(1)</sup> (public schemes) to inactive population<sup>(2)</sup> ratio by age group (%)**

	2016	2020	2030	2040	2050	2060	2070
Total							
- Age group -54	2.4	2.5	2.2	1.8	1.6	1.5	1.3
- Age group 55-59	34.6	26.1	28.5	24.0	23.4	20.4	19.9
- Age group 60-64	69.1	63.4	52.6	45.5	37.5	34.7	31.0
- Age group 65-69	96.3	96.4	82.8	78.6	76.3	70.2	56.0
- Age group 70-74	98.7	93.9	97.3	96.7	93.8	96.6	91.3
- Age group 75+	96.5	96.6	98.1	97.3	96.6	96.6	97.1
- Age group 55-69	75.1	70.2	63.7	60.0	54.5	48.7	40.5
- Age group 70+	97.1	95.8	97.9	97.1	96.0	96.6	95.9
Without non resident pensioners in 2016							
- Age group -54	2.4	2.4	2.1	1.8	1.6	1.5	1.3
- Age group 55-59	34.3	25.9	28.4	24.0	23.4	20.3	19.9
- Age group 60-64	68.6	63.2	52.5	45.4	37.5	34.6	31.0
- Age group 65-69	94.1	95.6	82.7	78.6	76.3	70.2	55.9
- Age group 70-74	95.6	91.4	96.1	96.6	93.8	96.6	91.3
- Age group 75+	93.7	93.7	95.7	96.3	96.3	96.5	96.9
- Age group 55-69	73.8	69.7	63.6	60.0	54.4	48.6	40.5
- Age group 70+	94.2	92.9	95.8	96.4	95.8	96.5	95.8
- Net elderly immigrants 70+ <sup>(3)</sup>	0.0	0.1	0.4	0.7	0.7	0.8	0.7

Source: Commission Services.

(1) Value at the end of the year.

(2) Average annual value.

(3) Cumulated net flows of immigrants above 60 as a share of inactive population 70+.

**Table 12.b - Pensioners<sup>(1)</sup> (public schemes) to population<sup>(2)</sup> ratio by age group (%)**

	2016	2020	2030	2040	2050	2060	2070
Total							
- Age group -54	1.1	1.1	1.0	0.8	0.8	0.7	0.7
- Age group 55-59	11.7	7.9	6.6	6.3	6.0	5.1	5.0
- Age group 60-64	42.2	31.8	19.1	14.2	11.5	10.3	8.9
- Age group 65-69	87.3	79.4	57.6	49.6	45.0	37.6	28.4
- Age group 70-74	95.1	91.6	92.1	90.3	86.6	86.4	80.1
- Age group 75+	96.5	96.6	98.1	97.3	96.6	96.6	97.1
- Age group 55-69	45.5	36.4	27.0	24.9	21.0	17.5	14.1
- Age group 70+	96.1	95.0	96.3	95.2	94.2	94.3	93.2
Without non resident pensioners in 2016							
- Age group -54	1.1	1.1	1.0	0.8	0.8	0.7	0.7
- Age group 55-59	11.6	7.8	6.6	6.3	6.0	5.1	5.0
- Age group 60-64	42.0	31.7	19.0	14.2	11.5	10.3	8.9
- Age group 65-69	85.3	78.7	57.5	49.6	45.0	37.6	28.3
- Age group 70-74	92.0	89.0	90.9	90.1	86.5	86.4	80.1
- Age group 75+	93.7	93.7	95.7	96.3	96.3	96.5	96.9
- Age group 55-69	44.7	36.1	27.0	24.9	21.0	17.5	14.1
- Age group 70+	93.2	92.2	94.3	94.4	94.0	94.3	93.1
- Net elderly immigrants 70+ <sup>(3)</sup>	0.0	0.2	0.6	0.8	0.8	0.9	0.8

Source: Commission Services.

(1) Value at the end of the year.

(2) Average annual value.

(3) Cumulated net flows of immigrants above 60 as a share of inactive population 70+.

**Table 13.a - Female pensioners<sup>(1)</sup> (public schemes) to inactive population<sup>(2)</sup> ratio by age group (%)**

	2016	2020	2030	2040	2050	2060	2070
Total							
- Age group -54	2.6	2.6	2.3	1.7	1.5	1.4	1.2
- Age group 55-59	22.0	19.1	22.8	20.6	19.0	15.9	15.4
- Age group 60-64	50.2	41.4	39.3	34.6	28.9	26.0	23.2
- Age group 65-69	85.3	80.1	68.7	67.3	60.5	53.4	43.0
- Age group 70-74	92.4	87.8	87.8	89.8	87.9	89.0	83.0
- Age group 75+	95.1	95.1	96.0	94.5	94.4	95.3	95.8
- Age group 55-69	58.6	52.0	49.9	48.8	41.9	35.9	30.1
- Age group 70+	94.3	92.9	93.7	93.3	93.0	94.1	93.4
Without non resident pensioners in 2016							
- Age group -54	2.5	2.6	2.3	1.7	1.5	1.4	1.2
- Age group 55-59	21.7	18.9	22.7	20.6	19.0	15.8	15.4
- Age group 60-64	49.7	41.1	39.2	34.6	28.9	26.0	23.2
- Age group 65-69	83.9	79.7	68.6	67.2	60.5	53.4	43.0
- Age group 70-74	90.6	86.2	87.6	89.8	87.8	89.0	83.0
- Age group 75+	91.7	92.2	94.6	94.1	94.3	95.2	95.8
- Age group 55-69	57.8	51.6	49.8	48.7	41.8	35.9	30.1
- Age group 70+	91.4	90.5	92.7	92.9	93.0	94.1	93.4
- Net elderly immigrants 70+ <sup>(3)</sup>	0.0	0.1	0.4	0.7	0.8	0.8	0.8

Source: Commission Services.

(1) Value at the end of the year.

(2) Average annual value.

(3) Cumulated net flows of immigrants above 60 as a share of inactive population 70+.

**Table 13.b - Female pensioners<sup>(1)</sup> (public schemes) to population<sup>(2)</sup> ratio by age group (%)**

	2016	2020	2030	2040	2050	2060	2070
Total							
- Age group -54	1.4	1.4	1.2	0.9	0.8	0.8	0.7
- Age group 55-59	10.3	7.9	7.2	6.8	6.1	5.1	4.9
- Age group 60-64	35.7	25.0	16.7	12.5	10.4	9.0	7.8
- Age group 65-69	80.7	70.3	50.3	43.2	36.9	30.4	22.9
- Age group 70-74	91.0	86.2	83.9	84.0	80.7	79.4	73.0
- Age group 75+	95.1	95.1	96.0	94.5	94.4	95.3	95.8
- Age group 55-69	41.0	31.8	24.3	22.2	18.1	14.8	11.9
- Age group 70+	94.0	92.5	92.6	91.5	91.3	92.1	91.0
Without non resident pensioners in 2016							
- Age group -54	1.4	1.4	1.2	0.9	0.8	0.8	0.7
- Age group 55-59	10.1	7.8	7.1	6.7	6.1	5.0	4.9
- Age group 60-64	35.4	24.8	16.7	12.5	10.4	9.0	7.7
- Age group 65-69	79.3	69.9	50.2	43.1	36.9	30.4	22.9
- Age group 70-74	89.2	84.7	83.7	83.9	80.7	79.4	73.0
- Age group 75+	91.7	92.2	94.6	94.1	94.3	95.2	95.8
- Age group 55-69	40.4	31.6	24.2	22.2	18.1	14.8	11.9
- Age group 70+	91.0	90.0	91.5	91.2	91.3	92.1	91.0
- Net elderly immigrants 70+ <sup>(3)</sup>	0.0	0.2	0.6	0.9	0.9	0.9	0.9

Source: Commission Services.

(1) Value at the end of the year.

(2) Average annual value.

(3) Cumulated net flows of immigrants above 60 as a share of inactive population 70+.

**Table 14.a - Projected and disaggregated new public pension expenditure (old-age and early earnings-related pensions) - Total**

	2016	2020	2030	2040	2050	2060	2070
Projected new pension expenditure (millions EUR)	6,905	9,103	17,312	20,273	22,538	35,445	45,384
I. Number of new pensions ('000)	312.0	388.6	698.8	691.8	589.5	580.8	528.2
II. Average contributory period	34.7	35.6	35.2	35.0	35.4	37.6	38.4
III. Average accrual rates	1.93	1.88	1.72	1.68	1.67	1.67	1.64
IV. Monthly average pensionable earnings ('000 EUR)	2,542	2,702	3,155	3,826	4,963	7,462	10,469
V. Sustainability/Adjustment factor	:	:	:	:	:	:	:
VI. Average number of months paid the first year	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Monthly average pensionable earnings/Monthly economy-wide average wage	112.4	112.0	104.4	94.9	86.7	91.3	90.1

Source: Commission Services.

**Table 14.b - Projected and disaggregated new public pension expenditure (old-age and early earnings-related pensions) - Male**

	2016	2020	2030	2040	2050	2060	2070
Projected new pension expenditure (millions EUR)	5,192	6,042	10,639	12,402	13,680	21,649	27,762
I. Number of new pensions ('000)	221.0	234.0	390.2	386.8	330.1	327.6	303.2
II. Average contributory period	36.2	37.2	36.2	36.0	36.1	37.9	38.8
III. Average accrual rates	1.92	1.85	1.68	1.64	1.63	1.63	1.60
IV. Monthly average pensionable earnings ('000 EUR)	2,606	2,890	3,446	4,192	5,425	8,213	11,338
V. Sustainability/Adjustment factor	:	:	:	:	:	:	:
VI. Average number of months paid the first year	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Monthly average pensionable earnings/Monthly economy-wide average wage	115.3	119.8	114.1	103.9	94.7	100.5	97.6

Source: Commission Services.

**Table 14.c - Projected and disaggregated new public pension expenditure (old-age and early earnings-related pensions) - Female**

	2016	2020	2030	2040	2050	2060	2070
Projected new pension expenditure (millions EUR)	1,713	3,061	6,674	7,872	8,858	13,796	17,622
I. Number of new pensions ('000)	91.0	154.6	308.6	305.1	259.4	253.2	225.0
II. Average contributory period	31.1	33.1	33.9	33.8	34.5	37.2	37.8
III. Average accrual rates	1.95	1.90	1.76	1.75	1.74	1.74	1.71
IV. Monthly average pensionable earnings ('000 EUR)	2,387	2,416	2,787	3,362	4,374	6,489	9,297
V. Sustainability/Adjustment factor	:	:	:	:	:	:	:
VI. Average number of months paid the first year	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Monthly average pensionable earnings/Monthly economy-wide average wage	105.6	100.1	92.3	83.4	76.4	79.4	80.0

Source: Commission Services.

**Table 15 - Financing of the system**

	Public employees <sup>(1)</sup>	Private employees	Self-employed <sup>(2)</sup>
Contribution base	114,704	363,952	146,429
Contribution rate/contribution in 2016	33.0%	33.0%	23.1%
<i>Employer</i>	24.2%	23.8%	
<i>Employee</i>	8.8%	9.2%	23.1%
<i>State</i>			
<i>Other revenues</i>			
Maximum contribution <sup>(3)(4)</sup>	33,107	33,107	23,175
Minimum contribution <sup>(4)</sup>	3,445	3,445	3,592

(1) For local bodies, the contribution rate is 32.65% of which 23.8% is paid by the employer and 8.85% is paid by the employee.

(2) Gradually increasing from around 23.1% in 2016 to 24% in 2018.

(3) Estimates based on maximum and minimum contribution base.

(4) Values only refer to the new entrants after 1995.

**Table 16 - Revenue from contribution (million), number of contributors in the public scheme (in 1000), total employment (in 1000) and related ratios (%)**

	2016	2020	2030	2040	2050	2060	2070
Public contribution	178,913	198,421	252,151	320,839	434,665	607,216	839,272
<i>Employer contribution</i>	109,920	121,931	155,642	198,001	268,673	374,606	518,050
<i>Employee contribution</i>	68,993	76,490	96,510	122,837	165,992	232,610	321,222
<i>State contribution<sup>(1)</sup></i>	:	:	:	:	:	:	:
Number of contributors (I)	23,397	24,141	24,633	23,430	22,311	21,802	21,192
Employment (II)	22,803	23,526	24,105	22,781	21,625	21,198	20,722
Ratio of (I)/(II)	102.6	102.6	102.2	102.8	103.2	102.9	102.3

Source: Commission Services.

(1) Contributions paid by the State as "employer" are included in "employer contribution". The quota of public pension expenditure not covered by contribution is charged on public finances.

**Table 17 - Public and total pension expenditures under different scenarios (deviation from the baseline)**

	2016	2020	2030	2040	2050	2060	2070
Public Pension Expenditure							
Baseline	15.6	15.6	17.2	18.7	17.3	15.1	13.9
Higher life expectancy (2 extra years)	0.0	0.0	-0.1	-0.3	0.0	0.1	0.1
Higher TFP (+0.4 pp.)	0.0	0.0	0.0	-0.5	-1.1	-1.2	-1.1
Lower TFP (-0.4 pp.)	0.0	0.0	0.0	0.5	1.2	1.4	1.3
Higher emp. rate (+2 pp.)	0.0	-0.1	-0.4	-0.3	-0.3	-0.1	0.0
Lower emp. rate (+2 pp.)	0.0	0.1	0.4	0.3	0.3	0.1	0.0
Higher emp. of older workers (+10 pp.)	0.0	-0.5	-1.9	-0.9	-0.1	0.1	0.3
Higher migration (+33%)	0.0	-0.1	-0.3	-0.5	-0.7	-0.6	-0.4
Lower migration (-33%)	0.0	0.1	0.3	0.6	0.8	0.7	0.5
Lower Fertility	0.0	0.0	0.0	0.2	0.6	0.9	1.2
TFP risk	0.0	0.0	0.1	0.3	0.6	0.7	0.6

Source: Commission Services.

**Table 18 - Average annual change in public pension expenditure to GDP during the projected period under the 2006, 2009, 2012, 2015 and 2018 projection exercises**

	Public pension to GDP	Dependency ratio	Coverage ratio	Employment effect	Benefit ratio	Labour intensity	Residual (incl. interaction effect)
2006 *	0.41	11.54	-3.17	-1.99	-5.29	:	-0.69
2009 **	-0.41	10.40	-3.22	-1.14	-5.47	:	-0.98
2012 ***	-0.90	9.55	-5.55	-1.31	-2.03	0.03	-1.58
2015 ****	-1.93	8.05	-5.16	-1.43	-1.95	0.06	-1.51
2018*****	-1.75	10.25	-4.54	-1.42	-3.96	0.00	-2.10

Source: Commission services.

\* 2004-2050; \*\* 2007-2060; \*\*\* 2010-2060; \*\*\*\* 2013-2060;\*\*\*\*\*2016-2070.

Explanatory note: The Table presents the average annual change of pension expenditure and the contributions of the underlying component to that change, whereas Table shows, for different intervals of time, the decomposition, in percentage points, of the factors behind the change in public pension expenditures. \* 2004 - 2050, \*\* 2007 - 2060, \*\*\* 2010 - 2060, \*\*\*\* 2013 - 2060. \*\*\*\*\*2016 - 2070. Please note that the four components do not add up because of a residual component.

**Table 19 - Decomposition of the difference between 2015 and the new public pension projection (% of GDP)**

	2010	2016	2020	2030	2040	2050	2060	2070
Ageing report 2015	14.8	15.6	15.3	15.7	15.8	14.8	13.8	0.0
- Change in assumptions	0.0	0.0	0.2	1.4	2.8	2.3	1.2	0.0
- Improvement in the coverage or in the modelling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- Change in the interpretation of constat policy	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- Policy related changes	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0
New projection	14.8	15.6	15.6	17.2	18.7	17.3	15.1	13.9

Source. Member State.



**Table 20 - Private component of the Italian pension system - Time series 2000-2016**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
<b>Pension expenditure, gross (mln €)</b>	1,568	2,120	1,847	2,788	1,887	1,502	2,484	1,715	2,336	1,697	1,731	1,695	1,608	1,565	1,328	1,519	1,765
Non-mandatory occupational pensions <sup>(1)(2)</sup>	1,568	2,120	1,847	2,788	1,887	1,502	2,484	1,715	2,336	1,697	1,731	1,695	1,608	1,565	1,328	1,519	1,765
- pensions	602	637	733	736	735	698	918	905	900	892	890	878	897	889	886	856	748
- benefit in capital	966	1,483	1,114	2,052	1,152	804	1,566	810	1,436	805	841	817	711	676	442	663	1,017
Non-mandatory private pensions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Number of pensioners (thousands)</b>	108	121	123	114	111	111	143	133	133	132	130	131	130	130	133	130	118
Non-mandatory occupational pensions <sup>(1)(2)</sup>	108	121	123	114	111	111	143	133	133	132	130	131	130	130	133	130	118
Non-mandatory private pensions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Contributions (mln €)</b>	2,665	3,751	4,231	4,568	4,951	5,481	6,231	8,434	10,900	11,121	11,481	11,842	12,052	12,414	13,008	13,547	14,256
Non-mandatory occupational pensions <sup>(1)</sup>	2,665	3,395	3,638	3,822	4,021	4,401	4,988	7,007	9,118	9,146	9,212	9,365	9,316	9,306	9,631	9,778	10,162
Non-mandatory private pensions	0	356	593	746	930	1,080	1,243	1,427	1,782	1,975	2,269	2,477	2,736	3,108	3,377	3,769	4,094
<b>Number of contributors (thousands)</b>	1,692	2,160	2,396	2,587	2,740	2,963	3,184	4,560	4,854	5,055	5,273	5,537	5,829	6,204	6,540	7,227	7,787
Non-mandatory occupational pensions <sup>(1)</sup>	1,692	1,959	2,038	2,078	2,112	2,219	2,304	3,424	3,536	3,570	3,569	3,577	3,580	3,627	3,687	4,251	4,547
Non-mandatory private pensions	0	201	357	509	628	744	880	1,136	1,314	1,485	1,703	1,960	2,249	2,577	2,853	2,976	3,240
<b>Assets of pension funds and reserves (mln €)</b>	23,011	32,970	34,642	37,609	40,878	47,307	51,576	57,747	61,302	73,827	83,167	90,687	104,363	116,465	130,941	140,351	151,278
Non-mandatory occupational pensions <sup>(1)</sup>	23,011	32,777	34,025	36,331	38,728	43,969	47,030	51,957	54,677	64,861	71,958	77,495	88,277	96,952	107,722	113,345	120,636
Non-mandatory private pensions	0	193	617	1,278	2,150	3,338	4,546	5,790	6,625	8,966	11,209	13,192	16,086	19,513	23,219	27,006	30,642

Source: Covip (2000-2016), Relazione annuale. Such reports can be downloaded from the following web site: [www.covip.it](http://www.covip.it)

(1) It includes open and close pension funds and those pre-existing before 1993-reform.

(2) It only refers to the "pre-existing" pension.

Figure 1: Age pyramid comparison: 2013 vs 2070

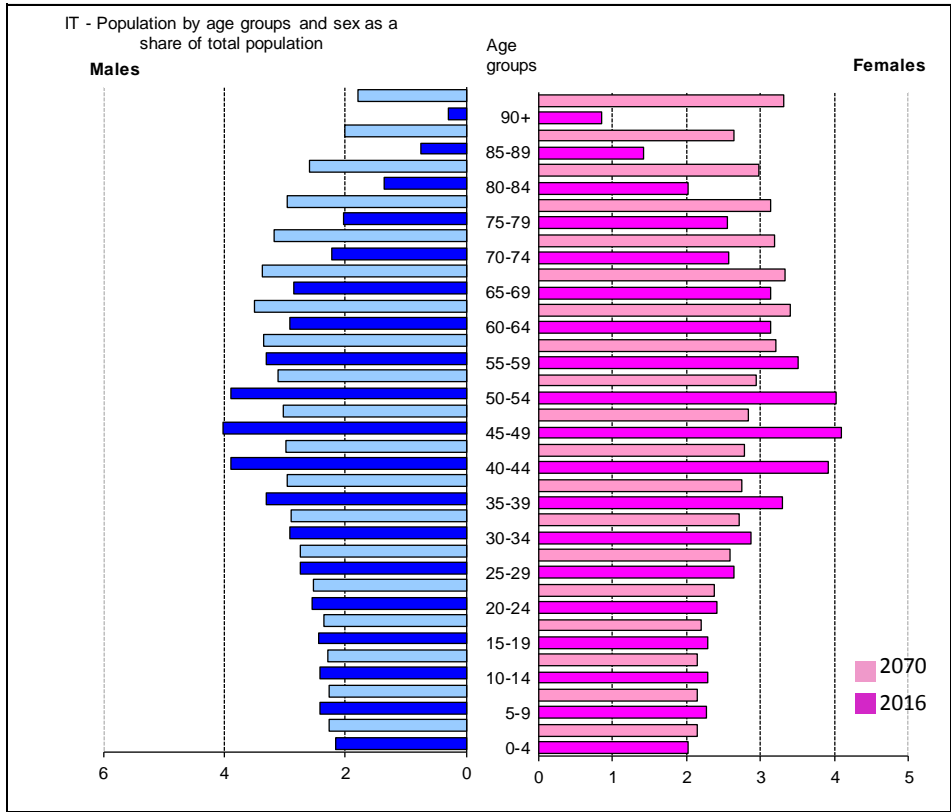
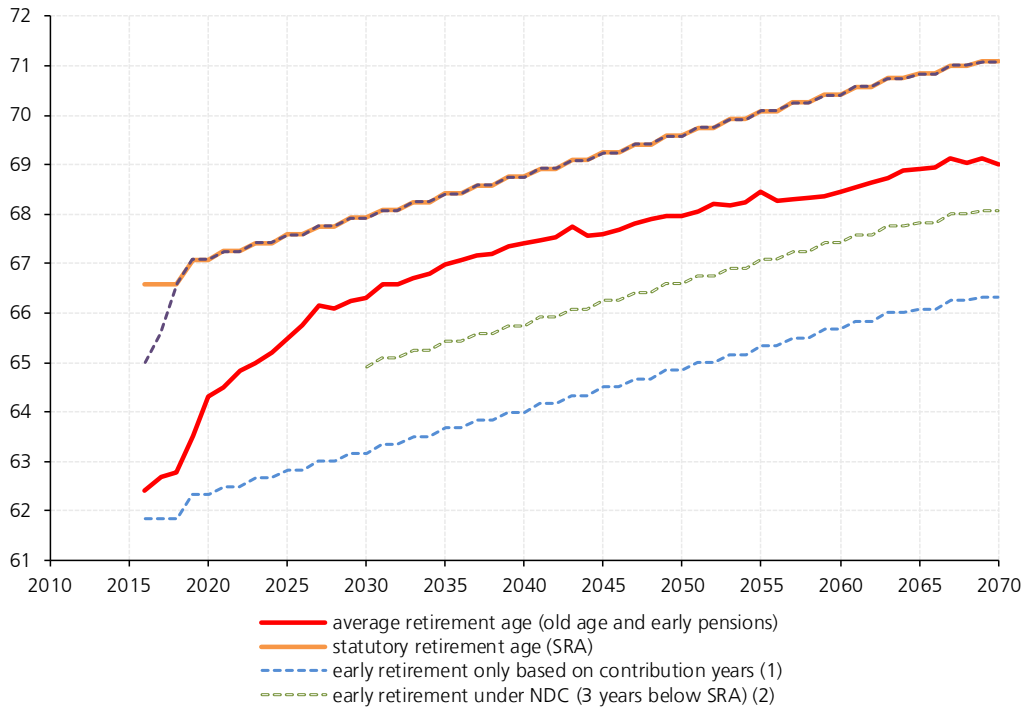


Figure 2: Eligibility requirements and average retirement age



(1) The age has been calculated assuming a full career, without interruptions, starting at 19 for males and 20 for females. In this sense it can be seen as a 'minimum age'. However, given the increasing delay the younger cohorts of workers enter the labour market, in the long run the contribution requirement will be achieved at much older ages.

(2) Though currently in force, it actually becomes effective around 2030.

Figure 3: interventions adopted with Law 232/2016 – Financial effects on pension expenditure in pp of GDP (+ costs; - savings)

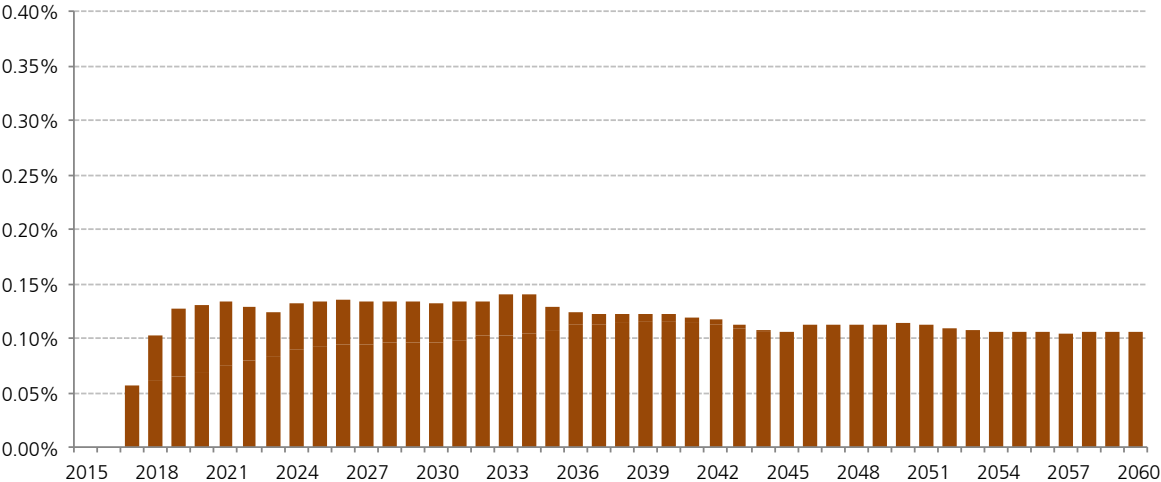


Figure 4: pension expenditures percentage of GDP and its decomposition - AWG 2018 Baseline projection

Figure 4.a: percentage ratio of expenditure to GDP

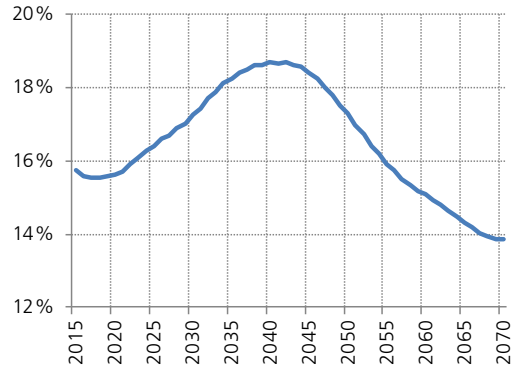


Figure 4.d: percentage ratio of pensions to people of 70+

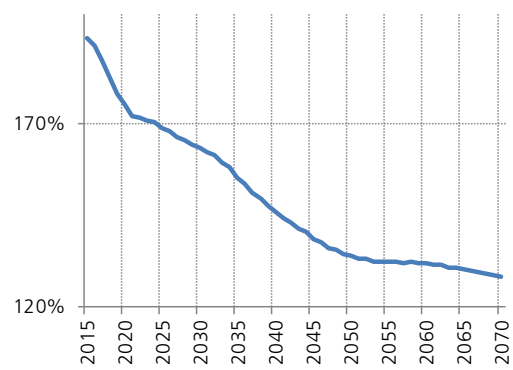


Figure 4.b: percentage ratio of average pension to productivity

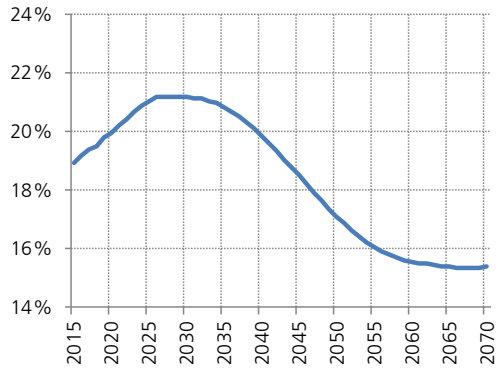


Figure 4.e: percentage ratio of employees to population [20-69]

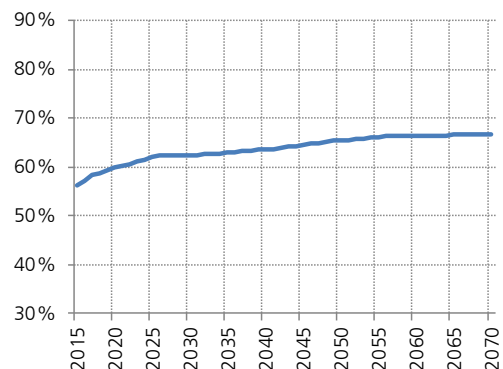


Figure 4.c: percentage ratio of pensions to employees

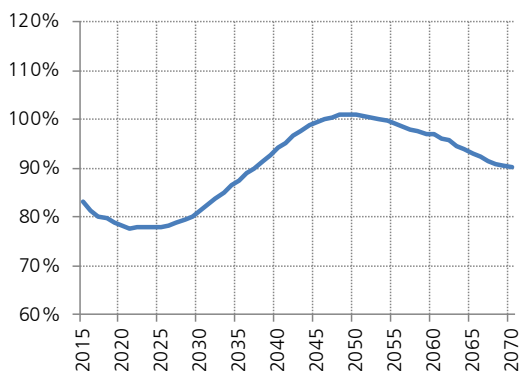


Figure 4.f: percentage ratio of people of 70+ to population [20-69]

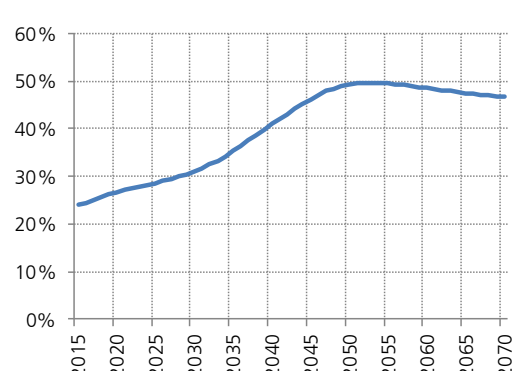


Figure 5: new old age, early pensions and disability by schemes

Figure 5.a: old age and early pensions

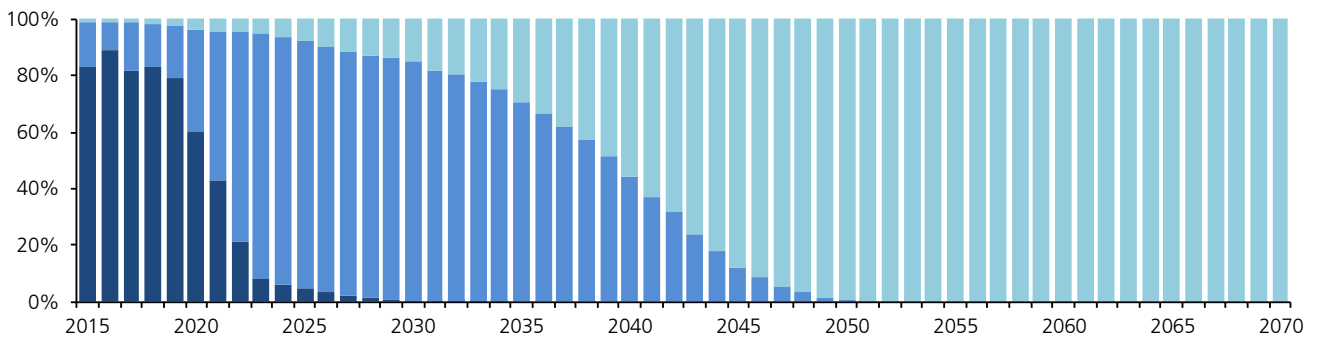


Figure 5.b: disability pensions

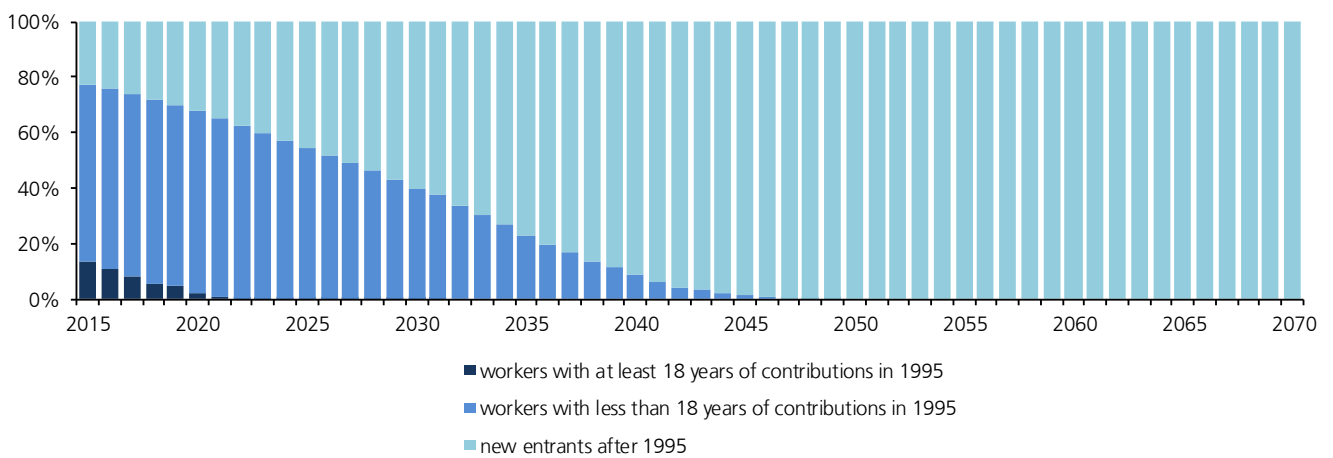


Figure 6: benefit ratio and replacement rate expressed in terms of economy wide average wage

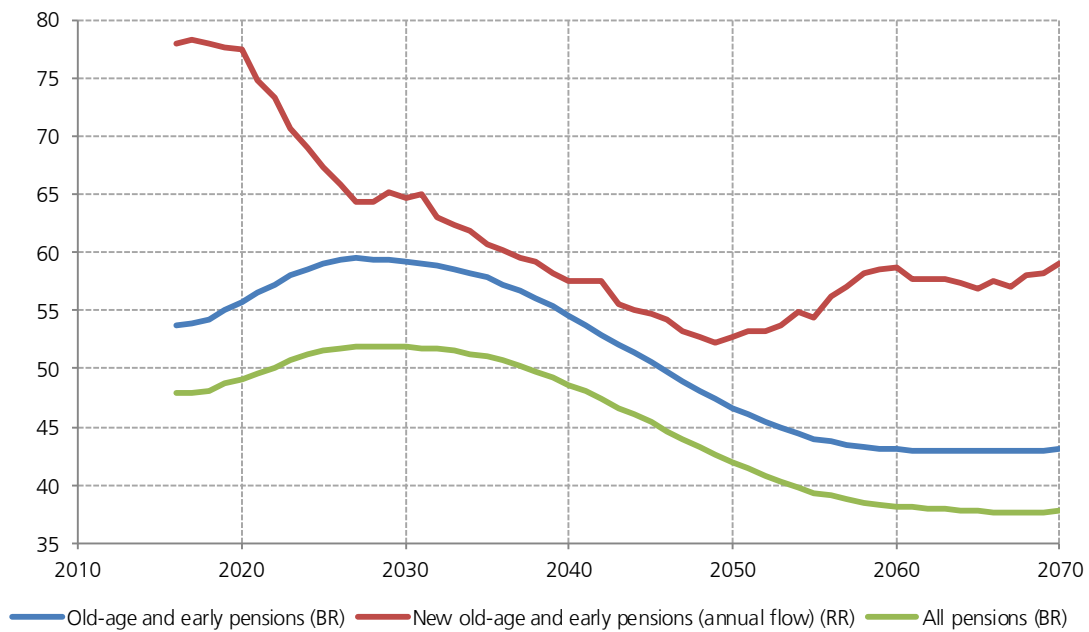


Figure 7: update of transformation coefficients and mean value at the average retirement age

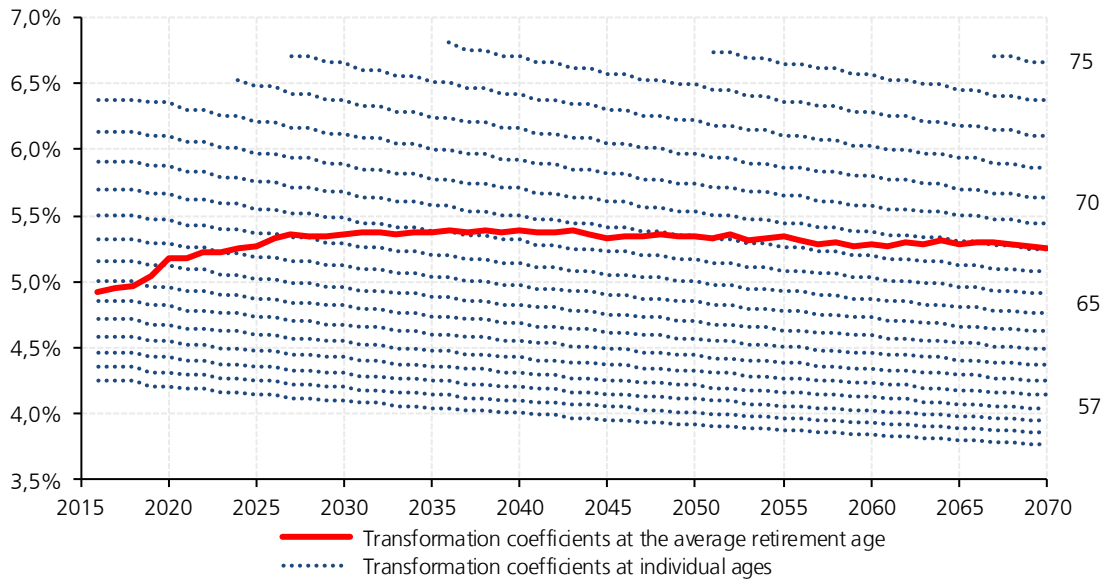


Figure 8: average contribution period

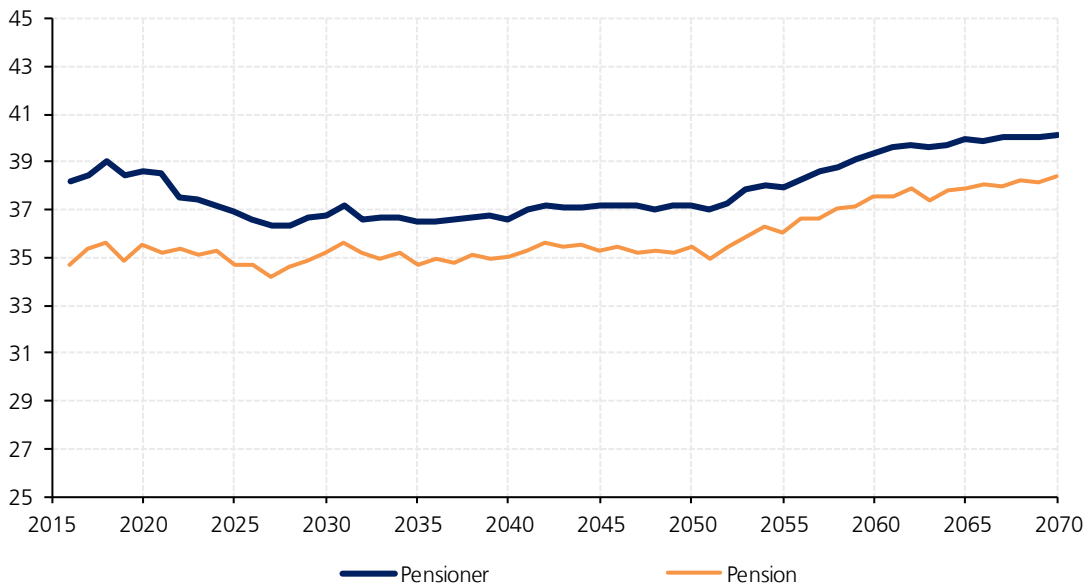


Figure 9: Pension Expenditure to GDP ratio - Comparison between 2015 and 2018 baseline projections

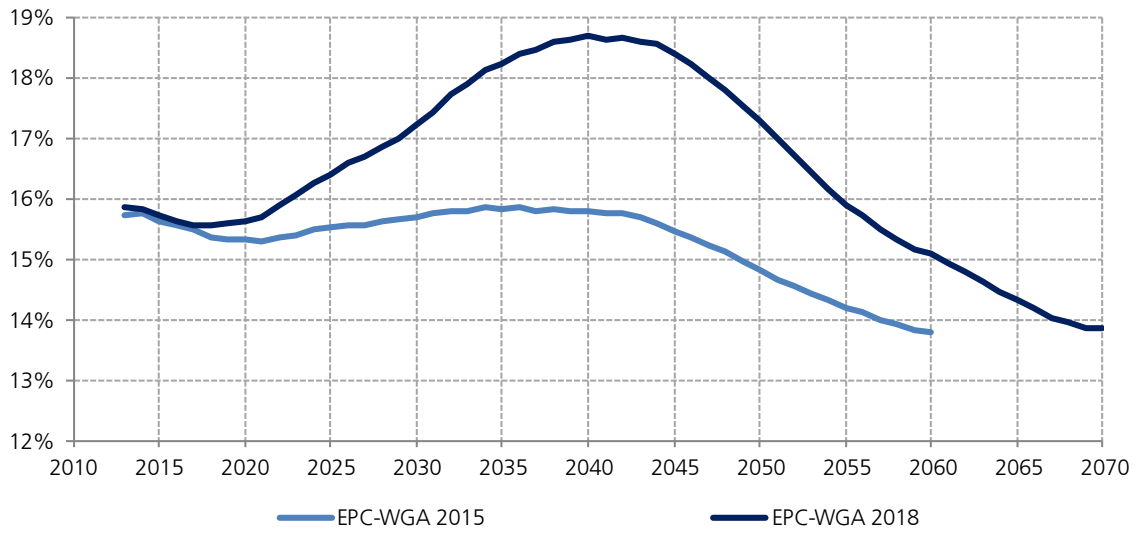
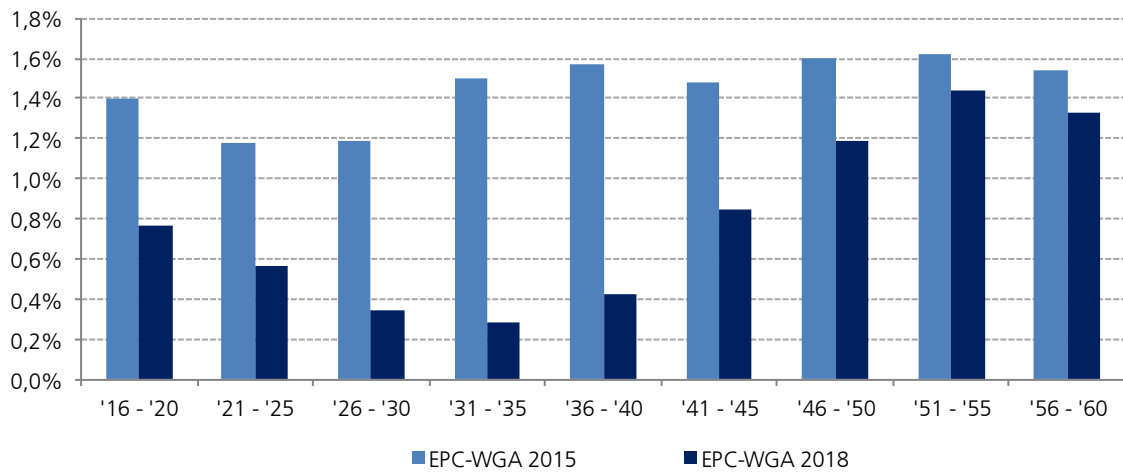


Figure 10: GDP growth rates - Average of the period



## ANNEX 1 – Regulatory framework

The annex includes:

- a summary table describing the calculation rules under the DB, mixed and NDC regimes (Table A1.1);
- a summary table describing the eligibility requirements under the DB, mixed and NDB regimes (Table A1.2 and Table A1.3);
- a summary table reporting the evolution of the minimum eligibility requirements for old age and early pensions, by 5-year step (Table A1.4);
- the formula and assumptions for the calculation of the transformation coefficients;
- transformation coefficients in force for the three-year period 2016-2018 (Table A1.5).



**Table A1.1 - Public pension system: calculation rules**

	Earnings-related scheme (DB) Workers with at least 18 years of contribution at the end of 1995, limited to pensions awarded until 31 <sup>st</sup> December 2011	Mixed scheme Workers with less than 18 years of contribution at the end of 1995, and workers with at least 18 years of contribution limited to pensions awarded as of 1 <sup>st</sup> January 2012	Contribution-based scheme (NDC) New entrants into the system as of 1 <sup>st</sup> January 1996
Old age, early retirement and disability pensions (1)	<p>Pension (P) is calculated according to the following formula:</p> $P = 2\% (C_1 W_1 + C_2 W_2)$ <p>where:  <math>W_1</math> and <math>W_2</math> = reference wage  <math>C_1</math> e <math>C_2</math> = years of contribution</p> <p>a) for contribution before 1992 (<math>C_1</math>), <math>W_1</math> is the last monthly wage for public employees and the average of the last 5 or 10 years, for private employees and the self-employed, respectively (2).</p> <p>b) for contribution after 1992 (<math>C_2</math>), <math>W_2</math> is the average of the last 10 years for private and public employees (3) and 15 years for the self-employed (starting from 2002) (4).</p> <p>The accrual rate for each year of contribution is 2% up to a fixed threshold of the reference wage (5). Beyond this limit, such a percentage decreases to 1% in the case of <math>W_1</math> and to 0.9% in the case of <math>W_2</math>.</p>	<p>Pension (P) is obtained as a sum of two components:</p> $P = PA + PB$ <p>The former (PA) is calculated by using the earning-related method while the latter (PB) the NDC method. In particular:</p> $PA = 2\% (C_1 W_1 + C_2 W_2)$ <p>where:  <math>W_1</math> and <math>W_2</math> = reference wage  <math>C_1</math> e <math>C_2</math> = years of contribution before 1995</p> <p>a) for contribution before 1992 (<math>C_1</math>), <math>W_1</math> is last monthly wage for public employees and the average of the last 5 or 10 years, respectively, for private employees and the self-employed (2).</p> <p>b) for contribution between 1993-1995 (<math>C_2</math>), <math>W_2</math> is the average wage of a number of last years progressively increasing (4).</p> <p>The accrual rate for each year of contribution is 2% up to a fixed threshold of the reference wage (5). Beyond this limit, such a percentage decreases to 1% in the case of <math>W_1</math> and to 0.9% in the case of <math>W_2</math>.</p> $PB = ct M$ <p>(for explanation, see the box on the right hand side).</p>	<p>Pension (P) is calculated according to the following formula:</p> $P = ct M$ <p>where: ct is the transformation coefficient and M the life-long contributions capitalized with the growth rate of nominal GDP.</p> <p>Transformation coefficients in force in the period 2010-2012 ranged from 4.42% at the age of 57 to 5.62% at age of 65 (above 65 they are set equal to that of 65).</p> <p>They are subject to a three-year revision (two-year revision as of 2021) to take account of changes in life expectancy, according to a procedure falling entirely under the administrative sphere of competence.</p> <p>As of 2013, they are extended to the age of 70 (6), and then further in line with the increase in the eligibility requirements linked to changes in life expectancy.</p> <p>Transformation coefficients in force in the period 2013-2015 ranged from 4.30% at the age of 57 to 5.43% at age of 65 (up to a maximum of 6.54% at age of 70). Those currently in force (years 2016-2018) ranges from 4.25% at the age of 57 to 5.33% at age of 65 (up to a maximum of 6.38% at age of 70)</p> <p>Under 57 the transformation coefficients are set equal to that of 57.</p> <p>The contribution rate is 33% for private and public employees, 20% for the self-employed in 2011, gradually increased to 24% in 2018.</p> <p>For atypical workers the contribution rate was 27% in 2012 and 2013, gradually increased to 33% in 2018.</p>
Survivors' pensions (8)	<p>60% of the pension calculated as above, if a survivor is a widow or widower of an employee; 60% of the deceased's pension, if a survivor is a widow or widower of a pensioner.</p> <p>Such a percentage is reduced by 25%, 40% or 50% if the survivor total income exceeds, respectively, 3, 4 or 5 times the minimum pension.</p>	as before	as before

(1) Disability pensions include the 'assegno ordinario di invalidità' and the 'pensione di inabilità'. As for the latter, extra contributions are generally accrued (up to the maximum that beneficiaries would have reached if they had continued to work).

(2) Wages involved in the calculation of the reference wage are indexed to prices.

(3) For the public employees, starting from 2008.

(4) Wages involved in the calculation of the reference wage are indexed to prices, plus 1%.

(5) This threshold is 46,123 euros in 2017.

(6) Indexation of age requirements is foreseen every three years from 2013 to 2019 and every two years from 2021. The 2013 and 2016 indexation of the eligibility requirements were adopted by a directorial decree of the Ministry of Economy and Finance of 14th December 2011 and 16th December 2014, respectively. The next update, which comes into force as of 1<sup>st</sup> January 2019, will be finalized by the end of 2017.

(7) The threshold is 100,324 euros in 2017.

(8) In the case of a surviving spouse with one or two children, the percentage of 60% is increased to 80% and 100%, respectively. Such a percentage is arranged differently when there are only surviving children.

**Table A1.2 - Public pension system: eligibility requirements - DB and Mixed schemes**

		Earnings-related (DB) and mixed schemes (DB and NDC) - Workers already insured at the end of 1995		
		2004 - 2007	Starting from 2008 (Law 243/2004 and Law 247/2007)	Starting from 2012 (Law 214/2011)
Old age retirement Statutory Retirement Age (SRA) <sup>(1)</sup>	Private/public sector employees and self employed	65 years for men, 60 years for women and 20 years of contribution for both genders	as before <sup>(6)</sup>	In 2012, SRA is 66 for men and women in the public sector, 62 for women in the private sector. In all cases, 20 years of contributions are also required  From 2012 to 2018, SRA of women in the private sector is gradually aligned to that of other workers  From 2013, SRA is indexed to changes in life expectancy <sup>(7)</sup> .
	Private sector employees	35 years of contribution and 57 years of age <sup>(2)</sup> or, alternatively, 38 years of contribution, in the period 2004 - 2005, and 39 in the period 2006 - 2007 <sup>(3)</sup>	40 years of contribution regardless of age or, alternatively, 35 years of contribution and 58 years of age until 30/06/2009, 60 from 1/07/2009 to 2010 and 61 in 2011 <sup>(6)</sup> .  Starting from July 2009, workers are allowed to access early retirement at an age lower by 1 year with at least 36 years of contribution <sup>(4) (5) (6)</sup> .	Contribution requirement regardless of age:  - Men: 42 years and 1 month of contributions in 2012 (plus 1 month in 2013, 2 months in 2014) ;  - Women: 41 years and 1 month of contributions in 2012 (plus 1 month in 2013, 2 months in 2014).  From 2013, contribution requirements are indexed every three years (every 2 years as of 2021) to changes in life expectancy <sup>(7)</sup> .
	Public sector employees			
Self employed	35 years of contribution and 58 years of age or 40 years of contribution <sup>(3)</sup> .	40 years of contribution regardless of age or, alternatively, 35 years of contribution and 59 years of age until 30/06/2009, 61 from 1/07/2009 to 2010 and 62 in 2011 <sup>(6)</sup> .  Starting from July 2009, workers are allowed to access early retirement at an age lower by 1 year with at least 36 years of contribution <sup>(4) (5) (6)</sup> .		
Disability pensions <sup>(8)</sup>		5 years of contribution 3 of which accrued in the last five years.	as before	as before
Survivors' pensions <sup>(9)</sup>		15 years of contribution, or alternatively, only 5 years of contribution 3 of which accrued in the last five years.	as before	as before

(1) Before 1992, the minimum retirement age was, respectively, 60 and 55 for private sector employees, and the minimum contribution period was 15 years.

(2) The age requirement was reduced to 56 for blue-collar workers in the period 2004 - 2005.

(3) A further postponement of the retirement age was envisaged through the so-called 'exit window', ranging from 3 to 11 months.

(4) For the period 2008-2015, women under DB and mixed schemes who have satisfied the requirements laid down by legislation before law 243/2004 are allowed to retire before 60 as long as they choose the less favourable pension treatment provided by the NDC method.

(5) From 2008, the further postponement through the 'exit window' was foreseen for all regimes, averaging about 9 months for the employees and 15 months for the self-employed.

(6) In 2011, for both old age and early pensions, the retirement age was postponed through the 'exit window' by 1 year for employees and 1 year and half for the self-employed.

(7) The 2013 and 2016 indexation of the eligibility requirements were adopted by a directorial decree of the Ministry of Economy and Finance of 14th December 2011 and 16th December 2014, respectively. The next update, which comes into force as of 1st January 2019, will be finalized by the end of 2017.

(8) After the 1984-reform (law 222/84), the entitlement of disability pensions only depend on mental and physical impairments regardless of labour market conditions.

(9) Survivors' pensions may be also entitled to children up to 18 (or 26, in the case of students).

**Table A1.3 - Public pension system: eligibility requirements - NDC scheme**

		Contribution-based scheme (NDC) - New entrants into the system after 1995		
		up to 2007	Starting from 2008 (Law 243/2004 and Law 247/2007)	Starting from 2012 (Law 148/2011)
Old age retirement Statutory Retirement Age (SRA) <sup>(1)</sup>	Private/public sector employees and self employed		Men: 65, with at least 5 years of contribution <sup>(3)</sup> . Women: 60, with at least 5 years of contribution <sup>(3)</sup> .	In 2012, SRA is 66 for men and women in the public sector; is 62 for women in the private sector.  Retirement is allowed with at least 20 years of contribution and an amount of pension not inferior to 643 euro per month in 2012 ( 1.5 times the old-age allowance, in 2012). Such a threshold is indexed with the five-year average of nominal GDP.  From 2012 to 2018 (1 <sup>st</sup> January), SRA of women in the private sector is gradually aligned to that of other workers  From 2013, SRA is indexed to changes in life expectancy <sup>(4)</sup> .
	Private sector employees	For both genders, retirement is allowed with at least 57 year of age and 5 years of contribution or, alternatively, 40 years of contribution regardless of age.	40 years of contribution regardless of age or, alternatively, 35 years of contribution and 58 years of age until 30/06/2009, 60 from 1/07/2009 to 2010 and 61 in 2011 <sup>(3)</sup> .	Two retirement channels :  1) Contribution requirement regardless of age:  - Men: 42 years of contributions (plus 1 month in 2012, 2 months in 2013 and 3 months in 2014) ;  - Women: 41 years of contributions (plus 1 month in 2012, 2 months in 2013 and 3 months in 2014) ;  From 2013, contribution requirements are indexed every three years (every 2 years as of 2021) to changes in life expectancy <sup>(4)</sup> .  2) For both gender, early retirement is also allowed, up to a maximum of three years before the SRA (63 in 2012), as long as they have matured 20 years of contributions and an amount of pension not inferior to 1,200 euro per month in 2012 ( 2.8 times the old-age allowance, in 2012). Such a threshold is indexed with the five-year average of nominal GDP.
Public sector employees	Starting from July 2009, workers are allowed to access early retirement at an age lower by 1 year with at least 36 years of contribution <sup>(2)(3)</sup> .			
Self employed	40 years of contribution regardless of age or, alternatively, 35 years of contribution and 59 years of age until 30/06/2009, 61 from 1/07/2009 to 2010 and 62 in 2011 <sup>(3)</sup> .  Starting from July 2009, workers are allowed to access early retirement at an age lower by 1 year with at least 36 years of contribution <sup>(2)(3)</sup> .			
Disability pensions <sup>(5)</sup>	5 years of contribution 3 of which accrued in the last five years.		as before	as before
Survivors' pensions <sup>(6)</sup>	15 years of contributions, or alternatively, only 5 years of contribution 3 of which accrued in the last five years.		as before	as before

(1) Before 1992, the minimum retirement age was, respectively, 60 and 55 for private sector employees, and the minimum contribution period was 15 years.

(2) From 2008, the further postponement through the 'exit window' was foreseen for all regimes averaging about 9 months for employees and 15 months for the self-employed.

(3) In 2011, for both old age and early pensions, the retirement age was postponed through the 'exit window' by 1 year for employees and 1 year and half for the self-employed.

(4) The 2013 and 2016 indexation of the eligibility requirements were adopted by a directorial decree of the Ministry of Economy and Finance of 14th December 2011 and 16th December 2014, respectively. The next update, which come into force as of 1st January 2019, will be finalized by the end of 2017.

(5) After the 1984-reform (law 222/84), the entitlement of disability pensions only depend on mental and physical impairments regardless of labour market conditions.

(6) Survivors' pensions may be also entitled to children up to 18 (or 26, in the case of students).

**Table A1.4 - Statutory retirement age (SRA) and early retirement**

Years of contribution		2016	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070
Qualifying condition for old age retirement	<u>Old age retirement (SRA)<sup>(1)</sup></u>												
	Minimum retirement age (SRA) - men	66y+7m	67y+1m	67y+7m	67y+11m	68y+5m	68y+9m	69y+3m	69y+7m	70y+1m	70y+5m	70y+10m	71y+1m
	Minimum retirement age (SRA) - women <sup>(2)</sup>	65y+7m	67y+1m	67y+7m	67y+11m	68y+5m	68y+9m	69y+3m	69y+7m	70y+1m	70y+5m	70y+10m	71y+1m
	Minimum contributory period - men (DB, mixed and NDC regimes)	20	20	20	20	20	20	20	20	20	20	20	20
	Minimum contributory period - women (DB, mixed and NDC regimes)	20	20	20	20	20	20	20	20	20	20	20	20
Qualifying condition for early retirement	<u>Early retirement regardless of age (all regimes)<sup>(1)</sup></u>												
	Minimum contributory requirement - men	42y+10m	43y+4m	43y+10m	44y+2m	44y+8m	45y	45y+6m	45y+10m	46y+4m	46y+8m	47y+1m	47y+4m
	Minimum contributory requirement - women	41y+10m	42y+4m	42y+10m	43y+2m	43y+8m	44y	44y+6m	44y+10m	45y+4m	45y+8m	46y+1m	46y+4m
	<u>Early retirement under the NDC regime<sup>(1)</sup></u>												
	Minimum retirement age - men				64y+11m	65y+5m	65y+9m	66y+3m	66y+7m	67y+1m	67y+5m	67y+10m	68y+1m
	Minimum retirement age - women				64y+11m	65y+5m	65y+9m	66y+3m	66y+7m	67y+1m	67y+5m	67y+10m	68y+1m
	Minimum contributory period - men				20	20	20	20	20	20	20	20	20
	Minimum contributory period - women				20	20	20	20	20	20	20	20	20
	Minimum amount of pension - men <sup>(3)</sup>	1,200 euro per month in 2012 (2.8 times the old age allowance, in 2012) indexed with the five-year average of nominal GDP											
	Minimum amount of pension -women <sup>(3)</sup>	1,200 euro per month in 2012 (2.8 times the old age allowance, in 2012) indexed with the five-year average of nominal GDP											

(1) The age requirements (and contribution requirements for early retirement regardless of age) are indexed to changes in life expectancy at 65. The update is foreseen every three years until 2019 and then every two years. Changes in life expectancy are consistent with the mortality assumptions underlying the Eurostat demographic projection, with the 2015 as the base year. The 2013 and 2016 indexation of the eligibility requirements were adopted by a directorial decree of the Ministry of Economy and Finance of 14th December 2011 and 16th December 2014, respectively. The next update, which come into force as of 1st January 2019, will be finalized by the end of 2017.

(2) SRA of the female employees in the private sector equalizes that of men (and women in the public sector) starting from 2018. In 2016, the SRA of the female self-employed is 6 months lower.

(3) The minimum amount of pension is 1,200 euro per month in 2012 (which corresponds to 2.8 times the old age allowance, in 2012) indexed with the five-year average of nominal GDP.

## 1.1 Transformation coefficients: formula and assumptions

The formula and parameters for the calculation of the transformation coefficients are given below:<sup>45</sup>

$$TC_x = \frac{1}{\Delta_x}$$

$$\Delta_x = \frac{\sum_{s=m,f} (a_{x,s}^{v(t)} + A_{x,s}^{v(t)})}{2} - k$$

Average present value of direct pension awards:

$$a_{x,s}^{v(t)} = \sum_{t=0}^{w-x} \frac{l_{x+t,s}}{l_{x,s}} \left( \frac{1+r}{1+\sigma} \right)^{-t}$$

Average present value of reversibility pension awards:

$$A_{x,s}^{v(t)} = \sum_{t=0}^{w-x} \frac{l_{x+t,s}}{l_{x,s}} q_{x+t,s} \left( \frac{1+r}{1+\sigma} \right)^{-t} \Theta_{x+t,s} \eta \delta_s \sum_{\tau=1}^{w-x-t+\varepsilon_s} \frac{l_{x+t+\tau-\varepsilon_{x,s},\bar{s}}^{ved}}{l_{x+t+1-\varepsilon_{x,s},\bar{s}}^{ved}} \left( \frac{1+r}{1+\sigma} \right)^{-\tau}$$

Where :

$TC$  = transformation coefficient

$\Delta$  = divisor

$s = m, f$

$\frac{l_{x+t,s}}{l_{x,s}}$  = probability of surviving between ages  $x$  and  $x+t$

$x$  = retirement age

$w$  = maximum age

$q_{x+t,s}$  = probability of death between ages  $x+t$  and  $x+t+1$

$\Theta_{x+t,s}$  = probability of leaving a surviving spouse at the age  $x+t$

<sup>45</sup> Ministero dell'Economia e delle Finanze-RGS (2017), *Le tendenze di medio-lungo periodo del sistema pensionistico e socio-sanitario* (Mid-long term trends for the pension, health and long term care systems), Report no. 18, Appendice 1, lettera B.1, <http://www.rgs.mef.gov.it/VERSIONE-I/Attivit-i/Spesa-soci/Attivita di previsione RGS/2017/>. The 2016-revision of the transformation coefficients was adopted by a directorial decree of the Ministry of Labour and Social Policies of 22 June, 2015 according to an automatic, administrative procedure laid down by law 247/2007.

$\frac{j_{x+t,s}^{ved}}{j_x^{ved}} = \text{probability for a widow or widower to be eliminated because of death or new marriage.}$

$k = \text{adjustment owing to how pension is drawn. This parameter accounts for 0.4615}$

$\varepsilon_s = \text{difference between the pensioner's age of sex } s \text{ and the spouse's age}$

$\eta = \text{percentage of reversibility}$

$\delta_s = \text{average percentage of reduction of the survivor's pension owing to income requirements.}$

$r = \text{internal return rate}$

$\sigma = \text{indexation rate}$

$$\left(\frac{1+r}{1+\sigma} - 1\right) = 1.5\% = \text{discount rate}$$

**Table A1.5 – Transformation coefficients in force for the three-year period 2016-2018**

Age	Transformation coefficients	Annuity factor
57	23.550	4.246%
58	22.969	4.354%
59	22.382	4.468%
60	21.789	4.589%
61	21.192	4.719%
62	20.593	4.856%
63	19.991	5.002%
64	19.385	5.159%
65	18.777	5.326%
66	18.163	5.506%
67	17.544	5.700%
68	16.922	5.910%
69	16.301	6.135%
70	15.678	6.378%

Source: Directorial decree of the Ministry of Economy and Finance of June 22, 2015, published in the Official Journal (Gazzetta Ufficiale) of July 6, 2015.



## ANNEX 2 – Pension adequacy

### 2.1 Distributive effects of the NDC scheme on pension income of the elderly

The decline in the ratio between average pension and average gross wage due to the introduction of the NDC scheme mainly comes about from a reduction in the amount of pension granted to workers with steep, unbroken careers who, under the previous DB scheme, would have benefited from a very generous internal rate of returns.

In this regard, it is worthwhile recalling the distributive effects brought about by the NDC calculation method, compared to the previous one<sup>46</sup>:

- the extension of the reference calculation base to life-long contributions (and, implicitly, wages) automatically produces a redistribution of pension rights in favour of workers with flat and discontinuous careers;
- the NDC calculation method allows workers to increase substantially their pension amounts by delaying retirement. For example, postponing retirement by 5 years increases the amount of pension by more than 30%;
- the fulfilment of stringent eligibility requirements, increasing through time, prevents pensioners from being entitled to low pensions because of short careers or low retirement ages<sup>47</sup>;
- worker must qualify for a minimum pension amount of 1.5 times the old-age allowance in order to be able to retire at the SRA;
- on reaching the SRA, the elderly on low income are entitled to the old age allowance and additional social sums (safety net)<sup>48</sup>.

According to past experience of private sector employees, the early pensions are as much as twice the old-age ones being granted to workers with full, regular careers, and are supposed to be paid for a longer period.

This aspect can be seen in table A2.1, which provides the average amount of earnings-related pensions other than survivor's, in terms of NA average gross wage, calculated for ten-year age classes and ten-year periods. As may be seen, in 2016 the average amount of pension is significantly higher in age classes 51-60 and 61-70, where the incidence of early pensions is relevant. Such an hump-shape, however, tends to be reduced

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<sup>46</sup> The NDC scheme equalizes the internal rate of returns across all participants, which instead varied considerably under the previous one.

<sup>47</sup> Furthermore, indexation of the eligibility requirements to changes in life expectancy allows for the compensation of the negative effect due to the revision of the transformation coefficients.

<sup>48</sup> The public pension system, through the old age allowances and social additional sums, guarantees to the elderly of 70+ a personal income not less than 8,298.29 euro if single, and a couple's income not less than 14,123.2 euro, if married, in 2016.



significantly as the DB scheme is being replaced by the NDC one. In fact, starting from 2035, the age-class differences are much more contained, mainly reflecting the effects of the indexation to price inflation.

## 2.2 Theoretical replacement rates.

Apart from the distributive effects mentioned above, the adequacy of benefits needs to be assessed in terms of disposable income before and after retirement. In fact, considering that contributions paid to the public pension system are entirely deductible from income tax and tax rates are progressive, net replacement rates are significantly higher than the gross ones, all else being equal. Tables A2.2 and A2.3 show the evolution of gross and net replacement rates assuming a dynamic for wages (or labour earnings) and GDP consistent with the average growth rate underlying the EPC-AWG baseline scenario.

Calculations have been made for an employee in the private sector<sup>49</sup> and for a self-employed, in order to take account of different contribution rate (33% against 24%). As for the former, the 'base case' assumes 38 years of contribution and an age of retirement at the SRA, under the DB and mixed regimes, and 3 years lower under the NDC (early retirement)<sup>50</sup>, which may be representative of an average behaviour in the mid-long run. For the self-employed, besides assuming the same years of contributions, the age of retirement has been set to the SRA in all regimes. Consistently with the expenditure projection, the calculation of replacement rates takes into account the periodic update of transformation coefficients and eligibility requirements.

The analysis of gross replacement rates highlights that the process of elevating the average retirement age exerts a relevant expansive effect on pension levels, thus contributing to improving pension adequacy under the NDC. Such an aspect is even more marked assuming a contribution period linked to the minimum age requirement foreseen for old age pensions.

In the base case, toward the end of the forecasting period, gross replacement rates accounts for around 60%, for an employee, and a bit below 50%, for a self-employed. Net replacement rates settle above the gross ones by about 10 and 22 percentage points, respectively. In order to take account of the eligibility requirements being temporary lower than those in the base case, replacement rates have also been calculated according to minimum eligibility requirements in force in each year.

Furthermore, it should be considered that the public pension may be supplemented with an additional income source coming from the private pension funds which, in the private

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<sup>49</sup> As the contribution rate is the same, figures reported for a private sector employee can also be referred to a public sector employee. For more details concerning different typologies of workers and the comparison between gross and net replacement rates, see Ministero dell'Economia e delle Finanze-RGS (2017), *Le tendenze di medio-lungo periodo del sistema pensionistico e socio-sanitario* (Mid-long term trends for the pension, health and long term care systems), Report no. 18, [http://www.rgs.mef.gov.it/VERSIONE-I/Attivit--i/Spesa-soci/Attivita\\_di\\_previsione\\_RGS/2017](http://www.rgs.mef.gov.it/VERSIONE-I/Attivit--i/Spesa-soci/Attivita_di_previsione_RGS/2017)

<sup>50</sup> In fact, in the case of the self-employed, even assuming the NA gross average wage as reference labour income, the minimum pension required to retire up to 3 years before the SRA is unlikely to be fulfilled, given the lower level of contribution rate, compared to that of employees.

sector employee, is mostly financed by the transfer of annual flows of severance pay (*Trattamento di fine rapporto*), up to its maximum of 6.91% of gross wages.

**Table A2.1: ratio between the average amount of earnings-related pensions<sup>(1)</sup> in the age-class and economy-wide average wage**

age-class	2016	2020	2030	2040	2050	2060	2070
<b>31-40</b>	18.0%	16.8%	16.0%	14.1%	13.7%	13.9%	13.7%
<b>41-50</b>	30.6%	26.3%	21.2%	19.3%	17.3%	17.6%	17.8%
<b>51-60</b>	68.9%	56.8%	35.5%	27.8%	23.4%	22.3%	22.6%
<b>61-70</b>	68.7%	75.2%	69.1%	59.0%	56.6%	60.2%	59.2%
<b>71-80</b>	53.4%	57.7%	69.1%	58.7%	48.4%	48.0%	51.5%
<b>81-90</b>	41.6%	44.9%	55.6%	61.7%	49.2%	40.6%	40.7%
<b>91-100</b>	35.5%	38.9%	43.6%	49.4%	51.5%	40.7%	34.2%

(1) Includes old age, early and disability pensions; does not include social assistance pensions (social pensions, old age allowances and social additional sums) and public, supplementary pensions.

Tab. A2.2: gross replacement rates in the public pension system - Base case and retirement with the minimum eligibility requirements (values %)

Private employees

	2010	2020	2030	2040	2050	2060	2070
	<b>Contribution period: 38 years</b>						
Base case <i>(age)</i>	75.2 <i>(65+4m)</i>	70.8 <i>(67+1m)</i>	67.6 <i>(67+11m)</i>	59.4 <i>(65+9m)</i>	59.8 <i>(66+7m)</i>	60.0 <i>(67+5m)</i>	59.9 <i>(68+1m)</i>
	<b>Years of contribution and age requirement increasing through time</b>						
Old age retirement <i>(age/contr. period)</i>	70.1 <i>(65+4m/35+4m)</i>	69.0 <i>(67+1m/37+1m)</i>	67.4 <i>(67+11m/37+11m)</i>	67.2 <i>(68+9m/38+9m)</i>	69.0 <i>(69+7m/39+7m)</i>	70.8 <i>(70+5m/40+5m)</i>	71.8 <i>(71+1m/41+1m)</i>
	<b>Years of contribution and age requirement increasing through time (NDC alone)</b>						
Early retirement <i>(age/contr. period)</i>	- -	- -	55.5 <i>(64+11m/34+11m)</i>	56.1 <i>(65+9m/35+9m)</i>	57.7 <i>(66+7m/36+7m)</i>	59.2 <i>(67+5m/37+5m)</i>	60.0 <i>(68+1m/38+1m)</i>
	<b>Contribution requirement channel (age of entry into the labor market: 19 years)</b>						
Early retirement - Female <i>(age/contr. period)</i>	79.0 <i>(60/41)</i>	73.8 <i>(61+4m/42+4m)</i>	67.1 <i>(62+2m/43+2m)</i>	63.3 <i>(63/44)</i>	64.1 <i>(63+10m/44+10m)</i>	65.6 <i>(64+8m/45+8m)</i>	66.4 <i>(65+4m/46+4m)</i>
Early retirement - Male <i>(age/contr. period)</i>	79.0 <i>(60/41)</i>	81.0 <i>(62+4m/43+4m)</i>	70.6 <i>(63+2m/44+2m)</i>	66.8 <i>(64/45)</i>	67.4 <i>(64+10m/45+10m)</i>	69.0 <i>(65+8m/46+8m)</i>	69.9 <i>(66+4m/47+4m)</i>

Self-employed

	2010	2020	2030	2040	2050	2060	2070
	<b>Contribution period: 38 years</b>						
Base case <i>(age)</i>	74.1 <i>(65+7m)</i>	54.1 <i>(67+1m)</i>	47.0 <i>(67+11m)</i>	45.7 <i>(68+9m)</i>	48.0 <i>(69+7m)</i>	48.6 <i>(70+5m)</i>	48.5 <i>(71+1m)</i>
	<b>Years of contribution and age requirement increasing through time</b>						
Old age retirement <i>(age/contr. period)</i>	69.6 <i>(65+7m/35+7m)</i>	52.4 <i>(67+1m/37+1m)</i>	46.8 <i>(67+11m/37+11m)</i>	46.4 <i>(68+9m/38+9m)</i>	49.6 <i>(69+7m/39+7m)</i>	51.6 <i>(70+5m/40+5m)</i>	52.3 <i>(71+1m/41+1m)</i>
	<b>Years of contribution and age requirement increasing through time (NDC alone)</b>						
Early retirement <i>(age/contr. period)</i>	- -	- -	36.9 <i>(64+11m/34+11m)</i>	39.2 <i>(65+9m/35+9m)</i>	41.8 <i>(66+7m/36+7m)</i>	43.1 <i>(67+5m/37+5m)</i>	43.7 <i>(68+1m/38+1m)</i>
	<b>Contribution requirement channel (age of entry into the labor market: 19 years)</b>						
Early retirement - Female <i>(age/contr. period)</i>	77.6 <i>(60+6m/41+6m)</i>	63.2 <i>(61+4m/42+4m)</i>	49.7 <i>(62+2m/43+2m)</i>	43.1 <i>(63/44)</i>	45.3 <i>(63+10m/44+10m)</i>	47.7 <i>(64+8m/45+8m)</i>	48.4 <i>(65+4m/46+4m)</i>
Early retirement - Male <i>(age/contr. period)</i>	77.6 <i>(60+6m/41+6m)</i>	77.1 <i>(62+4m/43+4m)</i>	52.6 <i>(63+2m/44+2m)</i>	45.4 <i>(64/45)</i>	47.5 <i>(64+10m/45+10m)</i>	50.1 <i>(65+8m/46+8m)</i>	50.9 <i>(66+4m/47+4m)</i>

Tab. A2.3: net replacement rates in the public pension system - Base case and retirement with the minimum eligibility requirements (values %)

Private employees

	2010	2020	2030	2040	2050	2060	2070
	<b>Contribution period: 38 years</b>						
Base case <i>(age)</i>	84.3 <i>(65+4m)</i>	80.2 <i>(67+1m)</i>	77.1 <i>(67+11m)</i>	69.1 <i>(65+9m)</i>	69.5 <i>(66+7m)</i>	69.7 <i>(67+5m)</i>	69.6 <i>(68+1m)</i>
	<b>Years of contribution and age requirement increasing through time</b>						
Old age retirement <i>(age/contr. period)</i>	79.4 <i>(65+4m/35+4m)</i>	78.4 <i>(67+1m/37+1m)</i>	76.9 <i>(67+11m/37+11m)</i>	76.6 <i>(68+9m/38+9m)</i>	78.4 <i>(69+7m/39+7m)</i>	80.2 <i>(70+5m/40+5m)</i>	81.1 <i>(71+1m/41+1m)</i>
	<b>Years of contribution and age requirement increasing through time (NDC alone)</b>						
Early retirement <i>(age/contr. period)</i>	- -	- -	65.3 <i>(64+11m/34+11m)</i>	65.9 <i>(65+9m/35+9m)</i>	67.5 <i>(66+7m/36+7m)</i>	68.9 <i>(67+5m/37+5m)</i>	69.7 <i>(68+1m/38+1m)</i>
	<b>Contribution requirement channel (age of entry into the labor market: 19 years)</b>						
Early retirement - Female <i>(age/contr. period)</i>	88.0 <i>(60/41)</i>	83.1 <i>(61+4m/42+4m)</i>	76.6 <i>(62+2m/43+2m)</i>	72.9 <i>(63/44)</i>	73.6 <i>'63+10m/44+10m)</i>	75.1 <i>(64+8m/45+8m)</i>	75.9 <i>(65+4m/46+4m)</i>
Early retirement - Male <i>(age/contr. period)</i>	88.0 <i>(60/41)</i>	90.1 <i>(62+4m/43+4m)</i>	80.0 <i>(63+2m/44+2m)</i>	76.3 <i>(64/45)</i>	76.9 <i>'64+10m/45+10m)</i>	78.4 <i>(65+8m/46+8m)</i>	79.3 <i>(66+4m/47+4m)</i>

Self-employed

	2010	2020	2030	2040	2050	2060	2070
	<b>Contribution period: 38 years</b>						
Base case <i>(age)</i>	95.2 <i>(65+7m)</i>	76.7 <i>(67+1m)</i>	68.4 <i>(67+11m)</i>	66.9 <i>(68+9m)</i>	69.5 <i>(69+7m)</i>	70.2 <i>(70+5m)</i>	70.1 <i>(71+1m)</i>
	<b>Years of contribution and age requirement increasing through time</b>						
Old age retirement <i>(age/contr. period)</i>	90.2 <i>(65+7m/35+7m)</i>	74.6 <i>(67+1m/37+1m)</i>	68.2 <i>(67+11m/37+11m)</i>	67.8 <i>(68+9m/38+9m)</i>	71.4 <i>(69+7m/39+7m)</i>	73.7 <i>(70+5m/40+5m)</i>	74.5 <i>(71+1m/41+1m)</i>
	<b>Years of contribution and age requirement increasing through time (NDC alone)</b>						
Early retirement <i>(age/contr. period)</i>	- -	- -	55.3 <i>(64+11m/34+11m)</i>	58.0 <i>(65+9m/35+9m)</i>	61.0 <i>(66+7m/36+7m)</i>	62.5 <i>(67+5m/37+5m)</i>	63.3 <i>(68+1m/38+1m)</i>
	<b>Contribution requirement channel (age of entry into the labor market: 19 years)</b>						
Early retirement - Female <i>(age/contr. period)</i>	99.1 <i>(60+6m/41+6m)</i>	87.2 <i>(61+4m/42+4m)</i>	71.5 <i>(62+2m/43+2m)</i>	64.0 <i>(63/44)</i>	66.5 <i>'63+10m/44+10m)</i>	69.2 <i>(64+8m/45+8m)</i>	70.0 <i>(65+4m/46+4m)</i>
Early retirement - Male <i>(age/contr. period)</i>	99.1 <i>(60+6m/41+6m)</i>	103.3 <i>(62+4m/43+4m)</i>	74.9 <i>(63+2m/44+2m)</i>	66.6 <i>(64/45)</i>	69.0 <i>'64+10m/45+10m)</i>	71.9 <i>(65+8m/46+8m)</i>	72.9 <i>(66+4m/47+4m)</i>



## ANNEX 3 –Decomposition of the pension expenditure to GDP ratio

### 3.1 A set of consistent indicators

The ratio between pension expenditure and GDP ( $\psi$ ) can be decomposed as follows:

$$\psi = \frac{P}{\Pi} \frac{V}{E} \frac{E}{L} \frac{R}{V} \quad [1]$$

where:  $P$  stands for the average pension,  $\Pi$  for GDP per worker,  $V$  for the old-age population (70+),  $E$  for the working age population (20-69),  $L$  for employment, and  $R$  for pensions. Moreover, setting:  $P/\Pi = \lambda$ ,  $V/E = \delta$ ,  $E/L = \alpha$  and  $R/V = \beta$ , the ratio becomes:

$$\psi = \lambda \delta \alpha \beta \quad [2]$$

Furthermore,  $\beta$  can be decomposed as follows:

$$\beta = \beta^{dir} + \beta^{sup} + \beta^{sur} + \beta^{less} \quad [3]$$

where:  $\beta^{dir}$  stands for the pensioners 70+ entitled to any kind of pension other than survivor's, divided by the old-age population;  $\beta^{sup}$  stands for the supplementary pensions<sup>51</sup> of 70+ divided by the old-age population;  $\beta^{sur}$  stands for the survivor's pensions of 70+ divided by the old-age population;  $\beta^{less}$  stands for the pensions below 70, divided by the old-age population.

In turn, the latter can be further decomposed as a product of two factors:

$$\beta^{less} = \beta_{norm}^{less} \beta_{dem}^{less} \quad [4]$$

where:  $\beta_{norm}^{less}$  is the ratio between the pensions below 65 and the population in the age class 50-69, while  $\beta_{dem}^{less}$  is the ratio between the population in the age class 50-69 and the old age population.

Finally, from equations [2]-[4], we have:

$$\psi = \lambda \delta \alpha (\beta^{dir} + \beta^{sup} + \beta^{sur} + \beta_{dem}^{less} \cdot \beta_{norm}^{less}) \quad [5]$$

It is worthwhile pointing out that:

<sup>51</sup> Supplementary pensions are generally small in amount insofar as they are calculated on contribution years other than those already utilised for the main pension

- the indicators:  $\alpha, \delta$  and  $\beta_{dem}^{less}$  do not depend on the pension model results, but only on labour and demographic scenario assumptions as defined in the EPC-WGA;
- the indicator  $\lambda$  mainly reflects the calculation and the indexation rules foreseen by the legal-institutional framework;
- the indicator  $\beta_{norm}^{less}$  mainly reflects possible changes in the eligibility requirements already legislated;
- the evolution of the indicator  $\beta^{sur}$  is mainly driven by changes in life expectancy (especially, gender gap), and mortality rates at age of 70 and over;
- finally, the indicator  $\beta^{dir}$  allows to assess the consistency between the elderly people and the pensioners in the same age class.

Moving to the percentage changes, the equation [2] becomes:

$$\frac{\Delta\psi}{\psi} = \frac{\Delta\delta}{\delta} + \frac{\Delta\lambda}{\lambda} + \frac{\Delta\beta}{\beta} + \frac{\Delta\alpha}{\alpha} + \nu \quad [6]$$

where  $\nu$  measures the interaction effect of the explicative variables.

Finally, changes in the pension expenditure to GDP ratio may be decomposed as follows:

$$\Delta\psi = \left( \frac{\Delta\delta}{\delta} + \frac{\Delta\lambda}{\lambda} + \frac{\Delta\beta}{\beta} + \frac{\Delta\alpha}{\alpha} + \nu \right) \psi \quad [7]$$

The breakdown described in equations [5], [6] and [7] is given in Tables A3.1, A3.2 and A3.3, respectively, for the baseline and all sensitivity test projections.

### 3.2 The decomposition formula agreed in the AWG

To assess the relevance of the driving forces behind pension projection results, the following formula has been agreed in the AWG which basically decompose the evolution pension expenditure to GDP ratio into the effects of the following four factors: dependency ratio, coverage ratio, employment rate and benefit ratio.

$$\frac{\text{Pension Exp}}{\text{GDP}} = \frac{\overbrace{\text{Population 65+}}^{\text{Dependency Ratio}}}{\text{Population 20-64}} \times \frac{\overbrace{\text{Number of Pensioners (Pensions)}}^{\text{Coverage Ratio}}}{\text{Population 65+}} \times \frac{\overbrace{\text{Average income from pensions (Average Pension)}}^{\text{Benefit Ratio}}}{\text{GDP}} \times \frac{\overbrace{\text{Population 20-64}}^{\text{Labour Market/Labour Intensity}}}{\text{Hours Worked 20-74}} \times \text{Hours Worked 20-74} \quad [8]$$

The labour market indicator can be further decomposed according to the following:

$$\frac{\overbrace{\text{Population 20-64}}^{\text{Labour Market/Labour Intensity}}}{\text{Hours Worked 20-74}} = \frac{\overbrace{\text{Population 20-64}}^{1/\text{Employment Rate}}}{\text{Working People 20-64}} \times \frac{\overbrace{\text{Working People 20-64}}^{1/\text{Labour Intensity}}}{\text{Hours Worked 20-64}} \times \frac{\overbrace{\text{Hours Worked 20-64}}^{1/\text{Careershift}}}{\text{Hours Worked 20-74}} \quad [9]$$

Such a formula may be applied to the entire forecasting period or to specific sub-periods, within the forecasting horizon. Of course, the cumulative effects calculated for each sub-period should equalize that over the entire period. This property should be maintained also when the effects of the driving factors are expressed in terms of potential changes in pension expenditure to GDP ratio.

However, this does not happen in the Commission's calculations reported in the table 9 of the fiche. In fact, in that context: i) the cumulative effects over the entire forecasting period are obtained as an algebraic sum of the effects over the ten-year sub-periods, which differ from the value attainable applying the formula directly to 2016-2070 period; ii) the effects calculated for each sub-period (and the sum of them) depend on their temporal length and frequency; iii) changes occurring only to one factor are somewhat spread over the others<sup>52</sup>.

Tables A3.4 compares the decomposition reported in the Table 9 of the fiche with an alternative one which overcomes the shortcomings mentioned above. In Table A3.4.a the composition refers to pensions, while in Table A3.4.b to pensioners.

<sup>52</sup> For instance, a reduction in the benefit ratio due to normative reasons also affects all the other driving factors, especially demography, the change of which may even outrun that in the benefit ratio.



**Table A3.1: 2018 AWG pension projections – decomposition of pension expenditure to GDP ratio through a consistent set of explanatory factors<sup>(1)</sup>**

	baseline scenario							lower migration							higher migration							high life expectancy						
	2016	2020	2030	2040	2050	2060	2070	2016	2020	2030	2040	2050	2060	2070	2016	2020	2030	2040	2050	2060	2070	2016	2020	2030	2040	2050	2060	2070
Pension expenditure / GDP (Y)	15.6%	15.6%	17.2%	18.7%	17.3%	15.1%	13.9%	15.6%	15.7%	17.5%	19.3%	18.1%	15.8%	14.4%	15.6%	15.6%	17.0%	18.1%	16.6%	14.5%	13.4%	15.6%	15.6%	17.1%	18.4%	17.3%	15.2%	14.0%
Average pension / GDP per worker (I)	19.2%	20.0%	21.2%	19.9%	17.1%	15.6%	15.4%	19.2%	19.9%	21.1%	19.7%	16.8%	15.2%	14.9%	19.2%	20.0%	21.3%	20.0%	17.4%	15.9%	15.8%	19.2%	19.9%	21.2%	20.0%	17.4%	15.9%	15.8%
Pension / employees (YI = a b d)	81.3%	78.3%	81.4%	94.1%	101.0%	96.8%	90.2%	81.4%	78.8%	83.1%	97.9%	107.3%	104.0%	96.6%	81.2%	77.9%	79.8%	90.5%	95.5%	90.7%	84.9%	81.3%	78.3%	80.9%	91.9%	99.1%	95.4%	88.4%
Old age dependency ratio pop (70+) / pop (20-69) (d)	30.6%	33.6%	41.9%	55.6%	63.1%	61.8%	60.8%	30.6%	33.8%	42.9%	58.1%	67.2%	66.1%	64.7%	30.6%	33.4%	40.9%	53.0%	59.0%	56.8%	55.2%	30.6%	33.7%	42.5%	57.1%	66.0%	66.1%	66.3%
Pop (20-69) / employees (a)	142.0%	134.9%	120.8%	117.8%	119.2%	117.9%	115.1%	142.2%	134.7%	120.2%	116.9%	118.3%	117.2%	114.3%	141.9%	135.1%	121.4%	118.7%	120.1%	118.4%	115.7%	142.0%	134.9%	120.3%	115.5%	116.3%	115.2%	111.8%
Pensions / pop (70+) (b=b <sup>dir</sup> +b <sup>sup</sup> +b <sup>sur</sup> +b <sup>less</sup> )	187.1%	172.7%	160.8%	143.7%	134.3%	133.0%	128.8%	187.1%	172.8%	161.0%	144.2%	135.0%	134.2%	130.5%	187.1%	172.7%	160.8%	143.9%	134.9%	134.9%	132.9%	187.1%	172.1%	158.1%	139.3%	129.1%	125.3%	119.4%
Direct pensioners (70+) / pop (70+) (b <sup>dir</sup> )	81.6%	81.7%	84.0%	85.8%	86.7%	87.4%	86.6%	81.6%	81.8%	84.1%	86.0%	87.1%	87.9%	87.3%	81.6%	81.7%	84.1%	86.0%	87.3%	88.8%	90.0%	81.6%	81.7%	84.1%	86.0%	86.3%	86.0%	84.4%
Direct supplementary pensions (70+) / pop (70+) (b <sup>sup</sup> )	6.7%	7.4%	8.2%	6.2%	4.7%	4.1%	4.1%	6.7%	7.4%	8.3%	6.3%	4.8%	4.3%	4.4%	6.7%	7.4%	8.2%	6.1%	4.7%	4.1%	4.1%	6.7%	7.4%	8.2%	6.1%	4.7%	4.0%	3.7%
Survivors' pensions (70+) / pop (70+) (b <sup>sur</sup> )	35.8%	34.4%	31.7%	27.3%	26.5%	27.5%	26.0%	35.8%	34.4%	31.8%	27.4%	26.8%	28.1%	26.9%	35.8%	34.4%	27.3%	26.6%	27.6%	26.4%	26.4%	35.8%	34.4%	31.3%	26.5%	25.1%	25.5%	23.8%
Pensions (<70) / pop (70+) (b <sup>less</sup> = norm b <sup>less</sup> * dem b <sup>less</sup> )	63.0%	49.2%	36.8%	24.4%	16.2%	14.0%	12.0%	63.0%	49.2%	36.8%	24.5%	16.3%	13.9%	12.0%	63.0%	49.2%	36.8%	24.5%	16.4%	14.3%	12.5%	63.0%	48.7%	34.4%	20.7%	13.0%	9.8%	7.5%
Pensions (<70) / pop (50-69) (norm b <sup>less</sup> )	68.9%	54.4%	50.4%	50.1%	37.5%	29.9%	26.6%	68.9%	54.5%	50.9%	51.5%	39.7%	31.5%	28.0%	68.9%	54.3%	50.0%	48.7%	35.6%	28.4%	25.5%	68.9%	54.0%	47.9%	43.6%	31.3%	22.5%	18.0%
pop (50-69) / pop (70+) (dem b <sup>less</sup> )	91.5%	90.3%	73.0%	48.8%	43.3%	46.8%	45.0%	91.5%	90.2%	72.4%	47.5%	41.0%	44.2%	42.9%	91.5%	90.5%	73.6%	50.3%	45.9%	50.3%	49.2%	91.5%	90.1%	72.0%	47.5%	41.4%	43.8%	41.4%
	higher employment rate							lower employment rate							higher employment/participation rate older workers							higher TFP						
	2016	2020	2030	2040	2050	2060	2070	2016	2020	2030	2040	2050	2060	2070	2016	2020	2030	2040	2050	2060	2070	2016	2020	2030	2040	2050	2060	2070
Pension expenditure / GDP (Y)	15.6%	15.6%	16.9%	18.4%	17.0%	15.0%	13.9%	15.6%	15.7%	17.6%	19.0%	17.6%	15.2%	13.9%	15.6%	15.2%	15.4%	17.8%	17.2%	15.2%	14.2%	15.6%	15.6%	17.2%	18.2%	16.2%	13.9%	12.8%
Average pension / GDP per worker (I)	19.2%	20.0%	21.3%	20.0%	17.3%	15.7%	15.6%	19.2%	20.0%	21.1%	19.7%	16.9%	15.4%	15.2%	19.2%	19.8%	21.4%	21.2%	18.9%	17.5%	17.6%	19.2%	20.0%	21.1%	19.3%	16.0%	14.3%	14.1%
Pension / employees (YI = a b d)	81.3%	77.9%	79.2%	91.6%	98.5%	95.0%	89.2%	81.3%	78.8%	83.8%	96.7%	103.8%	98.9%	91.3%	81.3%	76.5%	72.0%	83.8%	90.8%	86.6%	80.4%	81.3%	78.3%	81.4%	94.1%	101.1%	96.9%	90.3%
Old age dependency ratio pop (70+) / pop (20-69) (d)	30.6%	33.6%	41.9%	55.6%	63.1%	61.8%	60.8%	30.6%	33.6%	41.9%	55.6%	63.1%	61.8%	60.8%	30.6%	33.6%	41.9%	55.6%	63.1%	61.8%	60.8%	30.6%	33.6%	41.9%	55.6%	63.1%	61.8%	60.8%
Pop (20-69) / employees (a)	142.0%	134.2%	117.5%	114.8%	116.1%	114.8%	112.2%	142.0%	135.7%	124.3%	121.1%	122.6%	121.1%	118.2%	142.0%	133.3%	112.6%	109.7%	111.7%	110.6%	107.9%	142.0%	134.9%	120.8%	117.8%	119.2%	117.9%	115.1%
Pensions / pop (70+) (b=b <sup>dir</sup> +b <sup>sup</sup> +b <sup>sur</sup> +b <sup>less</sup> )	187.1%	172.7%	160.8%	143.7%	134.3%	133.9%	130.7%	187.1%	172.7%	160.8%	143.7%	134.2%	132.3%	127.0%	187.1%	170.8%	152.6%	137.5%	128.7%	126.8%	122.4%	187.1%	172.7%	160.8%	143.7%	134.3%	133.2%	128.9%
Direct pensioners (70+) / pop (70+) (b <sup>dir</sup> )	81.6%	81.7%	84.0%	85.8%	86.7%	87.8%	87.3%	81.6%	81.7%	84.0%	85.8%	86.8%	87.1%	85.9%	81.6%	81.8%	84.0%	86.1%	87.6%	87.3%	85.3%	81.6%	81.7%	84.0%	85.8%	86.8%	87.4%	86.7%
Direct supplementary pensions (70+) / pop (70+) (b <sup>sup</sup> )	6.7%	7.4%	8.2%	6.2%	4.7%	4.3%	4.7%	6.7%	7.4%	8.2%	6.2%	4.7%	4.0%	3.7%	6.7%	7.4%	8.2%	5.9%	4.4%	3.6%	3.3%	6.7%	7.4%	8.2%	6.2%	4.7%	4.2%	4.1%
Survivors' pensions (70+) / pop (70+) (b <sup>sur</sup> )	35.8%	34.4%	31.7%	27.3%	26.5%	27.6%	26.3%	35.8%	34.4%	31.7%	27.3%	26.5%	27.5%	25.8%	35.8%	34.4%	31.8%	27.3%	26.6%	27.6%	26.0%	35.8%	34.4%	31.7%	27.3%	26.5%	27.5%	26.0%
Pensions (<70) / pop (70+) (b <sup>less</sup> = norm b <sup>less</sup> * dem b <sup>less</sup> )	63.0%	49.2%	36.8%	24.5%	16.3%	14.2%	12.5%	63.0%	49.2%	36.8%	24.4%	16.1%	13.7%	11.5%	63.0%	47.1%	28.6%	18.2%	10.1%	8.3%	7.8%	63.0%	49.2%	36.8%	24.4%	16.3%	14.0%	12.1%
Pensions (<70) / pop (50-69) (norm b <sup>less</sup> )	68.9%	54.4%	50.4%	50.1%	37.8%	30.5%	27.7%	68.9%	54.4%	50.4%	50.0%	37.3%	29.3%	25.6%	68.9%	52.2%	39.2%	37.3%	23.5%	17.8%	17.4%	68.9%	54.4%	50.4%	50.1%	37.7%	30.0%	26.8%
pop (50-69) / pop (70+) (dem b <sup>less</sup> )	91.5%	90.3%	73.0%	48.8%	43.3%	46.8%	45.0%	91.5%	90.3%	73.0%	48.8%	43.3%	46.8%	45.0%	91.5%	90.3%	73.0%	48.8%	43.3%	46.8%	45.0%	91.5%	90.3%	73.0%	48.8%	43.3%	46.8%	45.0%
	lower TFP							lower fertility							risk scenario													
	2016	2020	2030	2040	2050	2060	2070	2016	2020	2030	2040	2050	2060	2070	2016	2020	2030	2040	2050	2060	2070							
Pension expenditure / GDP (Y)	15.6%	15.6%	17.3%	19.2%	18.5%	16.5%	15.2%	15.6%	15.6%	17.3%	18.9%	17.9%	16.0%	15.1%	15.6%	15.7%	17.3%	19.0%	17.9%	15.8%	14.5%							
Average pension / GDP per worker (I)	19.2%	20.0%	21.2%	20.4%	18.3%	17.0%	16.8%	19.2%	20.0%	21.2%	19.8%	17.0%	15.3%	14.9%	19.2%	20.0%	21.3%	20.2%	17.7%	16.3%	16.1%							
Pension / employees (YI = a b d)	81.3%	78.3%	81.4%	94.1%	101.0%	96.7%	90.1%	81.3%	78.3%	81.4%	95.1%	105.3%	104.5%	101.5%	81.3%	78.3%	81.4%	94.1%	101.0%	96.8%	90.1%							
Old age dependency ratio pop (70+) / pop (20-69) (d)	30.6%	33.6%	41.9%	55.6%	63.1%	61.8%	60.8%	30.6%	33.6%	41.9%	55.6%	63.1%	61.8%	60.8%	30.6%	33.6%	41.9%	55.6%	63.1%	61.8%	60.8%							
Pop (20-69) / employees (a)	142.0%	134.9%	120.8%	117.8%	119.2%	117.9%	115.1%	142.0%	134.9%	120.8%	119.2%	124.2%	127.1%	129.5%	142.0%	134.9%	120.8%	117.8%	119.2%	117.9%	115.1%							
Pensions / pop (70+) (b=b <sup>dir</sup> +b <sup>sup</sup> +b <sup>sur</sup> +b <sup>less</sup> )	187.1%	172.7%	160.8%	143.7%	134.2%	132.9%	128.6%	187.1%	172.7%	160.8%	143.7%	134.3%	133.2%	128.9%	187.1%	172.7%	160.8%	143.7%	134.2%	133.0%	128.7%							
Direct pensioners (70+) / pop (70+) (b <sup>dir</sup> )	81.6%	81.7%	84.0%	85.8%	86.7%	87.3%	86.5%	81.6%	81.7%	84.0%	85.8%	86.8%	87.5%	86.8%	81.6%	81.7%	84.0%	85.8%	86.7%	87.4%	86.6%							
Direct supplementary pensions (70+) / pop (70+) (b <sup>sup</sup> )	6.7%	7.4%	8.2%	6.2%	4.7%	4.1%	4.1%	6.7%	7.4%	8.2%	6.2%	4.7%	4.1%	4.1%	6.7%	7.4%	8.2%	6.2%	4.7%	4.1%	4.1%							
Survivors' pensions (70+) / pop (70+) (b <sup>sur</sup> )	35.8%	34.4%	31.7%	27.3%	26.5%	27.5%	26.0%	35.8%	34.4%	31.7%	27.3%	26.5%	27.5%	26.0%	35.8%	34.4%	31.7%	27.3%	26.5%	27.5%	26.0%							
Pensions (<70) / pop (70+) (b <sup>less</sup> = norm b <sup>less</sup> * dem b <sup>less</sup> )	63.0%	49.2%	36.8%	24.4%	16.2%	13.9%	11.9%	63.0%	49.2%	36.8%	24.4%	16.3%	14.0%	11.9%	63.0%	49.2%	36.8%	24.4%	16.2%	14.0%	12.0%							
Pensions (<70) / pop (50-69) (norm b <sup>less</sup> )	68.9%	54.4%	50.4%	50.0%	37.4%	29.7%	26.5%	68.9%	54.4%	50.4%	50.1%	37.6%	30.0%	26.4%	68.9%	54.4%	50.4%	50.1%	37.5%	29.8%	26.6%							
pop (50-69) / pop (70+) (dem b <sup>less</sup> )	91.5%	90.3%	73.0%	48.8%	43.3%	46.8%	45.0%	91.5%	90.3%	73.0%	48.8%	43.3%	46.8%	45.0%	91.5%	90.3%	73.0%	48.8%	43.3%	46.8%	45.0%							

(1) With regard to population, pensions and pensioners, figures are referred to the end of the year.

**Table A3.2: 2018 AWG pension projections – break-down of percentage changes in pension Expenditure to GDP ratio <sup>(1)</sup>**

	baseline scenario						lower migration						higher migration						high life expectancy					
	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60
Pension expenditure / GDP (DY / Y)	0.1%	10.3%	8.3%	-7.4%	-12.8%	-8.0%	0.6%	11.5%	10.0%	-6.2%	-12.5%	-8.9%	-0.3%	9.1%	6.8%	-8.5%	-12.9%	-7.1%	-0.1%	9.9%	7.2%	-5.9%	-12.3%	-7.7%
<i>Pop(70+) / pop(20-69) (Dd/d)</i>	9.9%	24.7%	32.5%	13.6%	-2.2%	-1.5%	10.6%	26.8%	35.4%	15.7%	-1.6%	-2.1%	9.1%	22.5%	29.6%	11.3%	-3.7%	-2.9%	10.1%	26.2%	34.3%	15.5%	0.1%	0.3%
<i>Average pension / GDP per worker (D/n)</i>	4.0%	6.1%	-6.3%	-13.8%	-9.0%	-1.2%	4.0%	5.8%	-6.7%	-14.4%	-9.7%	-1.9%	4.0%	6.4%	-5.8%	-13.3%	-8.3%	-0.7%	3.8%	6.3%	-5.6%	-12.8%	-8.8%	-0.5%
<i>Pension / pop(70+) (Db / b)</i>	-7.7%	-6.9%	-10.6%	-6.6%	-0.9%	-3.2%	-7.7%	-6.8%	-10.4%	-6.4%	-0.6%	-2.8%	-7.7%	-6.9%	-10.5%	-6.3%	0.0%	-1.4%	-8.0%	-8.2%	-11.9%	-7.3%	-3.0%	-4.7%
<i>Pop(20-69) / employees (Da / a)</i>	-5.0%	-10.4%	-2.5%	1.2%	-1.2%	-2.3%	-5.3%	-10.7%	-2.8%	1.2%	-0.9%	-2.4%	-4.8%	-10.2%	-2.2%	1.1%	-1.4%	-2.3%	-5.0%	-10.8%	-4.0%	0.7%	-1.0%	-3.0%
<i>Interaction (n)</i>	-1.1%	-13.4%	-13.2%	5.6%	13.2%	8.3%	-1.6%	-15.0%	-15.5%	3.9%	12.8%	9.2%	-0.6%	-11.9%	-11.0%	7.1%	13.4%	7.3%	-1.0%	-13.5%	-12.8%	3.8%	12.6%	7.9%
	higher employment rate						lower employment rate						higher employment/participation rate older						higher TFP					
	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60
Pension expenditure / GDP (DY / Y)	-0.4%	8.5%	8.9%	-7.2%	-12.3%	-7.0%	0.7%	12.2%	7.8%	-7.7%	-13.3%	-9.1%	-3.0%	1.4%	15.5%	-3.4%	-11.5%	-6.8%	0.1%	10.0%	5.6%	-10.8%	-14.3%	-8.2%
<i>Pop(70+) / pop(20-69) (Dd/d)</i>	9.9%	24.7%	32.5%	13.6%	-2.2%	-1.5%	9.9%	24.7%	32.5%	13.6%	-2.2%	-1.5%	9.9%	24.7%	32.5%	13.6%	-2.2%	-1.5%	9.9%	24.7%	32.5%	13.6%	-2.2%	-1.5%
<i>Average pension / GDP per worker (D/n)</i>	4.0%	6.7%	-5.9%	-13.7%	-9.0%	-1.0%	3.9%	5.5%	-6.7%	-14.0%	-9.0%	-1.5%	3.1%	7.8%	-0.7%	-10.8%	-7.3%	0.5%	4.0%	5.8%	-8.6%	-17.0%	-10.6%	-1.4%
<i>Pension / pop(70+) (Db / b)</i>	-7.7%	-6.9%	-10.6%	-6.5%	-0.3%	-2.4%	-7.7%	-6.9%	-10.6%	-6.6%	-1.4%	-4.0%	-8.7%	-10.7%	-9.9%	-6.4%	-1.5%	-3.4%	-7.7%	-6.9%	-10.6%	-6.5%	-0.9%	-3.2%
<i>Pop(20-69) / employees (Da / a)</i>	-5.5%	-12.4%	-2.4%	1.2%	-1.1%	-2.3%	-4.5%	-8.3%	-2.6%	1.2%	-1.2%	-2.4%	-6.2%	-15.6%	-2.6%	1.8%	-1.0%	-2.5%	-5.0%	-10.4%	-2.5%	1.2%	-1.2%	-2.3%
<i>Interaction (n)</i>	-0.6%	-12.0%	-13.7%	5.4%	12.6%	7.2%	-1.6%	-14.9%	-12.7%	5.8%	13.8%	9.4%	1.9%	-6.3%	-19.4%	1.7%	11.9%	6.9%	-1.1%	-13.2%	-10.9%	8.8%	14.8%	8.4%
	lower TFP						lower fertility						risk scenario											
	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60						
Pension expenditure / GDP (DY / Y)	0.1%	10.6%	11.2%	-3.7%	-11.0%	-7.9%	0.1%	10.3%	9.4%	-5.1%	-10.8%	-5.6%	0.3%	10.6%	9.6%	-5.8%	-12.0%	-7.9%						
<i>Pop(70+) / pop(20-69) (Dd/d)</i>	9.9%	24.7%	32.5%	13.6%	-2.2%	-1.5%	9.9%	24.7%	32.5%	13.6%	-2.2%	-1.5%	9.9%	24.7%	32.5%	13.6%	-2.2%	-1.5%						
<i>Average pension / GDP per worker (D/n)</i>	4.0%	6.4%	-3.8%	-10.3%	-7.1%	-1.0%	4.0%	6.1%	-6.4%	-14.3%	-10.1%	-2.9%	4.2%	6.4%	-5.1%	-12.2%	-8.1%	-1.1%						
<i>Pension / pop(70+) (Db / b)</i>	-7.7%	-6.9%	-10.6%	-6.6%	-0.9%	-3.2%	-7.7%	-6.9%	-10.6%	-6.5%	-0.8%	-3.2%	-7.7%	-6.9%	-10.6%	-6.6%	-0.9%	-3.2%						
<i>Pop(20-69) / employees (Da / a)</i>	-5.0%	-10.4%	-2.5%	1.2%	-1.2%	-2.3%	-5.0%	-10.4%	-1.4%	4.3%	2.3%	1.9%	-5.0%	-10.4%	-2.5%	1.2%	-1.2%	-2.3%						
<i>Interaction (n)</i>	-1.1%	-13.7%	-15.7%	2.1%	11.4%	8.1%	-1.1%	-13.5%	-14.2%	3.0%	10.8%	5.7%	-1.3%	-13.7%	-14.3%	4.0%	12.4%	8.2%						

(1) With regard to population, pensions and pensioners, figures are referred to the end of the year.

Table A3.3: 2018 AWG pension projections – break-down of changes in pension expenditure to GDP ratio <sup>(1)</sup>

	baseline scenario						lower migration						higher migration						high life expectancy					
	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60
Pension expenditure / GDP (DY / Y)	0.0%	1.6%	1.4%	-1.4%	-2.2%	-1.2%	0.1%	1.8%	1.7%	-1.2%	-2.3%	-1.4%	0.0%	1.4%	1.2%	-1.5%	-2.1%	-1.0%	0.0%	1.5%	1.2%	-1.1%	-2.1%	-1.2%
Pop(70+) / pop(20-69) (Dd/d)	1.5%	3.9%	5.6%	2.5%	-0.4%	-0.2%	1.7%	4.2%	6.2%	3.0%	-0.3%	-0.3%	1.4%	3.5%	5.0%	2.0%	-0.6%	-0.4%	1.6%	4.1%	5.9%	2.9%	0.0%	0.0%
Average pension / GDP per worker (Dl / l)	0.6%	1.0%	-1.1%	-2.6%	-1.6%	-0.2%	0.6%	0.9%	-1.2%	-2.8%	-1.8%	-0.3%	0.6%	1.0%	-1.0%	-2.4%	-1.4%	-0.1%	0.6%	1.0%	-1.0%	-2.4%	-1.5%	-0.1%
Pension / pop(70+) (Db / b)	-1.2%	-1.1%	-1.8%	-1.2%	-0.2%	-0.5%	-1.2%	-1.1%	-1.8%	-1.2%	-0.1%	-0.4%	-1.2%	-1.1%	-1.8%	-1.1%	0.0%	-0.2%	-1.2%	-1.3%	-2.0%	-1.3%	-0.5%	-0.7%
Pop(20-69) / employees (Da / a)	-0.8%	-1.6%	-0.4%	0.2%	-0.2%	-0.4%	-0.8%	-1.7%	-0.5%	0.2%	-0.2%	-0.4%	-0.7%	-1.6%	-0.4%	0.2%	-0.2%	-0.3%	-0.8%	-1.7%	-0.7%	0.1%	-0.2%	-0.4%
Interaction (n)	-0.2%	-2.1%	-2.3%	1.0%	2.3%	1.2%	-0.3%	-2.4%	-2.7%	0.8%	2.3%	1.5%	-0.1%	-1.9%	-1.9%	1.3%	2.2%	1.1%	-0.2%	-2.1%	-2.2%	0.7%	2.2%	1.2%
	higher employment rate						lower employment rate						higher employment/participation rate						higher TFP					
	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60
Pension expenditure / GDP (DY / Y)	-0.1%	1.3%	1.5%	-1.3%	-2.1%	-1.1%	0.1%	1.9%	1.4%	-1.5%	-2.3%	-1.4%	-0.5%	0.2%	2.4%	-0.6%	-2.0%	-1.0%	0.0%	1.6%	1.0%	-2.0%	-2.3%	-1.1%
Pop(70+) / pop(20-69) (Dd/d)	1.5%	3.8%	5.5%	2.5%	-0.4%	-0.2%	1.5%	3.9%	5.7%	2.6%	-0.4%	-0.2%	1.5%	3.7%	5.0%	2.4%	-0.4%	-0.2%	1.5%	3.9%	5.6%	2.5%	-0.3%	-0.2%
Average pension / GDP per worker (Dl / l)	0.6%	1.0%	-1.0%	-2.5%	-1.5%	-0.2%	0.6%	0.9%	-1.2%	-2.7%	-1.6%	-0.2%	0.5%	1.2%	-0.1%	-1.9%	-1.3%	0.1%	0.6%	0.9%	-1.5%	-3.1%	-1.7%	-0.2%
Pension / pop(70+) (Db / b)	-1.2%	-1.1%	-1.8%	-1.2%	-0.1%	-0.4%	-1.2%	-1.1%	-1.9%	-1.3%	-0.3%	-0.6%	-1.4%	-1.6%	-1.5%	-1.1%	-0.3%	-0.5%	-1.2%	-1.1%	-1.8%	-1.2%	-0.1%	-0.4%
Pop(20-69) / employees (Da / a)	-0.9%	-1.9%	-0.4%	0.2%	-0.2%	-0.3%	-0.7%	-1.3%	-0.5%	0.2%	-0.2%	-0.4%	-1.0%	-2.4%	-0.4%	0.3%	-0.2%	-0.4%	-0.8%	-1.6%	-0.4%	0.2%	-0.2%	-0.3%
Interaction (n)	-0.1%	-1.9%	-2.3%	1.0%	2.1%	1.1%	-0.3%	-2.4%	-2.2%	1.1%	2.4%	1.4%	0.3%	-1.0%	-3.0%	0.3%	2.0%	1.0%	-0.2%	-2.1%	-1.9%	1.6%	2.4%	1.2%
	lower TFP						lower fertility						risk scenario											
	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60	'20-'16	'30-'20	'40-'30	'50-'40	'60-'50	'70-'60						
Pension expenditure / GDP (DY / Y)	0.0%	1.7%	1.9%	-0.7%	-2.0%	-1.3%	0.0%	1.6%	1.6%	-1.0%	-1.9%	-0.9%	0.1%	1.7%	1.7%	-1.1%	-2.1%	-1.3%						
Pop(70+) / pop(20-69) (Dd/d)	1.5%	3.9%	5.6%	2.6%	-0.4%	-0.2%	1.5%	3.9%	5.6%	2.6%	-0.4%	-0.2%	1.5%	3.9%	5.6%	2.6%	-0.4%	-0.2%						
Average pension / GDP per worker (Dl / l)	0.6%	1.0%	-0.7%	-2.0%	-1.3%	-0.2%	0.6%	1.0%	-1.1%	-2.7%	-1.8%	-0.5%	0.7%	1.0%	-0.9%	-2.3%	-1.5%	-0.2%						
Pension / pop(70+) (Db / b)	-1.2%	-1.1%	-1.8%	-1.3%	-0.2%	-0.5%	-1.2%	-1.1%	-1.8%	-1.2%	-0.2%	-0.5%	-1.2%	-1.1%	-1.8%	-1.3%	-0.2%	-0.5%						
Pop(20-69) / employees (Da / a)	-0.8%	-1.6%	-0.4%	0.2%	-0.2%	-0.4%	-0.8%	-1.6%	-0.2%	0.8%	0.4%	0.3%	-0.8%	-1.6%	-0.4%	0.2%	-0.2%	-0.4%						
Interaction (n)	-0.2%	-2.1%	-2.7%	0.4%	2.1%	1.3%	-0.2%	-2.1%	-2.4%	0.6%	1.9%	0.9%	-0.2%	-2.2%	-2.5%	0.8%	2.2%	1.3%						

(1) With regard to population, pensions and pensioners, figures are referred to the end of the year.

**Table A3.4.a: 2018 AWG pension projections – factors behind the change in public pension expenditures between 2016 and 2070 (in percentage points of GDP) - Pension**

		2016-20	2020-30	2030-40	2040-50	2050-60	2060-70	2016-70
Alternative decomposition	Public pensions to GDP	0,0	1,6	1,4	-1,4	-2,2	-1,2	-1,7
	Dependency ratio effect	0,9	3,9	5,8	2,2	-0,6	-0,4	11,9
	Coverage ratio effect	-0,8	-1,4	-0,9	-0,1	-0,2	-0,5	-3,9
	<i>Coverage ratio old-age*</i>	-0,4	-0,9	-0,5	0,1	-0,1	-0,6	-2,5
	<i>Coverage ratio early-age*</i>	-3,4	-3,1	-1,5	-1,3	-0,8	-0,3	-10,4
	<i>Cohort effect*</i>	0,4	-2,1	-4,1	-1,0	0,5	0,0	-6,2
	Benefit ratio effect	0,6	1,0	-1,1	-2,2	-1,2	-0,2	-3,1
	Labour Market/Labour intensity effect	-0,6	-1,1	-0,5	-0,1	-0,1	-0,2	-2,5
	Employment ratio effect	-0,5	-0,6	-0,2	-0,1	0,0	0,0	-1,3
	Labour intensity effect	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Career shift effect	-0,2	-0,5	-0,4	0,1	-0,2	-0,2	-1,3
	Residual	-0,1	-0,8	-1,9	-1,3	-0,1	0,0	-4,1
Decomposition reported in Table 9.a of the fiche	Public pensions to GDP	0,0	1,6	1,4	-1,4	-2,2	-1,2	-1,7
	Dependency ratio effect	0,9	3,6	4,7	1,6	-0,3	-0,2	10,3
	Coverage ratio effect	-0,8	-1,5	-1,2	-0,1	-0,2	-0,7	-4,5
	<i>Coverage ratio old-age*</i>	-0,4	-0,9	-0,6	0,1	-0,2	-0,6	-2,7
	<i>Coverage ratio early-age*</i>	-3,4	-4,3	-3,1	-3,2	-2,2	-0,8	-17,0
	<i>Cohort effect*</i>	0,4	-2,2	-5,6	-1,9	1,0	0,1	-8,3
	Benefit ratio effect	0,6	0,9	-1,1	-2,7	-1,5	-0,2	-4,0
	Labour Market/Labour intensity effect	-0,6	-1,2	-0,6	-0,1	-0,2	-0,2	-2,8
	Employment ratio effect	-0,5	-0,6	-0,2	-0,2	0,0	0,0	-1,4
	Labour intensity effect	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Career shift effect	-0,2	-0,6	-0,4	0,1	-0,2	-0,2	-1,4
	Residual	-0,1	-0,2	-0,3	-0,1	0,0	0,0	-0,7
Differences	Public pensions to GDP	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Dependency ratio effect	0,0	0,3	1,1	0,7	-0,2	-0,2	1,6
	Coverage ratio effect	0,0	0,2	0,3	0,0	0,1	0,1	0,7
	<i>Coverage ratio old-age*</i>	0,0	0,1	0,1	0,0	0,0	0,0	0,2
	<i>Coverage ratio early-age*</i>	0,0	1,2	1,6	2,0	1,4	0,5	6,6
	<i>Cohort effect*</i>	0,0	0,1	1,6	0,9	-0,4	0,0	2,1
	Benefit ratio effect	0,0	0,0	0,1	0,4	0,3	0,0	0,8
	Labour Market/Labour intensity effect	0,0	0,1	0,1	0,0	0,0	0,0	0,3
	- Employment ratio effect	0,0	0,0	0,0	0,0	0,0	0,0	0,1
	- Labour intensity effect	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	- Career shift effect	0,0	0,0	0,1	0,0	0,0	0,0	0,1
	Residual	0,0	-0,6	-1,6	-1,2	-0,2	0,0	-3,4

**Table A3.4.b: 2018 AWG pension projections – factors behind the change in public pension expenditures between 2016 and 2070 (in percentage points of GDP) - Pensioner**

		2016-20	2020-30	2030-40	2040-50	2050-60	2060-70	2016-70
Alternative decomposition	Public pensions to GDP	0,0	1,6	1,4	-1,4	-2,2	-1,2	-1,7
	Dependency ratio effect	0,9	3,9	5,8	2,2	-0,6	-0,4	11,9
	Coverage ratio effect	-0,9	-1,4	-0,8	-0,1	-0,2	-0,5	-3,8
	<i>Coverage ratio old-age*</i>	-0,4	-0,9	-0,3	0,1	-0,2	-0,6	-2,2
	<i>Coverage ratio early-age*</i>	-3,5	-3,0	-1,5	-1,2	-0,8	-0,3	-10,2
	<i>Cohort effect*</i>	0,4	-2,1	-4,1	-1,0	0,5	0,0	-6,2
	Benefit ratio effect	0,7	1,1	-1,3	-2,2	-1,2	-0,2	-3,1
	Labour Market/Labour intensity effect	-0,6	-1,1	-0,5	-0,1	-0,1	-0,2	-2,5
	Employment ratio effect	-0,5	-0,6	-0,2	-0,1	0,0	0,0	-1,3
	Labour intensity effect	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Career shift effect	-0,2	-0,5	-0,4	0,1	-0,2	-0,2	-1,3
	Residual	-0,1	-0,8	-1,8	-1,3	-0,1	0,0	-4,1
Decomposition reported in Table 9.b of the fiche	Public pensions to GDP	0,0	1,6	1,4	-1,4	-2,2	-1,2	-1,7
	Dependency ratio effect	0,9	3,6	4,7	1,6	-0,3	-0,2	10,3
	Coverage ratio effect	-0,9	-1,6	-1,0	-0,1	-0,3	-0,6	-4,5
	<i>Coverage ratio old-age*</i>	-0,4	-0,9	-0,3	0,2	-0,2	-0,6	-2,3
	<i>Coverage ratio early-age*</i>	-3,5	-4,2	-3,0	-3,0	-2,1	-0,8	-16,5
	<i>Cohort effect*</i>	0,4	-2,2	-5,6	-1,9	1,0	0,1	-8,3
	Benefit ratio effect	0,7	1,0	-1,4	-2,7	-1,5	-0,2	-4,0
	Labour Market/Labour intensity effect	-0,6	-1,2	-0,6	-0,1	-0,2	-0,2	-2,8
	Employment ratio effect	-0,5	-0,6	-0,2	-0,2	0,0	0,0	-1,4
	Labour intensity effect	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Career shift effect	-0,2	-0,6	-0,4	0,1	-0,2	-0,2	-1,4
	Residual	-0,1	-0,2	-0,3	-0,1	0,0	0,0	-0,7
Differences	Public pensions to GDP	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Dependency ratio effect	0,0	0,3	1,1	0,7	-0,2	-0,2	1,6
	Coverage ratio effect	0,0	0,2	0,3	0,0	0,1	0,1	0,6
	<i>Coverage ratio old-age*</i>	0,0	0,1	0,1	0,0	0,0	0,0	0,1
	<i>Coverage ratio early-age*</i>	0,0	1,2	1,5	1,8	1,3	0,5	6,3
	<i>Cohort effect*</i>	0,0	0,1	1,6	0,9	-0,4	0,0	2,1
	Benefit ratio effect	0,0	0,0	0,1	0,4	0,3	0,0	0,9
	Labour Market/Labour intensity effect	0,0	0,1	0,1	0,0	0,0	0,0	0,3
	- Employment ratio effect	0,0	0,0	0,0	0,0	0,0	0,0	0,1
	- Labour intensity effect	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	- Career shift effect	0,0	0,0	0,1	0,0	0,0	0,0	0,1
	Residual	0,0	-0,6	-1,5	-1,2	-0,2	0,0	-3,4

## ANNEX 4 – Pensions as a share of population 70+

The figures reported below illustrate, in total and for both genders, the projected evolution of the total number of pensions in terms of the elderly population (age 70+), broken down by typology. The bold line indicates the number of pensioners of 70+ divided by the population in the corresponding age class. The number of pensioners of 70+ is composed of: old age and early pensions, old age allowances, survivors' pensions entitled to people without any other contributory pensions and pensions paid to the non-resident in the base year, all granted to people in the age bracket 70+. All the remaining pensions are reported above the bold line, namely: pensions paid to people below 70 and survivors' and supplementary pensions granted to people already retired (entitled to old age, early or disability pension).

From the analysis of the graphs, the following considerations can be drawn:

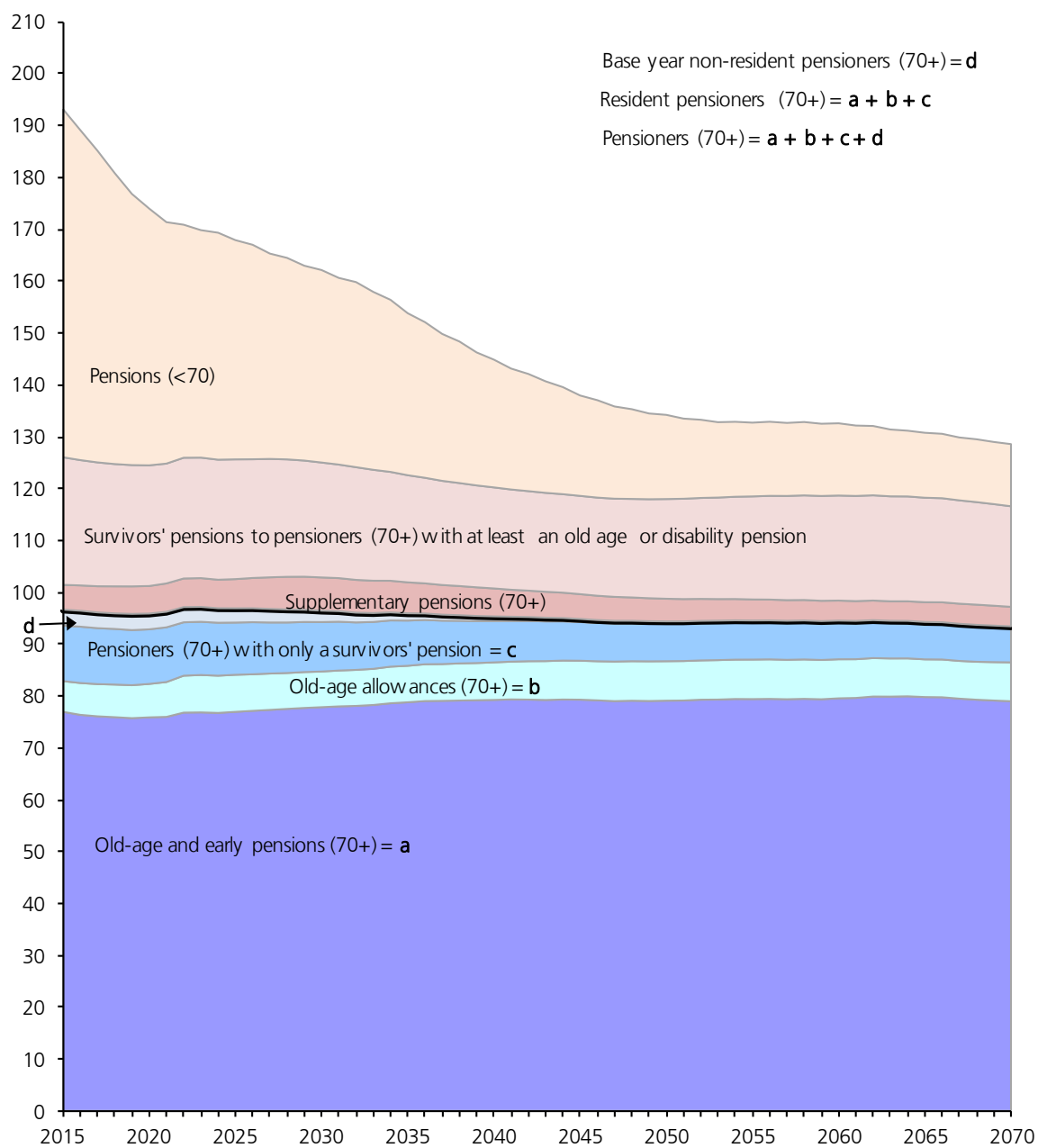
- the relevant decline in the ratio between pensions and population of 70+ is mainly due to the reduction of pensions paid to people below 70. As known, such a reduction comes from the tightening of the eligibility requirements and the transition of the baby boom generations.
- the coverage of the pension system, i.e. the quota of elderly population (70+) entitled to at least a pension, is almost stable over time<sup>53</sup>.
- the coverage is close to 100% for men, and somewhat lower for women. The difference<sup>54</sup> is mainly explained by the means-tested regulation of social assistance provisions (safety net) which also takes into account the total income of the couple. So an elderly person, with low individual income, will not be entitled to the old age allowance and social additional sums if their spouse brings the couple's income over the foreseen threshold.

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<sup>53</sup> A slight decline can be seen in the last 10-15 years of the forecasting period, due to the SRA exceeding the threshold of 70, which therefore disappear of the elderly 75+.

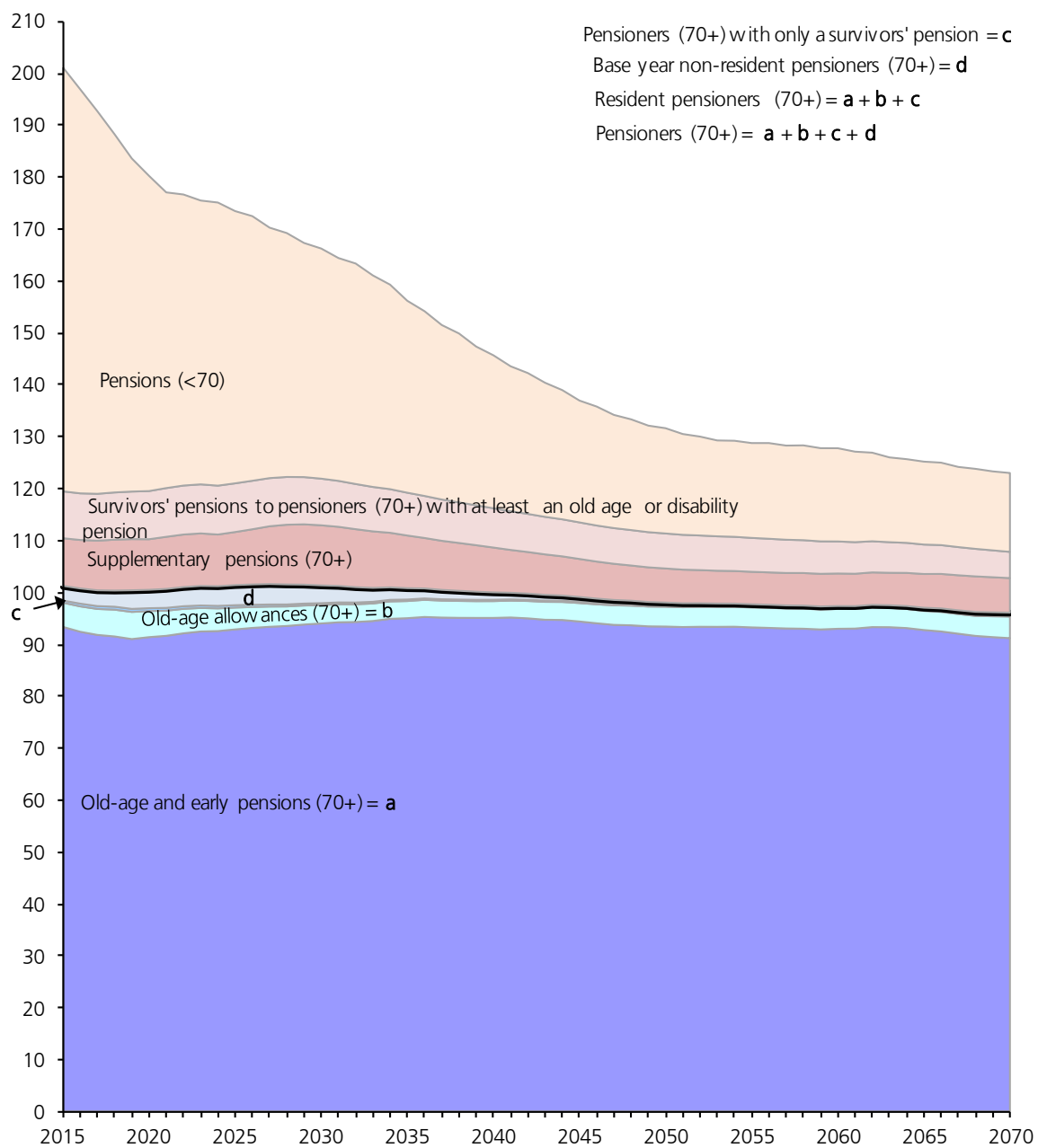
<sup>54</sup> As pointed out in the fiche, tables 12.a and 12.b, a quota of the difference for as much as 0.7-0.9 pp is to be attributed to the elderly net immigration.

Figure A4.a: pensions as a share of population of 70+ - Males and females <sup>(1)</sup>



(1) Pensions, pensioners and population at the end of the year

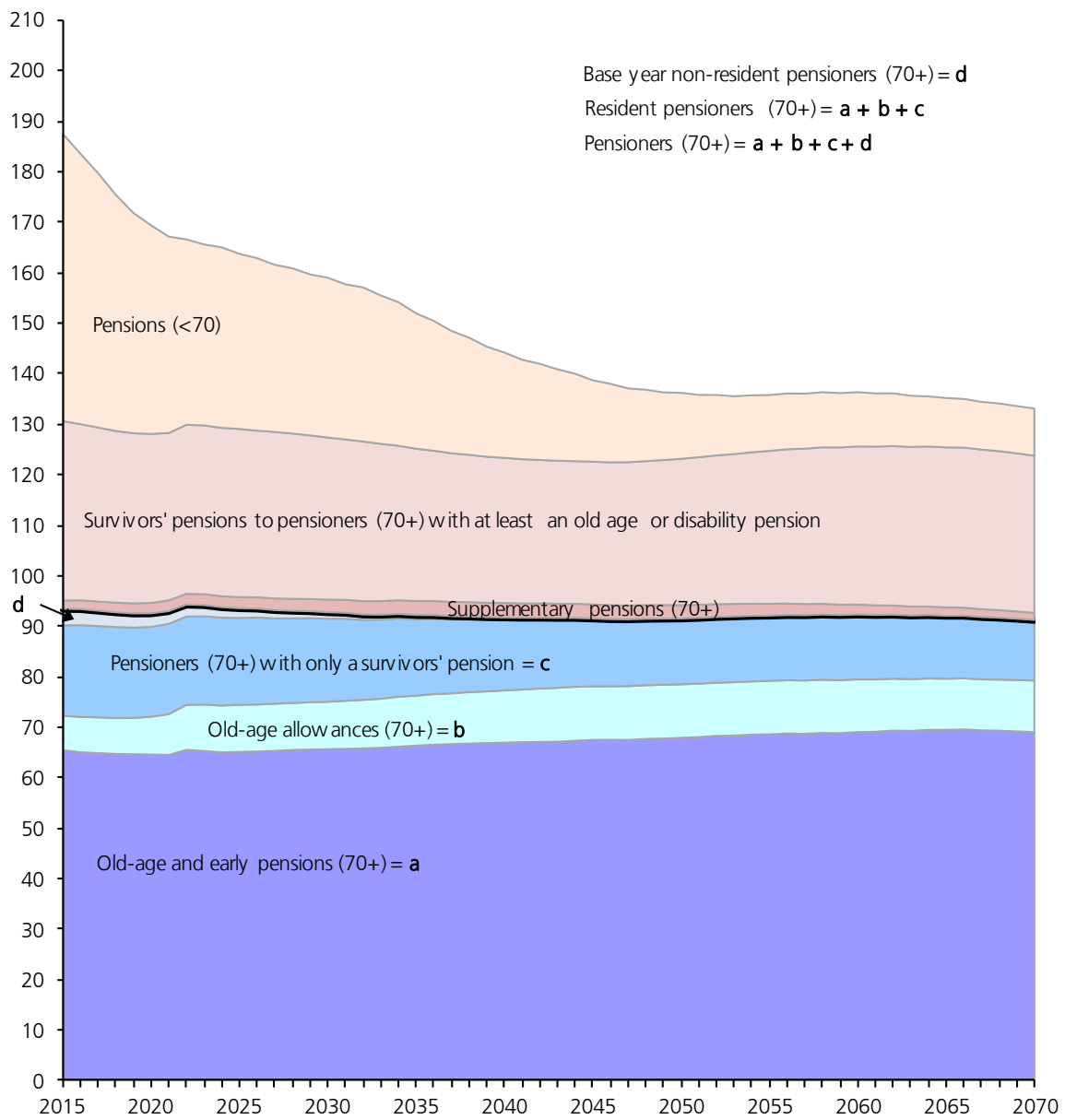
Figure A4.b: pensions as a share of population of 70+ - Males<sup>(1)</sup>



(1) Pensions, pensioners and population at the end of the year



Figure A4.c: pensions as a share of population of 70+ - Females<sup>(1)</sup>

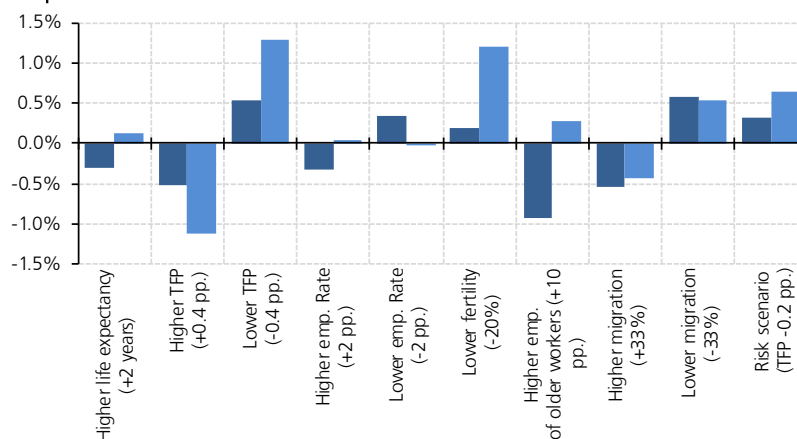


(1) Pensions, pensioners and population at the end of the year

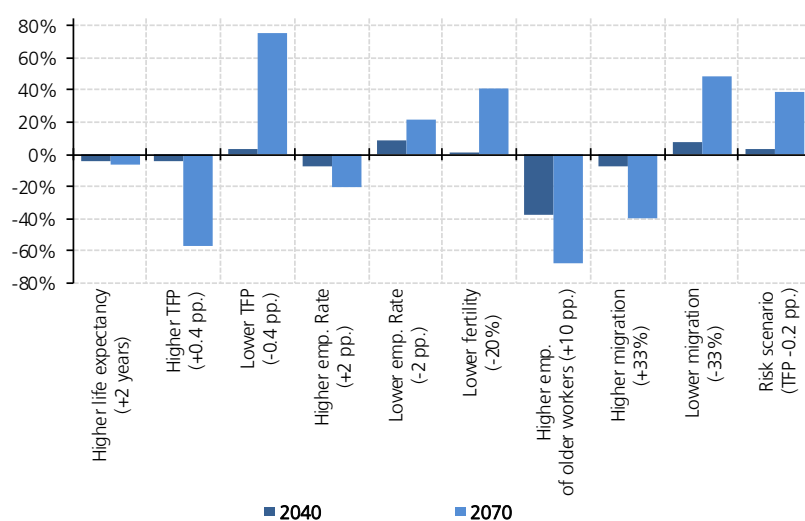
## ANNEX 5 –Sensitivity analysis

A series of graphs are given below, to complement the sensitivity analysis of the Italian pension system. In particular, graph A5.1.a compares the deviations in the pension expenditure to GDP ratio in 2040 and 2070. Graph A5.1.b reports the corresponding deviations in terms of public debt<sup>55</sup> as share of GDP. Finally, graphs A5.2 – A5.11 compare the evolution of the pension expenditure to GDP ratio as well as their driving factors, under the baseline and the sensitivity test assumptions.

**Figure A5.1.a: pension expenditure as percentage of GDP - Comparison with the baseline scenario**



**Figure A5.1.b: differential cumulative effect on debt - Comparison with the baseline scenario**



<sup>55</sup> The effect on public debt has been projected according to the EU methodology for the calculation of the cost of ageing in the S1 and S2 indicators.

Figure A5.2: pension expenditure as a percentage of GDP and its decomposition - A comparison between two hypotheses on life expectancy

Figure A5.2.a: percentage ratio of expenditure to GDP

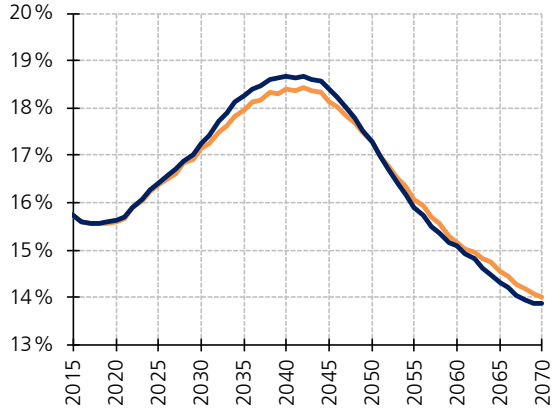


Figure A5.2.d: percentage ratio of pensions to people of 70+

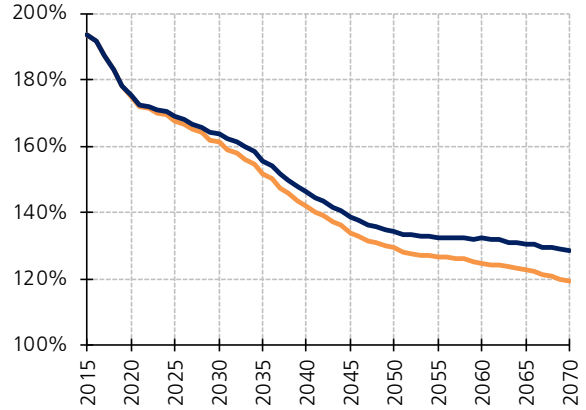


Figure A5.2.b: percentage ratio of average pension to productivity

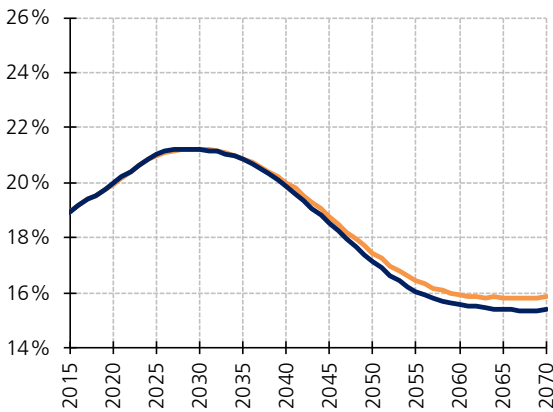


Figure A5.2.e: percentage ratio of employees to population [20-69]

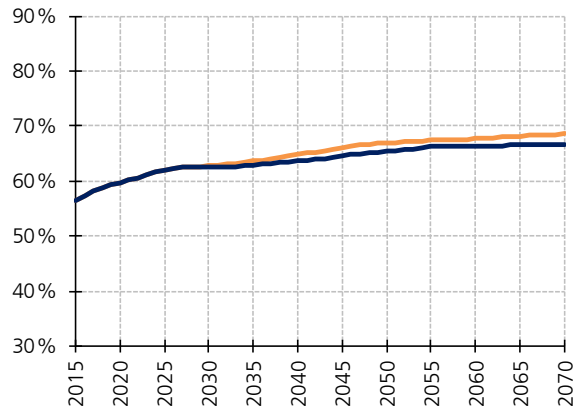


Figure A5.2.c: percentage ratio of pensions to employees

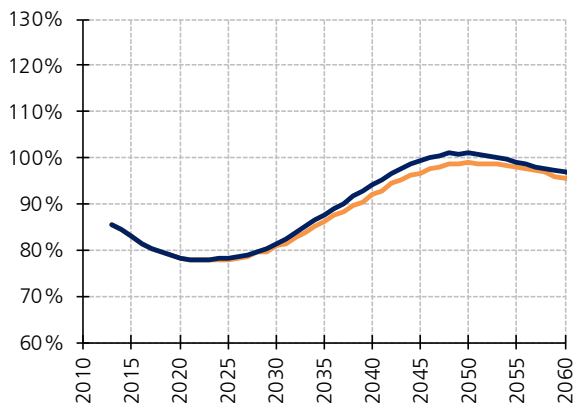
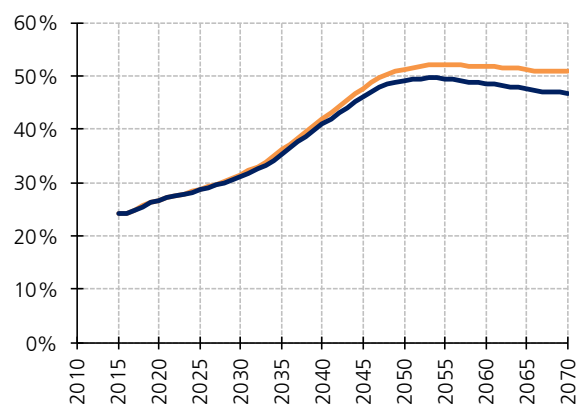


Figure A5.2.f: percentage ratio of people of 70+ to population [20-69]



— Higher life expectancy (+2 years) — Baseline

Figure A5.3: pension expenditure as a percentage of GDP and its decomposition - A comparison between two hypotheses on migration flows

Figure A5.3.a: percentage ratio of expenditure to GDP

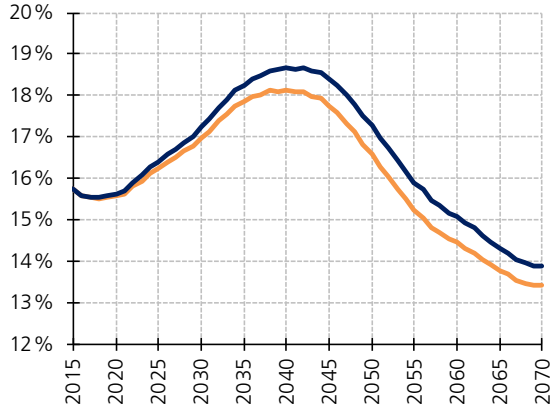


Figure A5.3.d: percentage ratio of pensions to people of 70+

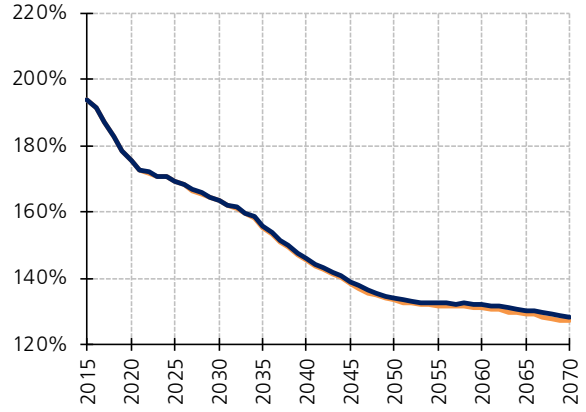


Figure A5.3.b: percentage ratio of average pension to productivity

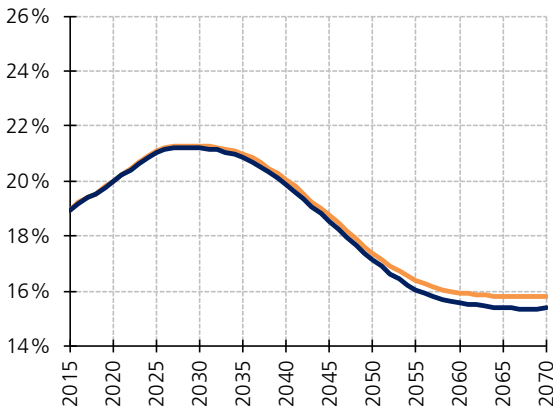


Figure A5.3.e: percentage ratio of employees to population [20-69]

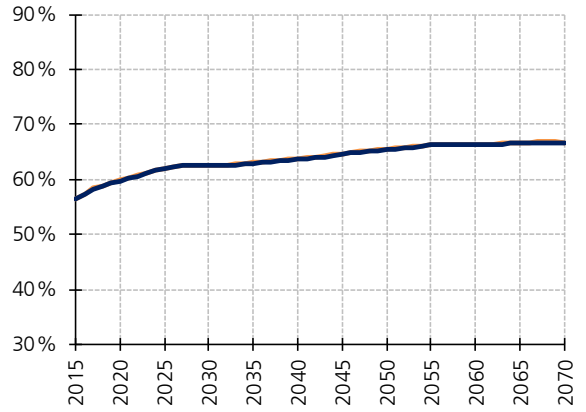


Figure A5.3.c: percentage ratio of pensions to employees

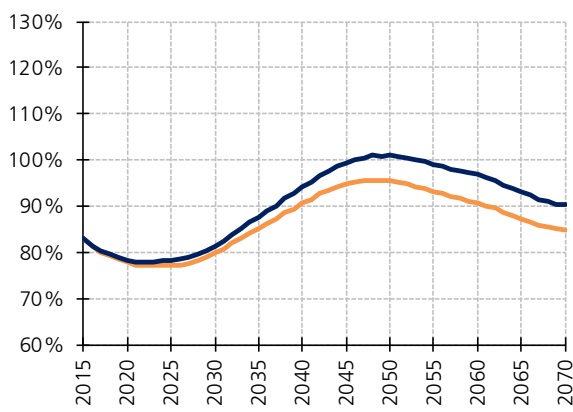
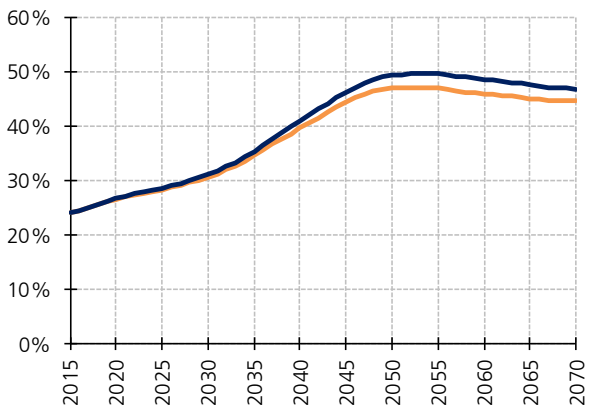


Figure A5.3.f: percentage ratio of people of 70+ to population [20-69]



Higher migration (+33%) Baseline

Figure A5.4: pension expenditure as a percentage of GDP and its decomposition - A comparison between two hypotheses on migration flows

Figure A5.4.a: percentage ratio of expenditure to GDP

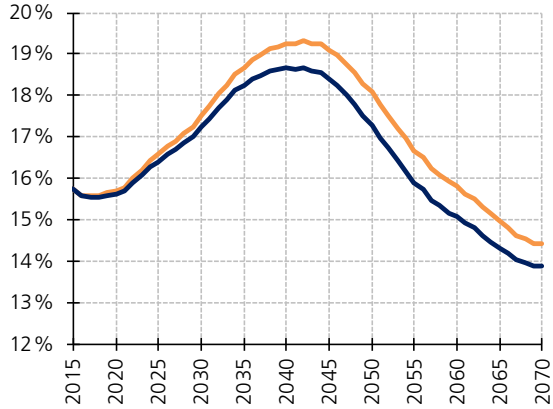


Figure A5.4.d: percentage ratio of pensions to people of 70+

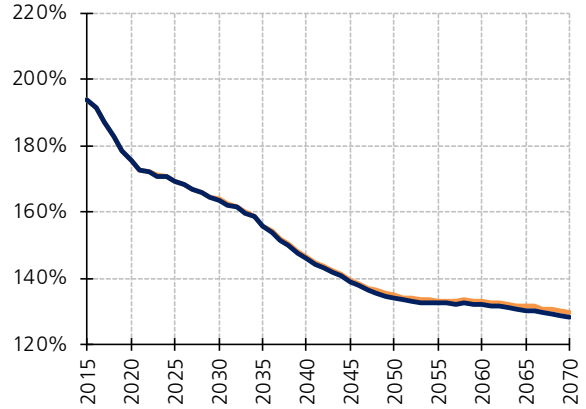


Figure A5.4.b: percentage ratio of average pension to productivity

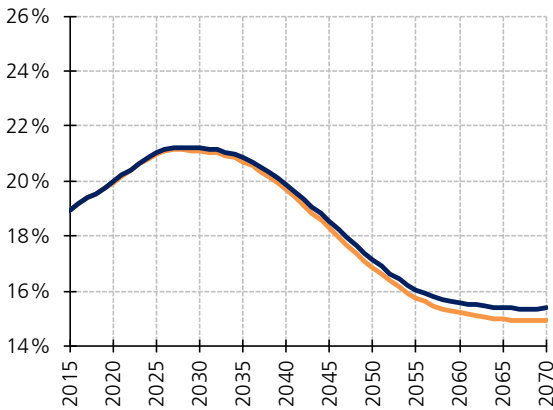


Figure A5.4.e: percentage ratio of employees to population [20-69]

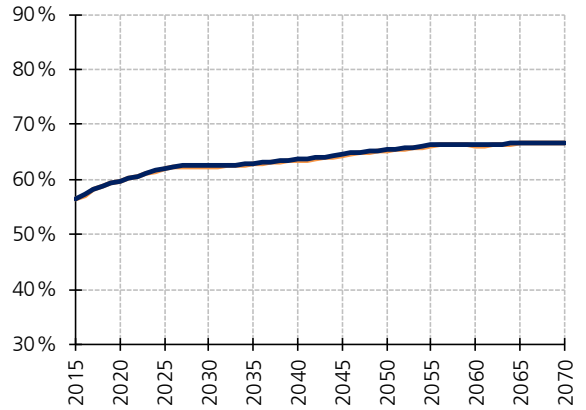


Figure A5.4.c: percentage ratio of pensions to employees

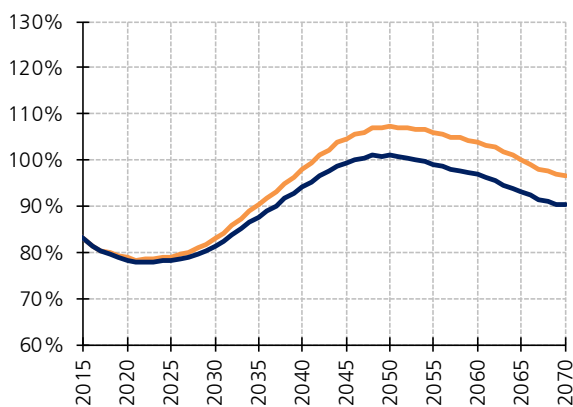
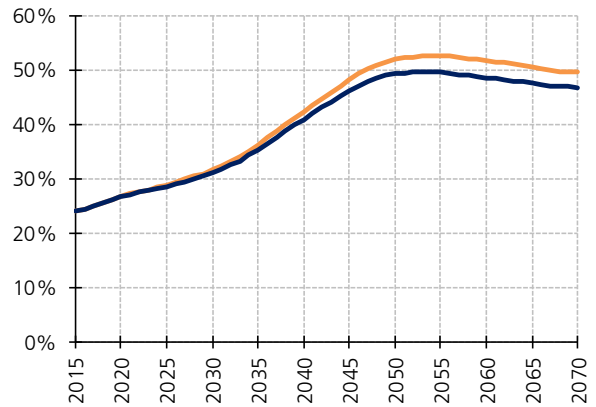


Figure A5.4.f: percentage ratio of people of 70+ to population [20-69]



— Lower migration (-33%) — Baseline

Figure A5.5: pension expenditure as a percentage of GDP and its decomposition - A comparison between two hypotheses on employment rate

Figure A5.5.a: percentage ratio of expenditure to GDP

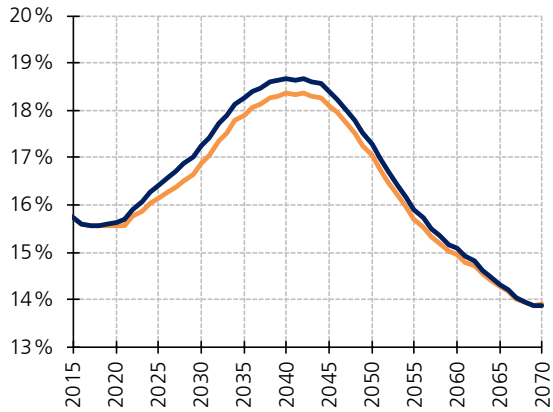


Figure A5.5.d: percentage ratio of pensions to people of 70+

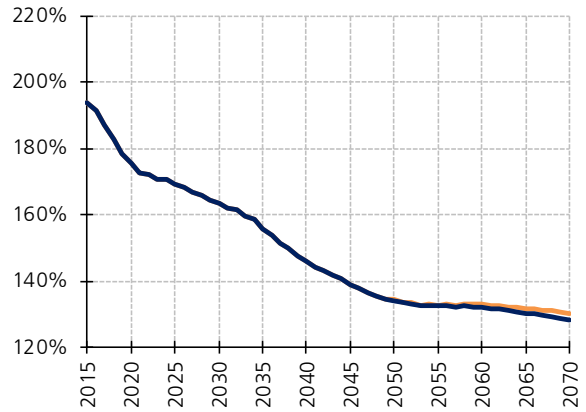


Figure A5.5.b: percentage ratio of average pension to productivity

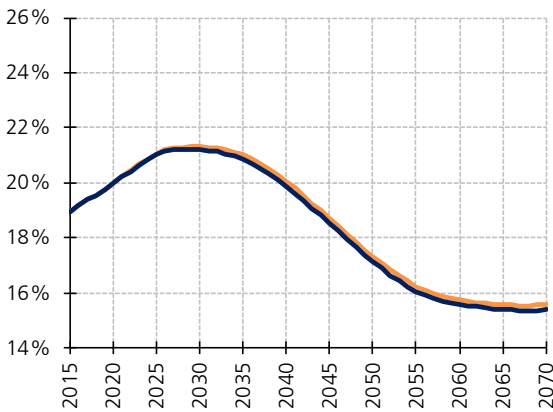


Figure A5.5.e: percentage ratio of employees to population [20-69]

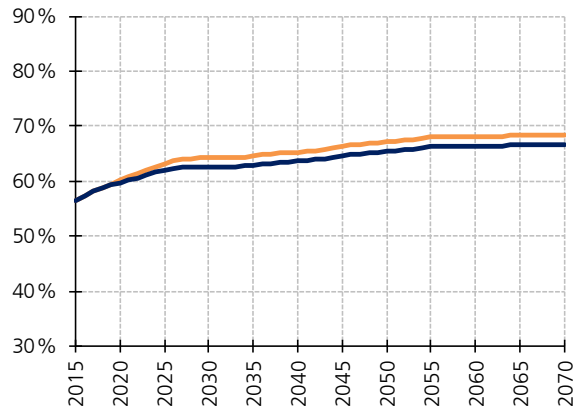


Figure A5.5.c: percentage ratio of pensions to employees

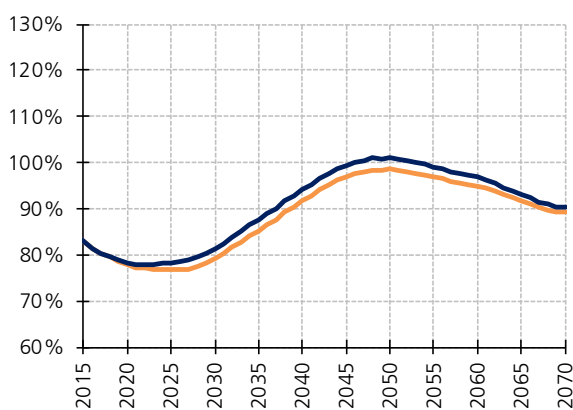
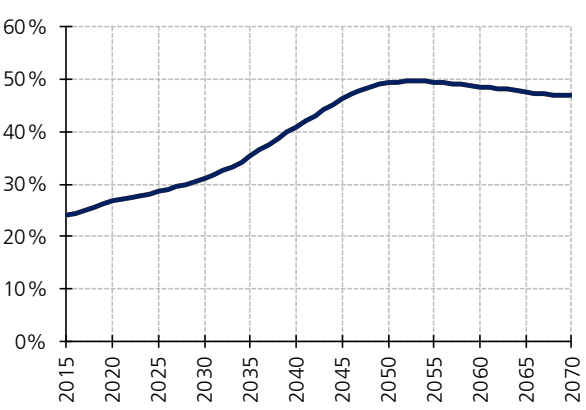


Figure A5.5.f: percentage ratio of people of 70+ to population [20-69]



— Higher emp. rate (+2 pp.) — Baseline

Figure A5.6: pension expenditure as a percentage of GDP and its decomposition - A comparison between two hypotheses on employment rate

Figure A5.6.a: percentage ratio of expenditure to GDP

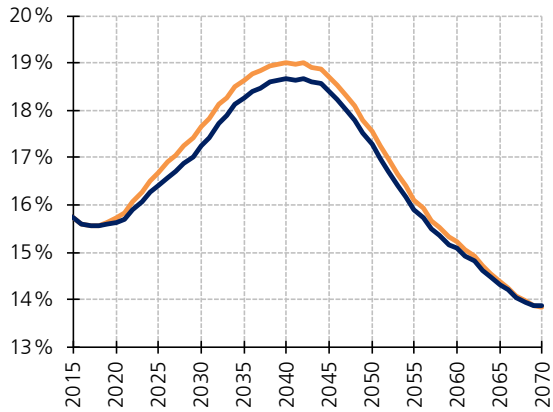


Figure A5.6.d: percentage ratio of pensions to people of 70+

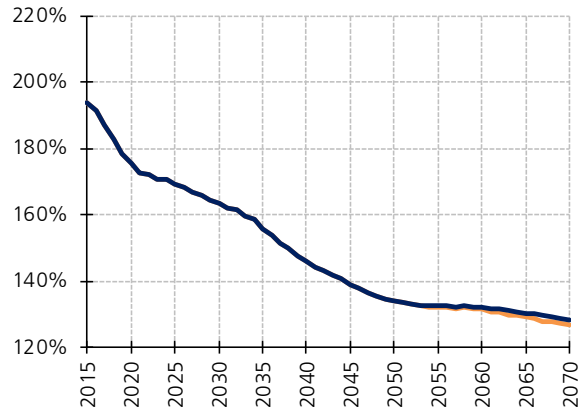


Figure A5.6.b: percentage ratio of average pension to productivity

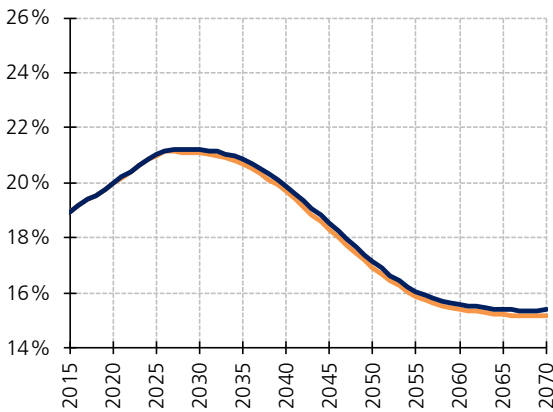


Figure A5.6.e: percentage ratio of employees to population [20-69]

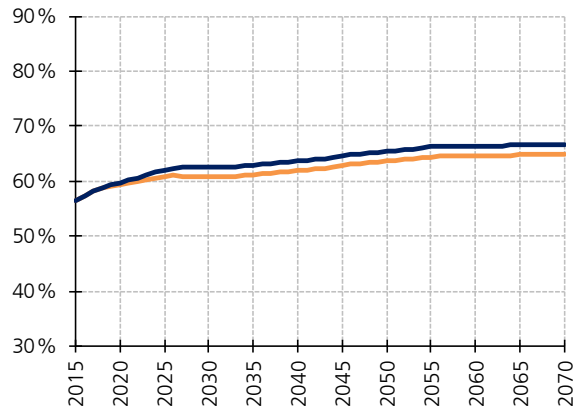


Figure A5.6.c: percentage ratio of pensions to employees

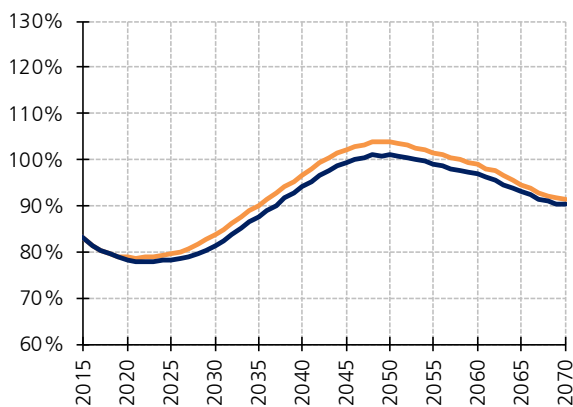
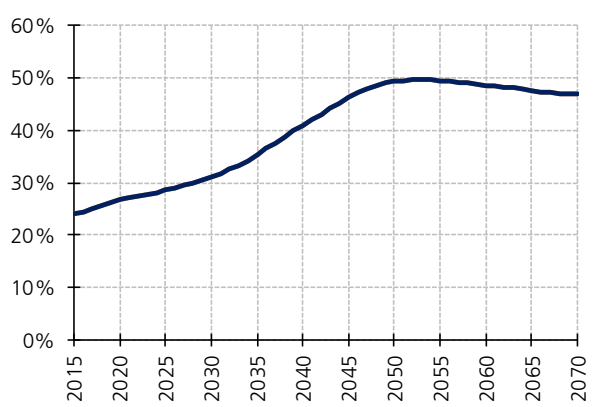


Figure A5.6.f: percentage ratio of people of 70+ to population [20-69]



— Lower emp. rate (-2 pp.) — Baseline

Figure A5.7: pension expenditure as a percentage of GDP and its decomposition - A comparison between two hypotheses on participation rate

Figure A5.7.a: percentage ratio of expenditure to GDP

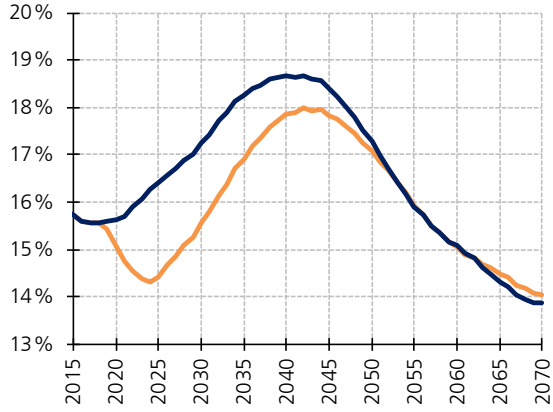


Figure A5.7.d: percentage ratio of pensions to people of 70+



Figure A5.7.b: percentage ratio of average pension to productivity

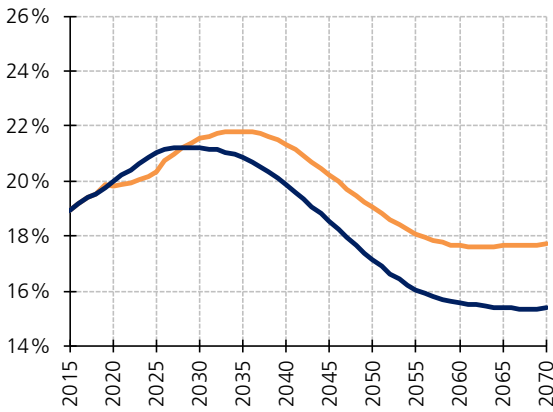


Figure A5.7.e: percentage ratio of employees to population [20-69]

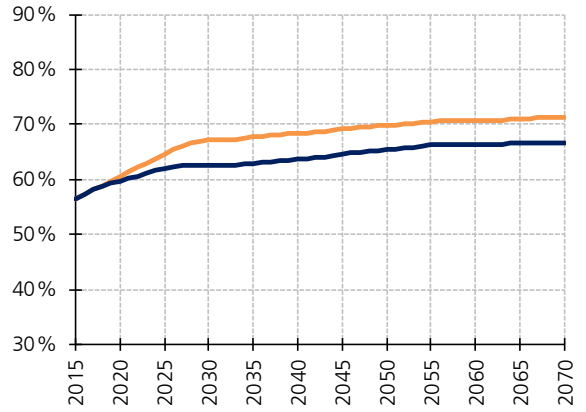


Figure A5.7.c: percentage ratio of pensions to employees

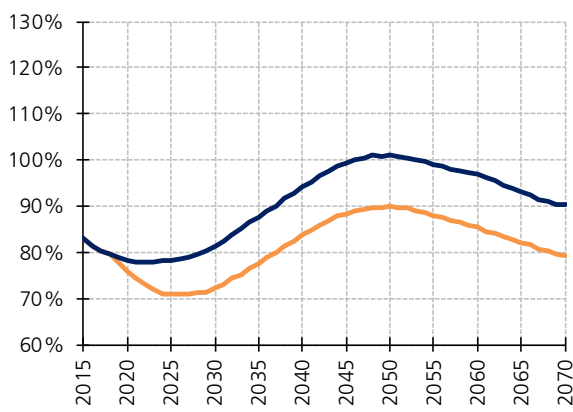
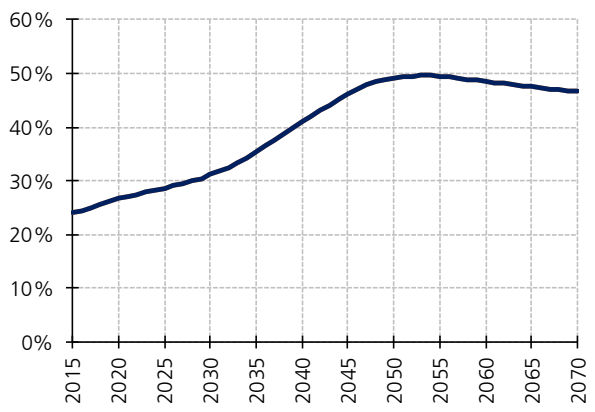


Figure A5.7.f: percentage ratio of people of 70+ to population [20-69]



Higher emp. of older workers (+10 pp.) Baseline



Figure A5.8: pension expenditure as a percentage of GDP and its decomposition - A comparison between two hypotheses on total factor productivity (TFP)

Figure A5.8.a: percentage ratio of expenditure to GDP

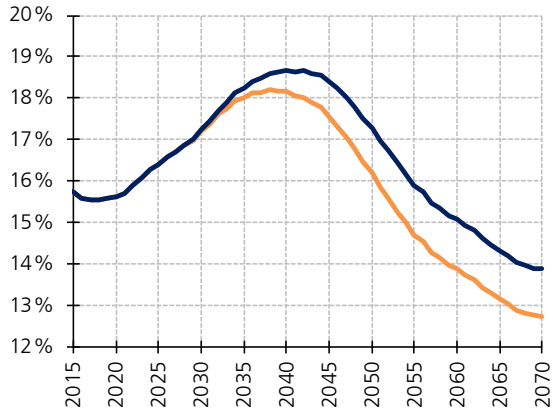


Figure A5.8.d: percentage ratio of pensions to people of 70+

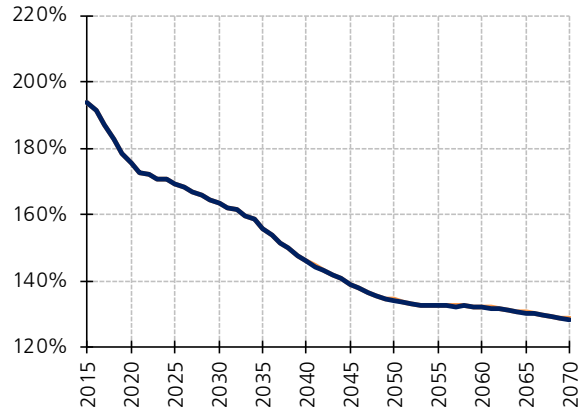


Figure A5.8.b: percentage ratio of average pension to productivity

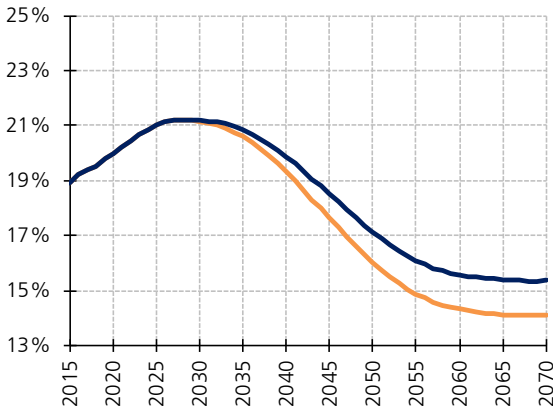


Figure A5.8.e: percentage ratio of employees to population [20-69]

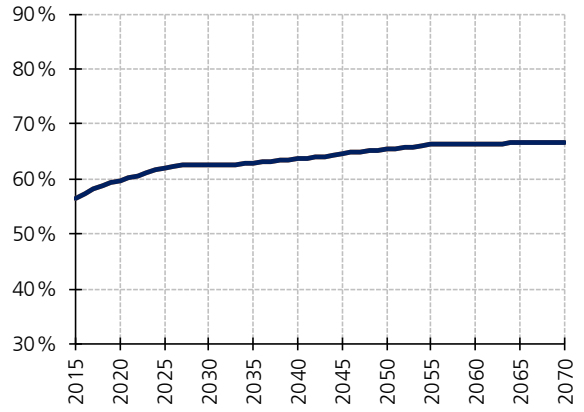


Figure A5.8.c: percentage ratio of pensions to employees

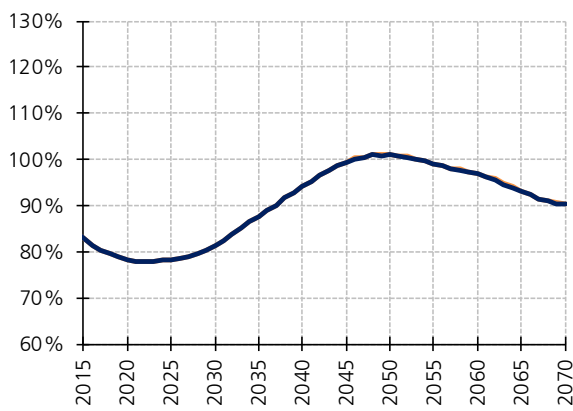
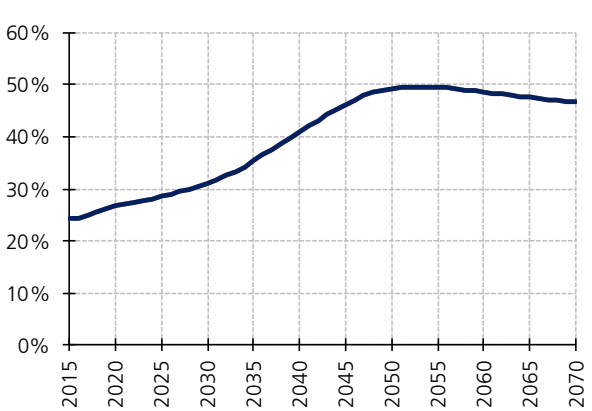


Figure A5.8.f: percentage ratio of people of 70+ to population [20-69]



— Higher TFP (+0.4pp.) — Baseline

Figure A5.9: pension expenditure as a percentage of GDP and its decomposition - A comparison between two hypotheses on total factor productivity (TFP)

Figure A5.9.a: percentage ratio of expenditure to GDP

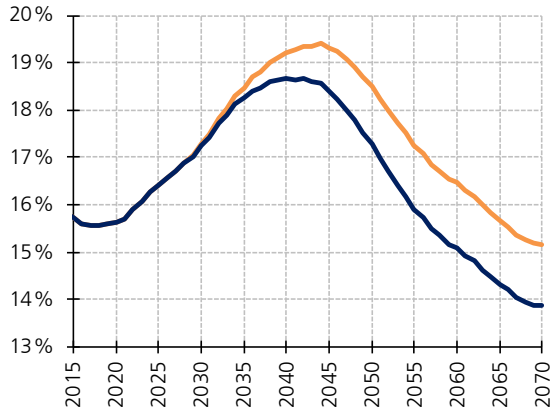


Figure A5.9.d: percentage ratio of pensions to people of 70+

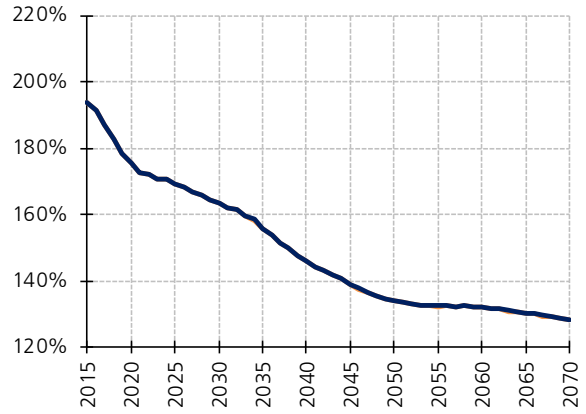


Figure A5.9.b: percentage ratio of average pension to productivity

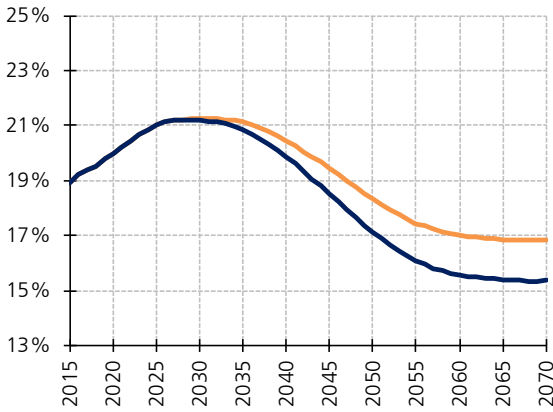


Figure A5.9.e: percentage ratio of employees to population [20-69]

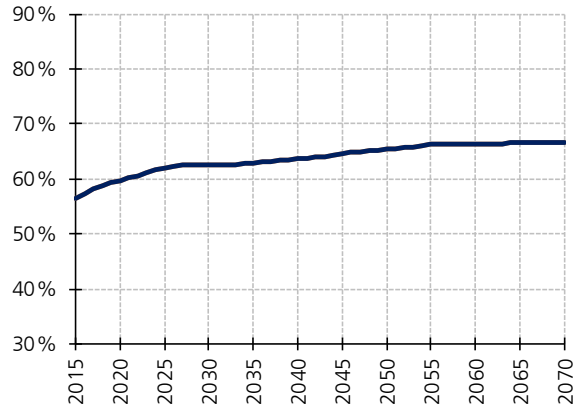


Figure A5.9.c: percentage ratio of pensions to employees

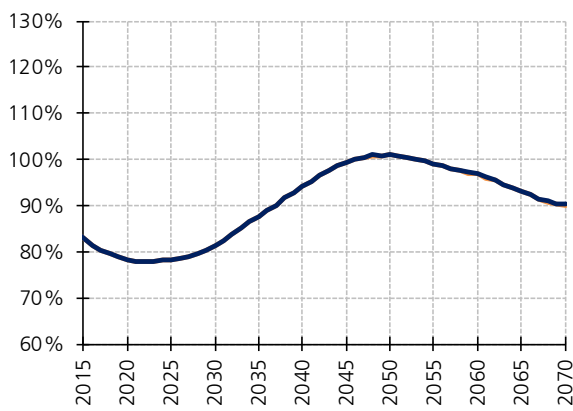
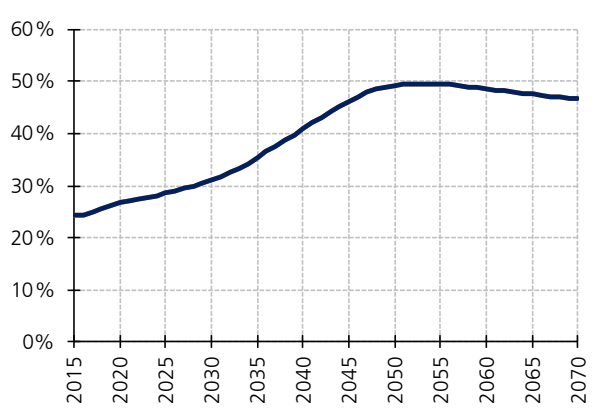


Figure A5.9.f: percentage ratio of people of 70+ to population [20-69]



— Lower TFP (-0.4pp.) — Baseline

Figure A5.10: pension expenditure as a percentage of GDP and its decomposition - A comparison between two hypotheses on fertility rate

Figure A5.10.a: percentage ratio of expenditure to GDP

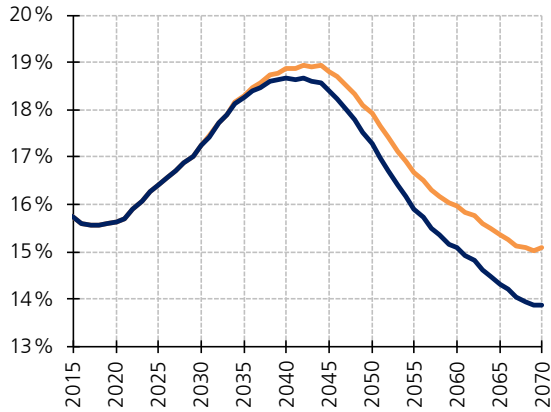


Figure A5.10.d: percentage ratio of pensions to people of 70+

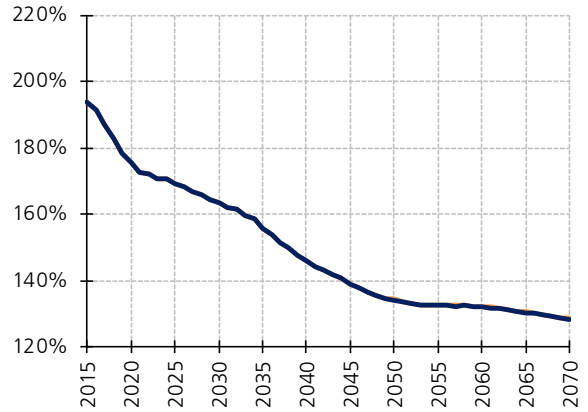


Figure A5.10.b: percentage ratio of average pension to productivity

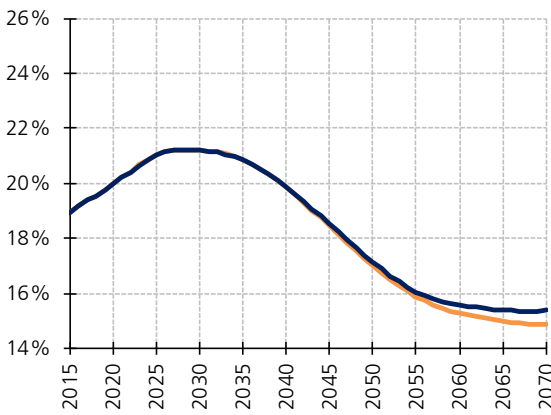


Figure A5.10.e: percentage ratio of employees to population [20-69]

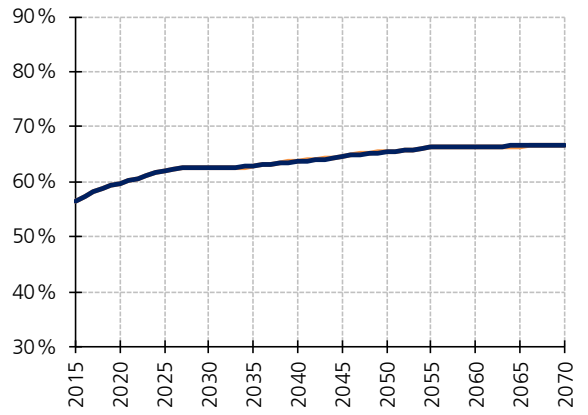


Figure A5.10.c: percentage ratio of pensions to employees

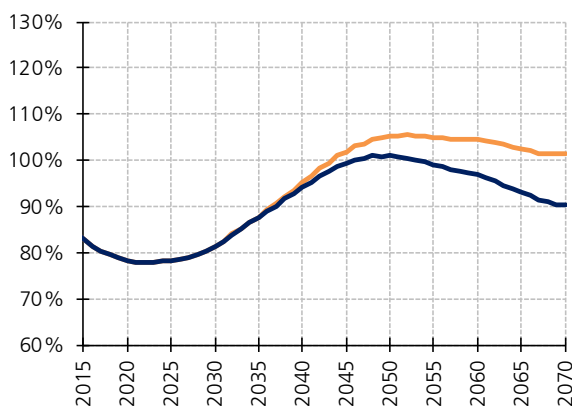
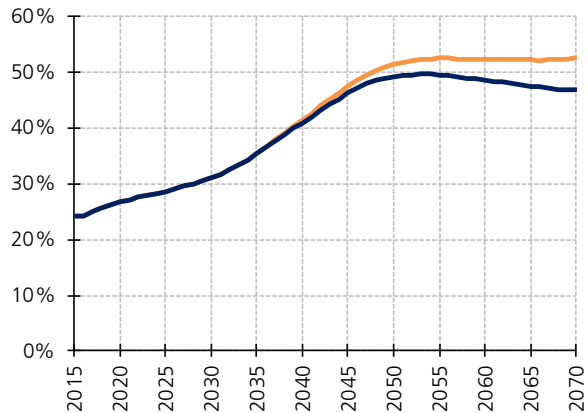


Figure A5.10.f: percentage ratio of people of 70+ to population [20-69]



— Lower fertility (-20%)

— Baseline

Figure A5.11: pension expenditure as a percentage of GDP and its decomposition - A comparison between two hypotheses on total factor productivity (TFP)

Figure A5.11.a: percentage ratio of expenditure to GDP

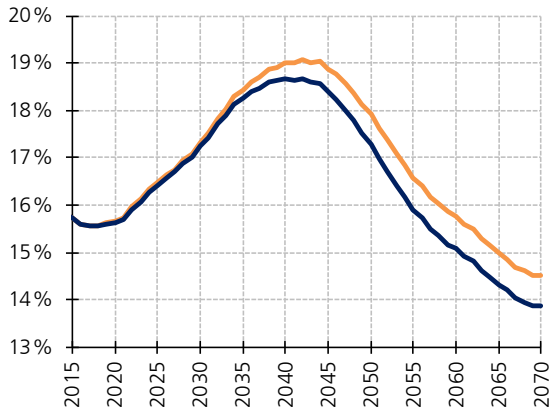


Figure A5.11.d: percentage ratio of pensions to people of 70+

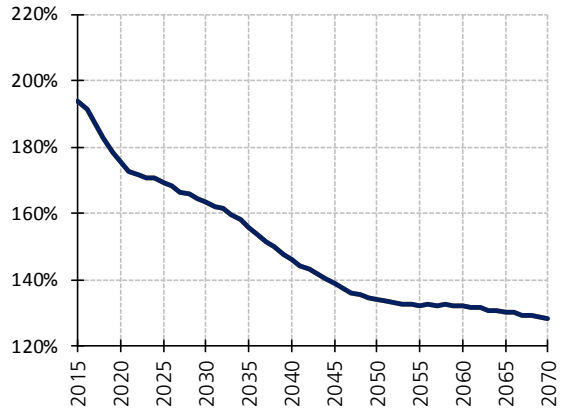


Figure A5.11.b: percentage ratio of average pension to productivity

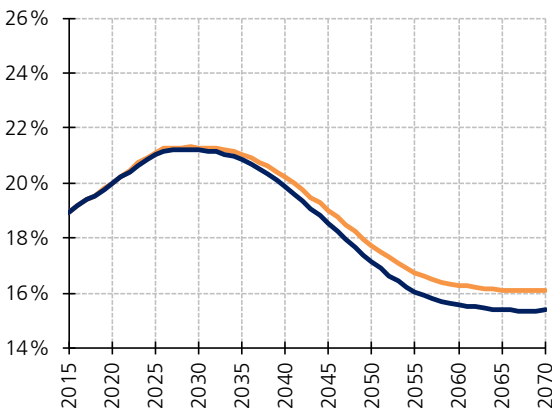


Figure A5.11.e: percentage ratio of employees to population [20-69]

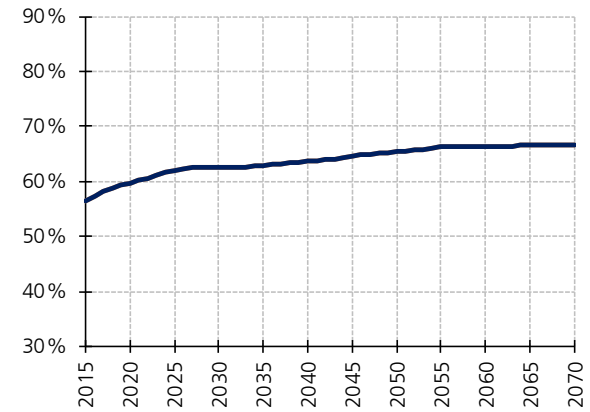


Figure A5.11.c: percentage ratio of pensions to employees

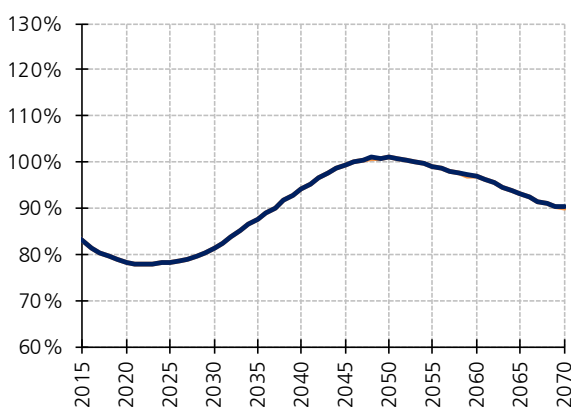
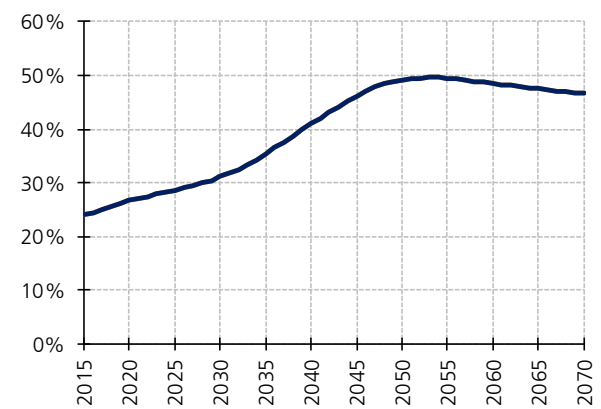


Figure A5.11.f: percentage ratio of people of 70+ to population [20-69]



— Risk scenario (TFP -0.2pp.) — Baseline



## ANNEX 6 –Pension expenditure to GDP ratio beyond 2070

Over the last three decades of the forecasting period, pension expenditure to GDP ratio is projected to decline significantly. As known, it is due to the legal-institutional framework (i.e. phasing in of NDC system, revision of the transformation coefficients, indexation of the eligibility requirements) as well as demographic developments (gradual exit of the baby boom cohorts). Therefore, it is interesting to detect what will happen beyond 2070. In this regard, both theoretical and empirical analyses may be carried out.

### 6.1 What does the theory say?

In equilibrium, a pay-as-you go pension system guarantees an Internal Rate of Return (IRR) that equals the growth rate of the contribution base (Aaron, 1996). As known, the equilibrium of a pay-as-you go pension system requires that contributions equal pension expenditure or, alternatively, the average contribution rate equals the ratio between pension expenditure and contribution base (equilibrium contribution rate).

With regard to the Italian pension system, the NDC scheme foresees an IRR which approximates the growth rate of GDP. In fact, the latter is explicitly utilized for the capitalization of contributions before retirement, while after retirement an estimate of 1.5% in real terms is envisaged, according to the 'discount rate' parameter foreseen in the transformation coefficient formula (Annex 1).

Assuming that annual growth rate of GDP converges at a level close to 1.5%, the earnings-related component of the pension system (i.e. net of social assistance benefits) will be approximately in equilibrium in the long run, except for the effects due to minor deviations from the actuarial equivalence, foreseen by current legislation.

This means that the equilibrium level of the pension expenditure as a share of the contribution base equals the average contribution rate, which accounts for approximately 31% (actually, the weighted average of 33% for employees and 24% for the self-employed).

Given that the incidence of the contribution base in GDP accounts for around 39% and is kept constant over time, in line with the methodological approach agreed in the AWG, the equilibrium level of pension expenditure (limited to the earnings-related component) as a share of GDP will settle at around 12.0-12.2%.

## 6.2 Pension projections beyond 2070

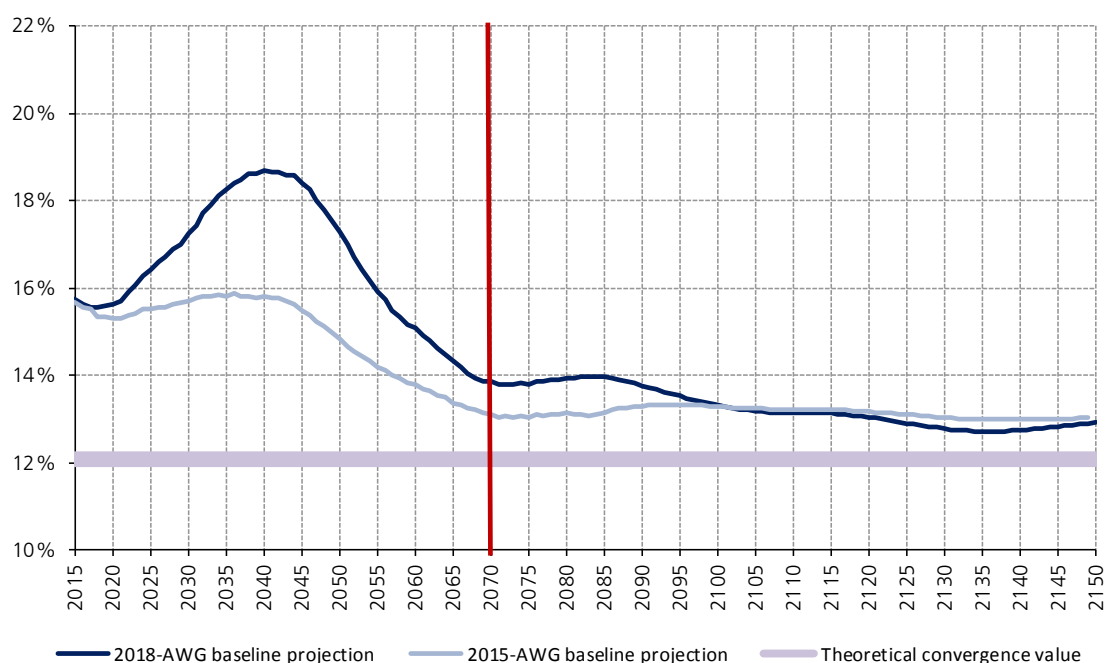
In order to assess the convergence value of the pension expenditure to GDP ratio in the very long run, the baseline pension projection has been extended beyond 2070, up to 2150. To this aim, demographic and macroeconomic scenarios have been extended as well, on the basis of the following assumptions:

- demographic parameters have been provided by Eurostat up to 2080, and then set constant;
- labour force projections have been prolonged consistently, according to the methodology agreed in the AWG (Cohort Simulation Model);
- the growth rate of productivity has been set constant at the level in 2070 as well as the unemployment rate

On the basis of these assumptions, the annual growth rate of GDP averages on about 1.5% over the last decades before 2150 and the pension expenditure to GDP ratio is projected to settle at about 13%, in the very long run (Figure A6.1). As expected, such an outcome is fully in line with that obtained in the previous round of projections (2015-EPC-WGA baseline), notwithstanding the huge revision of the scenario assumptions up to 2045.

The social assistance component (old age allowances and additional sums) explains the greater part (0.4-05 pp) of the difference from the projected values in the last part of the forecasting period and the theoretical estimate reported above. The remaining part mainly depends on disability and survivor's pensions awarded below 57 and the increase of the transformation coefficients granted to women in relation to the number of children.

Figure A6.1: pension expenditure to GDP ratio beyond 2070



## ANNEX 7 - Budget Law 2017 - Summary of the interventions to the pension system and their financial effects

The interventions to the Italian pension system introduced by Law 232/2016 (budget Law 2017) may be summarized as follows:

1. measures in favor of pensioners
2. measures facilitating access to retirement and/or lowering exit age from the labour market
3. measures concerning the programme of 'safeguard' from the increase in the eligibility requirements foreseen by Law Decree 201/2011, converted into Law 214/2014.
4. Other minor interventions

### 1. Insured already retired:

- 30% increase of the so-called 14th payment (*'quattordicesima'*) already granted to pensioners with a personal income up to 1.5 times the minimum pension (monthly payment of 750 euro) and the entitlement of the same provision, at its original amount, to pensioners with a personal income in between 1.5 and 2 times the minimum pension (monthly payment from 750 to 1,000 euro);
- enlargement of the no tax area for pensioners below the age of 75, through an increase of the fiscal deduction on pension income, which has been equalized to that of pensioners of 75 and older.

### 2. Insured not yet retired:

- facilitating access to retirement for the insured with contribution periods accrued in different funds, allowing do accumulate them all in order to fulfil the contribution eligibility requirements without additional charge<sup>56</sup>;
- strengthening of the facilitated access to retirement already foreseen for workers involved in the so-called arduous works (*'lavori usuranti'*). The privilege, in terms of lower retirement age, is granted within a given amount of planned resources, subject to constant monitoring. In case of possible overruns, the privilege is correspondently reduced;
- facilitating early access to retirement for workers so-called 'precocious' (with at least 1 year of actual work before the age of 19), lowering the contribution requirement regardless of age. Compared to the general rule<sup>57</sup>, the reduction accounts for 1 year and

<sup>56</sup> According to the previous legislation, free of charge accumulation of contributions accrued in different funds was only allowed in case the minimum contribution requirement for an old age pension were not achieved in any of the funds.

<sup>57</sup> The contribution prerequisite for early retirement regardless of age accounts for 42 years and 10 months (1 year lower for women) and is indexed to changes in life expectancy.



10 months for males and 10 months for females. Such a facilitation is only granted to given categories of workers under particular conditions: the unemployed no longer having the right to unemployment benefits, workers with a disability degree above 74%, caregivers for severely handicapped relatives, workers involved in arduous works, as clearly set out by law. The facilitation is allowed within the limit of a given amount of planned resources, and subject to constant monitoring. In case of possible overruns, the advantage in terms of lower retirement age is correspondently reduced;

- the small penalties foreseen to be applied to new early pensions (contribution requirement regardless of age) awarded to workers retiring below the age of 62 have been fully eliminated<sup>58</sup>. They had been already eliminated for the period 2015-2017 by the Budget Law for 2016.
- on an experimental basis, from May 1st 2017 to December 31st 2018, the insured of at least 63 years of age, and under specific conditions set out by law, may be entitled to a social assistance benefit of an amount up to a maximum of 1,500 euro per month paid out until the SRA (Statutory Retirement Age). The specific conditions are described as follows: i) the unemployed no longer having the right to unemployment benefits, ii) workers with a disability degree above 74% and iii) caregivers for their relatives severely handicapped. For each group mentioned above, 30 years of contributions are also required; iv) workers involved in particular arduous works as defined by pertinent regulations, as long as they possess at least 36 years of contributions. The benefit is granted within a given amount of planned resources, and subject to constant monitoring. In case of possible overruns, the access to the benefit is correspondently rescheduled;
- finally, on an experimental basis, from May 1st 2017 to December 31st 2018, a financial mechanism has been introduced consisting of a loan, granted by the bank sector and guaranteed by pension entitlements, in favor of the insured above 63 years of age and for a maximum period of 3.7 years before the SRA<sup>59</sup>. The size of the loan is correlated to the pension amount already matured<sup>60</sup> (which must not be inferior to 1.4 times the minimum pension, net of the reimbursement of the loan) and provided in monthly instalments. The loan, and the additional costs for interest and life insurance premium, are repaid by the beneficiary in 20 years after retirement, through monthly instalments which are automatically deducted from the pension to be paid by the social security institute (Istituto Nazionale Previdenza Sociale – INPS). A tax credit accounting for half percent of interest cost and insurance premium is also foreseen. The enabling decrees has been issued while the framework agreement with the banks and insurance companies participating to the programme are still under way.

### 3. Insured safeguarded from the eligibility requirements foreseen by Law 214/2011

- Within the process of rationalization of the public budget resources already planned for the safeguard from the increase in the eligibility requirements laid down by Law Decree 201/2011, converted into Law 214/2014, a temporary extension of the programme (the so-called 8th-safeguard) has been foreseen in order to bring it to a conclusion. Such intervention has implied a reallocation of the planned resources, as reported in the

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<sup>58</sup> Such penalties only applied to the earnings –related quota of pension and accounted for 1% for each year before 62, increased to 2% for each year before 60.

<sup>59</sup> The loan is compatible with employment status.

<sup>60</sup> That is the amount of pension corresponding to contributions already accrued.

table<sup>61</sup>. All the same, the safeguard mechanisms operate within a given amount of planned resources, and are subject to constant monitoring. In case of possible overruns, the facilitated access to retirement is no longer allowed;

- extension to females born in the last quarter of 1958 (if dependent workers) or 1957 (if self-employed) of the more favorable retirement regime foreseen by art.1, paragraph 9, of Law 243/2004 (so-called '*opzione donna*')<sup>62</sup>. Such an extension is aimed to bring to a conclusion the above mentioned regime, introduced in 2004 on an experimental basis.

#### 4. Other minor interventions

- Further interventions on pensions consist of: i) easing the access to disability pensions for workers exposed to asbestos, ii) improving pensions of blind workers employed in call centers through more favorable transformation coefficients and iii) temporary increase of resources planned to early retirements of journalists (capped expenditure);
- finally, there are a couple of measures related to the pension system with financial effects on tax revenues: i) tax exemption for pensions entitled to the victims of terrorism and ii) exemption from taxable income of orphan survivor's pensions for the amount exceeding 1,000 euro.

The table below summarizes the estimates of the financial effects brought about by the interventions to the pension system listed above, as described in the technical report to the budget Law for 2017.

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<sup>61</sup> The reported figures show positive/negative changes to the total amount of resources planned for the programme.

<sup>62</sup> 35 years of contribution with a minimum age of 58, indexed to changes in life expectancy. Such retirement channel is conditioned to the acceptance that pension is calculated according to the NDC scheme.

**Table A7.1: budget Law 2017 (Law 232/2016) - Summary of the financial effects of the interventions related to the pension system (+ positive; - negative)**

Interventions	Financial effects	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
<b>Insured already retired (pensioners)</b>											
Increase of the so-called "14th monthly payment" and enlargement of beneficiaries	<i>Pension expenditure</i>	-800.0	-800.0	-800.0	-800.0	-800.0	-800.0	-800.0	-800.0	-800.0	-800.0
Enlargement of no tax area for pensioners below the age of 75	<i>Tax revenues on pensions</i>	-212.7	-247.3	-246.2	-246.2	-246.2	-246.2	-246.2	-246.2	-246.2	-246.2
<b>Insured not yet retired (future pensioners)</b>											
Accumulation of contribution periods accrued in different funds	<i>Pension expenditure net of fiscal effect and, partially, less contributions (15-30 million in the first years)</i>	-104.0	-162.0	-195.0	-220.0	-297.0	-359.0	-426.0	-493.0	-554.0	-586.0
Facilitation of access to retirement for the insured involved in arduous works ("lavori usuranti")	<i>Pension expenditure and lump sum severance pay (TFR) net of fiscal effect</i>	-84.5	-86.3	-124.5	-126.6	-123.8	-144.4	-145.2	-151.8	-155.4	-170.5
Early retirement of precocious workers - Reduction of contribution requirement	<i>Pension expenditure (capped)</i>	-360.0	-550.0	-570.0	-590.0	-590.0	-590.0	-590.0	-590.0	-590.0	-590.0
Elimination of the small penalties to early pensions awarded below the age of 62	<i>Pension expenditure net of fiscal effect</i>	0.0	-23.0	-57.0	-91.0	-118.0	-138.0	-155.0	-172.0	-183.0	-195.0
Benefit granted to the insured before SRA under specific conditions ("Ape Sociale")	<i>Cash benefit other than pensions (capped)</i>	-300.0	-609.0	-647.0	-462.0	-280.0	-83.0	-8.0	0.0	0.0	0.0
Financial loan granted by the bank sector before the SRA and guaranteed by pension entitlements ("Ape di mercato")	<i>Cash benefit other than pensions</i>	0.0	-2.0	-8.0	-17.0	-33.0	-54.0	-57.0	-57.0	-57.0	-57.0
Retirement before the SRA financed by capital accumulated in private pension funds (RITA)	<i>Tax revenues</i>	30.1	13.7	-52.0	-23.6	-7.4	0.0	0.0	0.0	0.0	0.0
<b>Insured safeguarded from eligibility requirements foreseen by Law 2014/20111</b>											
Reallocation of resources already planned for the safeguard programme	<i>Pension expenditure (capped)</i>	506.5	102.0	-261.1	-256.0	-210.8	-113.9	4.6	-21.0	-9.0	-3.0
Extension of retirement conditions foreseen by art. 1, par. 9, Law 243/2004 to female born in the last quartely of 1957 (self-employed) and 1958 (employee)	<i>Pension expenditure and lump sum severance pay (TFR) net of fiscal effect</i>	-18.3	-47.2	-83.0	-66.1	-33.2	-1.5	26.3	38.9	40.9	32.1
<b>Other minor measures related to pensions</b>											
Disability pensions to workers exposed to asbestos	<i>Pension expenditure</i>	-20.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0
Blind workers employed in call centres	<i>Pension expenditure</i>	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
Extension of early retirement for journalists	<i>Pension expenditure</i>	-5.5	-5.5	-5.5	-5.0	-1.5	0.0	0.0	0.0	0.0	0.0
Tax exemption of pensions entitled to victims of terrorism	<i>Tax revenues on pensions</i>	-6.2	-7.7	-7.7	-7.7	-7.7	-7.7	-7.7	-7.7	-7.7	-7.7
Exemption of orphan survivor's pensions from taxable income	<i>Tax revenues on pensions</i>	-36.7	-40.0	-40.0	-40.0	-40.0	-40.0	-40.0	-40.0	-40.0	-40.0

## Annex 8: Further information requested in the methodological annex

### 1. Economy-wide average wage at retirement

In the projection the average contribution base grows in line with productivity (see §§. 3.6 and 4.3 of the fiche), so does the economy-wide average wage. The economy-wide average wage at retirement has been calculated as the product of economy-wide average wage times the ratio between the average contribution base at retirement and the average contribution base. The latter actually reflects the assumption on the career age wage profile.

Table A8.1 -Economy wide average wage at retirement evolution (in thousands euro)

	2010	2016	2020	2030	2040	2050	2060	2070
Economy-wide average wage	28.1	29.4	31.4	39.3	52.4	74.4	106.2	151.1
Economy-wide average wage at retirement		34.4	35.8	42.9	59.2	84.6	125.7	172.4

Source: Commission Service.

### 2. Pensioners vs pensions

See §. 3.4.4 and Annex 4

### 3. Pension taxation

See §. 3.2

### 4. Disability pensions

Disability pensions are transformed into old age pensions at the SRA. However, from a statistical point of view they continue to be labelled as “disability pensions”. Therefore the values included in the pension reporting frameworks correspond to an estimate of disability pensions below the SRA, which changes over time according to the indexation of the eligibility requirements.

Table A8.2 reports the disability rates by age group and forecasting years, which have been calculated as a ratio between disability pensions, projected by the pension model, and the corresponding population. The rates look quite stable over time. However, owing to the indexation of the eligibility requirements, a substantial increasing trend may be seen in the age classes mainly affected by changes in the retirement age.

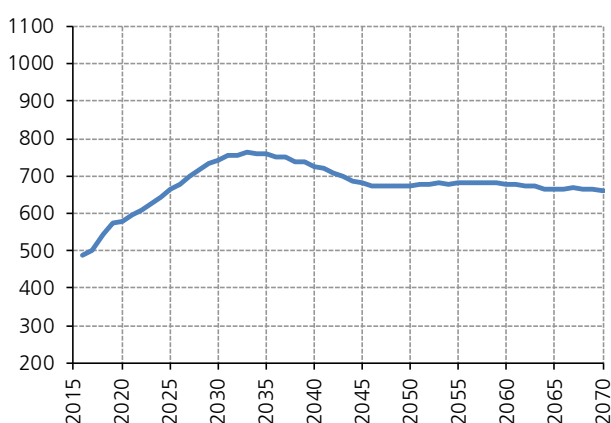
Figure A8.1 e A8.2 illustrate, respectively, the evolution of disability pensions and their average amount compared to that of old age and early pensions.

**Table A8.2 - Disability rates by age groups (%)**

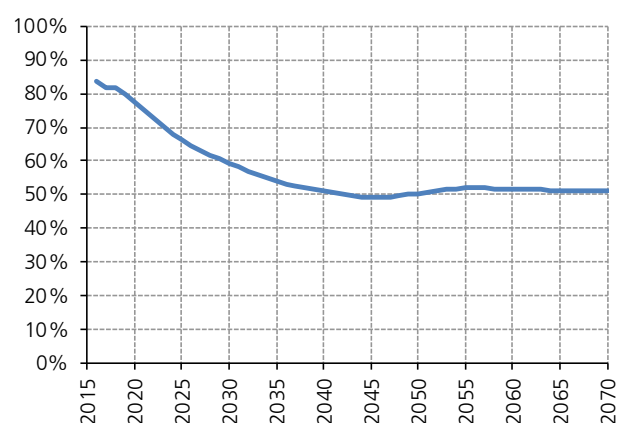
	2016	2020	2030	2040	2050	2060	2070
- Age group -54	0.5	0.6	0.6	0.7	0.6	0.6	0.6
- Age group 55-59	2.9	3.3	3.6	3.9	4.1	3.8	3.6
- Age group 60-64	3.8	3.6	5.1	5.7	5.7	5.1	5.4
- Age group 65-69	1.3	2.1	3.5	4.3	4.8	5.6	5.1
- Age group 70-74	0.0	0.0	0.0	0.0	0.0	0.5	1.1
- Age group 75+	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: Member State.

**Figure A8.1: number of disability pensions below SRA (thousand)**



**Figure A8.2: average disability pension to average old age and early pension**

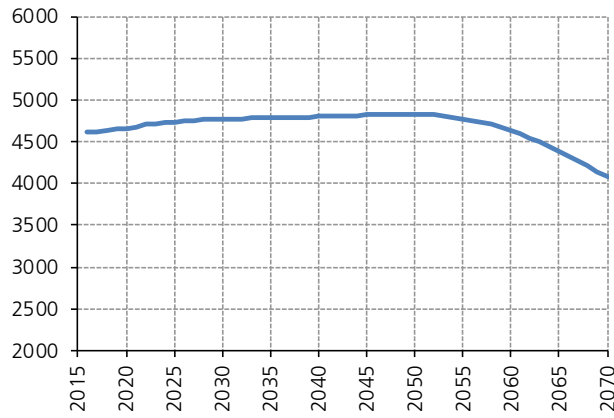


## 5. Survivor pensions

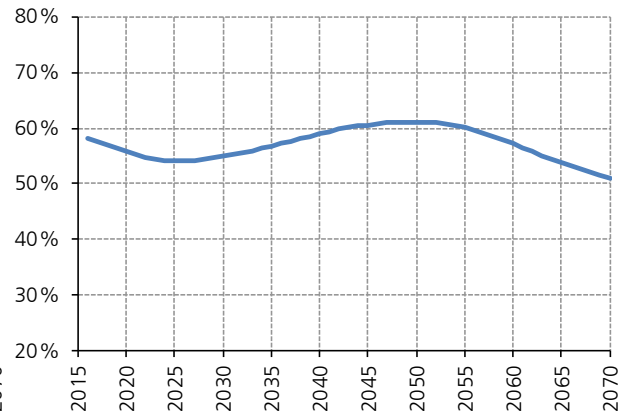
Survivor pensions, and the average amount, reflect the evolution of old age and early pensions with an average delay of 10-15 years. Besides that, it is positively correlated with the gap in life expectancy between males and females. Finally it also depends on the probabilities of leaving a spouse/children who have right to a survivor's pension and the age gap between the deceased pensioner and their spouse. The mortality rates utilized in the model are taken from the demographic assumptions, while the other parameters mentioned above are consistent with those utilized for the estimate of transformation coefficients currently in force.

Figure A8.3 e A8.3 illustrate, respectively, the evolution of disability pensions and their average amount compared to that of old age and early pensions.

**Figure A8.3: number of survivor pensions (thousand)**



**Figure A8.4: average survivor pension to average old age and early pension**



## 6. Contributions

See §. 3.6

## 7. Alternative pension expenditure decomposition

See Annex 3