

## Medium-Long Term Projections of Pension Spending

### 1. Introduction and summary

Projections of pension spending are a crucial element in the analysis of the long term sustainability of public finances. In fact they are used in the Economic and Financial Document (EFD) to evaluate the medium-long term dynamics of the public debt to GDP ratio, assuming among other things that the revenue to GDP ratio remains constant at the level reached in the last year of forecast covered in the document and that the spending to GDP ratio evolves according to population ageing. For this reason it is important, in case of considerably different projection exercises, to clarify the underlying hypotheses and their plausibility.

In the second part of 2017 and the first months of 2018 two projection exercises on the medium-long term pension expenditure to GDP ratio were

disseminated, which differ both in hypotheses and results.

The first is the national exercise, drawn up by the State General Accounting Office (RGS), as part of the annual updates of medium-long term projections of public spending connected with population ageing (pensions, health care, long term care, education and unemployment benefits) (hereinafter “national exercise”).<sup>1</sup> The second, drawn up by the RGS on the basis of the same analytical instrument, is the European

<sup>1</sup> The national exercise is described in RGS (2017a), “Le tendenze di medio-lungo periodo del sistema pensionistico e socio-sanitario”, Report N° 18, August. Two updates followed: the first with RGS (2017b), “Le tendenze di medio-lungo periodo del sistema pensionistico e socio-sanitario”, Report N° 18 – Update note, October; the second in the EFD 2018 last April. We thank M. Cacciotti of the Ministry of Economy and Finance for precious methodological clarifications supplied on both the national and AWG exercise.

exercise which adopts the hypotheses agreed upon within the Working Group on Ageing Populations and Sustainability (AWG) of the Economic Policy Committee (hereinafter “AWG exercise”).<sup>2</sup> This one is valid for the purpose of the European Commission’s analysis of the sustainability of public finances in the framework of multilateral surveillance. It is also the basis that each country considers for fixing the minimum value of the medium term objective (OMT) sufficient to ensure the convergence of debt towards prudent levels that take into account the economic and budget effects connected with an ageing population.

In the same period the International Monetary Fund (IMF), within a broader analysis of Italian public finances,<sup>3</sup> also disseminated its own long term projections of the pension expenditure to GDP ratio (hereinafter “IMF exercise”). These however do not derive from the use of an ad hoc pension system model

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<sup>2</sup> The AWG exercise is described in RGS (2017a), “Le tendenze di medio-lungo periodo del sistema pensionistico e socio-sanitario”, Report N° 18, August and its two updates: the first with RGS (2017b), “Le tendenze di medio-lungo periodo del sistema pensionistico e socio-sanitario”, Report N° 18 – Update note, October; the second in the EFD 2018 last April. The AWG exercise is also described in AWG (2018), “The 2018 Ageing Report. Economic & Budgetary Projections for the 28 EU Member States (2016-2070)”, Institutional paper N° 079. The hypotheses agreed upon within the AWG are also found in AWG (2017), “The 2018 Ageing Report. Underlying assumptions and projection methodologies”, Institutional paper N° 065.

<sup>3</sup> Andrle, M., Hebous, S., Kangur, A. and Raissi M. (2018), “Italy: Toward a Growth-Friendly Fiscal Reform”, IMF WP/18/59. We thank the authors for supplying details of the hypotheses underlying their projections, which made comparison with the national and AWG scenarios possible.

but rather from the application of a further group of hypotheses on the RGS results (mostly by means of sensitivity analyses).

All three exercises show common characteristics for pension expenditure to GDP ratio: it first increases until approximately 2040, and then starts to progressively decrease. At the root of this trend are mainly the under way demographic transition and the deployment of all the effects of past pension reforms (raising of the minimum requirements to retire and progressive diminishing of pensions containing a wage-based quota). The exercises however differ both for the peak value in 2040 (16.2 percent of GDP in the national exercise, 18.4 in the AWG and 20.5 in the IMF) and for the final value reached in 2070 after a progressive decreasing path (13.1 percent national, 13.8 AWG and 15.7 IMF).

The projections described in these three exercises are based on the same analytic instruments (also IMF in an indirect manner) and the same pension system legal framework. On the contrary, the underlying demographic and economic hypotheses diverge, sometimes even markedly. In the short term the difference in hypotheses influences mainly the dynamics of the denominator, i.e. the GDP, while in the medium and long term it affects also projections of the number of new pensioners and the average level of pensions paid.

As for demography, in all three exercises there is a rapid ageing process of the Italian population, only partly mitigated by a positive net migration flow. It is

however precisely in the estimate of net migration flows that we find the greatest demographic differences among the three projections; this variable is in fact subject to strong uncertainty. The highest net migration flows are those projected by AWG, whereas the lowest ones are those of the IMF, which adopts UNPD demographic projections.

The economic hypotheses differ mainly for the employment rate and the dynamics of productivity. Hypotheses differ mainly as a consequence of different visions regarding the influence of the recent crisis on future trends of the main economic variables, and regarding the possibility that they might converge toward levels comparable to those of the most virtuous European countries. The national exercise is more optimistic than the AWG one. Indeed even if both exercises envisage an alignment at average European levels in the long term,<sup>4</sup> the AWG exercise differs for its greater prudence in the first half of the projection horizon, when a possible longer persistence of the consequences of the crisis and a more difficult recovery towards long term regimes is taken into account. On the contrary, IMF macroeconomic hypotheses tend to give even greater relevance to historical data over the past twenty years and to exclude the possibility of significant improvements in the future.

Higher pension expenditure to GDP ratios in AWG and IMF exercises therefore do

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<sup>4</sup> According to AWG hypotheses, in the long term productivity growth rate should converge to around 1.5 percent in EU countries (AWG, 2017, *op. cit.*, page 72).

not stem from the effects of past pension reforms – which on the contrary aimed at improving sustainability – but rather from a longer persistence of the macroeconomic crisis in terms of low productivity and from a worsening demographic picture due to lower net migration flows.

## 2. The pension expenditure to GDP ratio

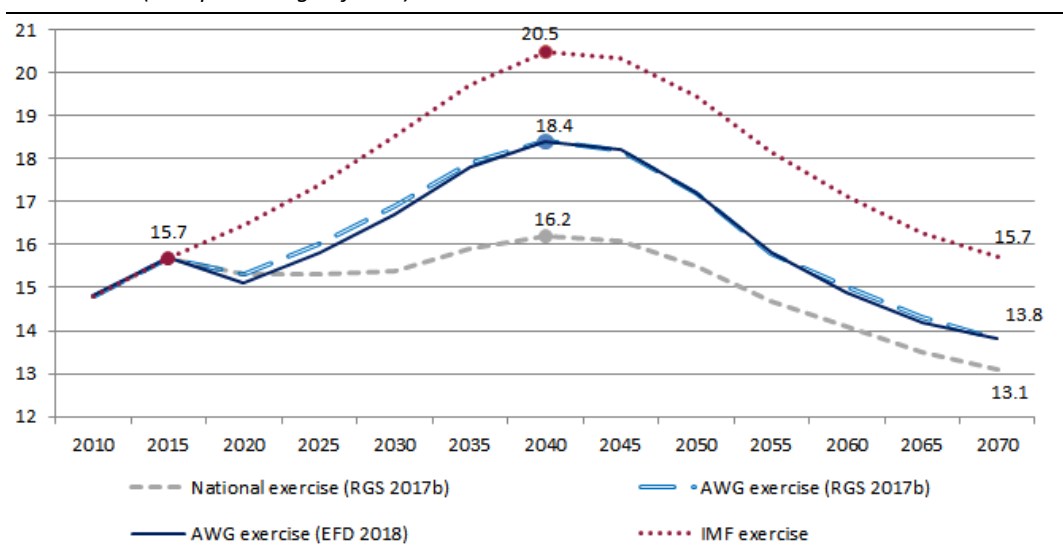
Figure 1 shows the projections of the pension expenditure to GDP ratio performed by RGS on the basis of national hypotheses (national exercise) and of those agreed upon at the European level (AWG exercise).<sup>5</sup> The projections developed by IMF on the basis of a third group of hypotheses (IMF exercise) have been also added.<sup>6</sup>

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<sup>5</sup> In all cases reference is made to the “base” projections (the central or median scenario). Appendix 1 shows the range of sensitivity scenarios for the national exercise. Invariance of current pension normative framework is assumed along the entire projection horizon.

<sup>6</sup> Among the various scenarios developed by IMF, in this Focus we only consider the one with the most negative features in terms of sustainability (at the same time, low labour productivity, low employment rate, and fast ageing implicit in the UNPD demographic projections), in which the pension expenditure to GDP ratio reaches the highest levels, touching 20.5 percent in 2040.

**Fig. 1** – Medium-long term evolution of pension spending  
(as a percentage of GDP)



Source: based on EFD 2018 and RGS (2017b), “Le tendenze di medio-lungo periodo del sistema pensionistico e socio-sanitario”, Report N° 18 – Update note; for IMF, data are those reported in Andriele *et al.* (2018), IMF WP/18/59.

The source of the most recent data for RGS and AWG projections is EFD 2018.<sup>7</sup> However, since this document does not provide some important details, comparison is carried out on the basis of RGS (2017b).<sup>8</sup> In the latter, pension projections differ from those in EDF 2018 only in the short term due to different economic forecasts. These differences are reflected in the pension expenditure to GDP ratio exclusively in the first years of the forecasting horizon.

<sup>7</sup> The projections in EFD 2018 incorporate the short-term economic forecasts on which the document is based.

<sup>8</sup> The projections in RGS (2017b) incorporate the short-term economic forecasts contained in the Update of the Economic and Financial Document 2017, released before EDF 2018. The update of the European scenario in AWG (2018) and based on the hypotheses issued in AWG (2017) is not taken into consideration in this Focus. In fact, although of more recent publication than both EFD 2018 and RGS (2017b), it incorporates the 2017 Spring forecasts of the European Commission, less updated than economic forecasts in EDF 2018 and in the Update of the EDF 2017. The difference in short term GDP dynamics explains why the peak of pension expenditure to GDP ratio reaches 18.7 percent, 0.3 percentage points above RGS (2017b) and EDF 2018.

In all three exercises the ratio follows a similar trend. The first phase of increase is due to the rise in the ratio between number of pensions and number of employed people determined by the demographic trend, only partly compensated by the rise in minimum requirements to retire. This increase prevails over the containment effect due to the gradual phasing in of the contribution-based calculation of pensions. The rapid drop in the pension expenditure to GDP ratio in the final part of the forecasting horizon is instead determined by the generalised application of the contribution-based regime accompanied by the stabilisation and subsequent decrease of the ratio between number of pensions and number of employed people. This second effect is ascribable to the progressive disappearance of Italian baby boomers and to the automatic adjustment of minimum retirement requirements to life expectancy.

With the exceptions of the short term, the pension spending to GDP ratio in the AWG exercise is always greater than that of national exercise. IMF projections, for which comparison with the other two is less immediate, are always far above those of the AWG exercise. Differences between the curves are so evident that around 2040 (the year in which the highest values of pension spending to GDP ratio are reached in all three exercises) the deviation between national and AWG exceeds 2 percentage points, while that between national and IMF exceeds 4 percentage points.

In the first years, according to the national exercise, pension expenditure to GDP ratio would undergo a slight reduction to around 15.3 percent, and then gradually increases to 16.2 percent in 2040. From this peak the ratio would begin to drop continuously until 13.1 percent in 2070, the last projection year.

For the AWG exercise the latest version of the EDF 2018 and of RGS (2017b) are reported; however the second is the one that will be considered in the rest of this Focus. Until 2025, in the AWG exercise the ratio remains not so dissimilar to the national, but later it grows faster culminating to a peak of 18.4 percent in

2040. Thenceforth the ratio starts diminishing with continuity until reaching 13.8 percent in the last year of projection. If in 2040 the difference between peaks of national and AWG exercises exceeds 2 percentage points, in 2070 this difference turns back to less than one point.

Lastly, the IMF exercise is characterised by a higher pension expenditure to GDP ratio throughout the forecasting horizon.<sup>9</sup> In particular, spending dynamics would immediately be significantly more lively and in 2040 the incidence on GDP would reach 20.5 percent, then begin to decrease until reaching less than 16 percent in 2070. On average, IMF projections are above those of national and AWG exercises by, respectively, more than 3 and more than 2 percentage points of GDP.

### **3. Analysis of the components of the pension expenditure to GDP ratio**

Pension spending to GDP ratio can be analysed using its traditional breakdown:<sup>10</sup>

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<sup>9</sup> On IMF projections see also Chiacchino, F. and Tagliapietra, S. (2018), "Italy's pension spending: implications of an ageing population" available on [www.bruegel.org](http://www.bruegel.org).

<sup>10</sup> Indeed canonical breakdown uses total employment of people aged 15 and above and not that of people aged 15-64 years. In this case, however, it was necessary to use the latter in order to allow full comparability with data available for IMF exercise.

$$\frac{\text{Pension spending}}{\text{GDP}} = \underbrace{\frac{\text{Average pension income}}{\text{GDP per employed 15-64}}}_{\text{Benefit ratio}} \cdot \frac{\text{Number of pensioners}}{\text{Number of employed 15-64}}$$

where:

$$\frac{\text{Number of pensioners}}{\text{Number of employed 15-64}} = \underbrace{\frac{\text{Number of pensioners}}{\text{Population 65+}}}_{\text{Coverage ratio}} \cdot \underbrace{\frac{\text{Population 15-64}}{\text{Number of employed 15-64}}}_{\text{Inverse of employment rate}} \cdot \underbrace{\frac{\text{Population 65+}}{\text{Population 15-64}}}_{\text{Old-age dependency ratio}}$$

This breakdown is also the starting point of the sensitivity analyses carried out by IMF on the results of national exercise. In particular, IMF adopts the same coverage ratio of national exercise (fig. 2, graph 3), whereas it formulates autonomous hypotheses on the other ratios (benefit ratio, employment rate, old-age dependency ratio).

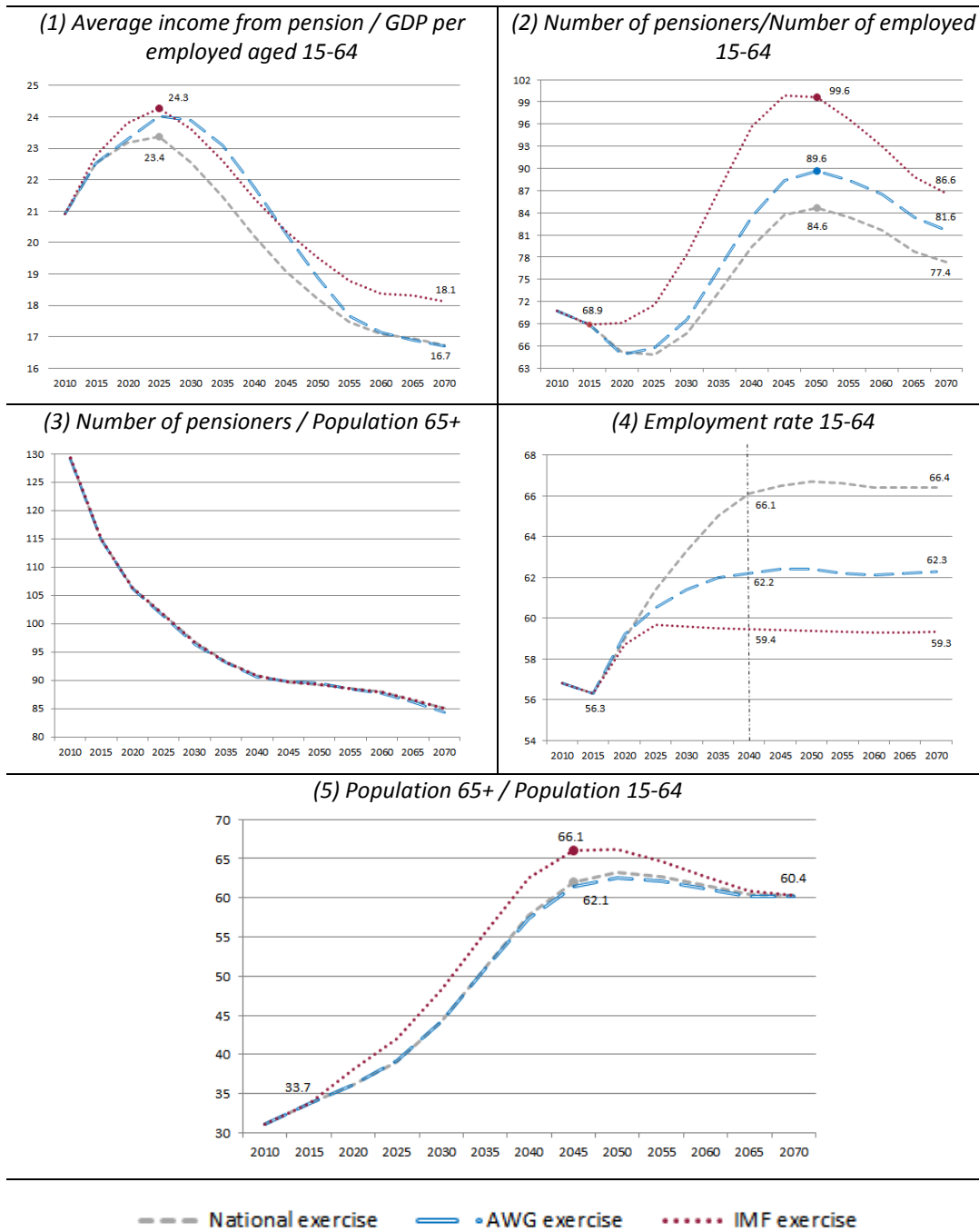
Figure 2 summarises the evolution of the single components of the breakdown. The ratio of average pension income and GDP per employed aged 15-64 (benefit ratio) provides indications about the generosity of the pension system as a whole (fig. 2, graph 1). In all exercises the ratio first undergoes an increasing phase when there will still be in payment pensions computed with a relevant wage-based quota, and then starts decreasing along with the phasing in of the contribution-based computation of pensions (NDC – Notional Defined Contribution rules, so called “Dini” rules). The national exercise reaches a peak of 23.4 percent in 2025, and then gradually decreases to 16.7 in 2070. AWG and IMF exercises reach a peak of, respectively, 24.0 and 24.3 percent in 2025, then the first gradually decrease to the same value as the national in 2070, whereas the second decline only to 18.1. The curve of

national exercise is always below both AWG and IMF due to the more favourable productivity dynamics (see paragraph 4.2). Nevertheless, while the difference with respect to AWG (slightly more than half a percentage point of GDP per employed in 2025) is reabsorbed over time until it completely disappears around 2060, that with respect to IMF (around 1 percentage point of GDP per employed in 2025) remains large and, from 2050 onwards, also shows a slight increase.

The ratio between number of pensioners and of employed aged 15-64 years shows significant differences across exercises, with the national one providing the lowest levels and IMF the highest. As far as peak data reached in 2050 are concerned, 84.6 percent of national exercise compares with 89.6 percent of AWG and with 99.6 percent of IMF<sup>11</sup> (fig. 2, graph 2).

<sup>11</sup> IMF peak is reached in 2045 and is equal to 99.8 percent.

**Fig. 2** – Breakdown of the pension expenditure to GDP ratio (1)  
(percentage values)



Source: based on RGS (2017b), “Le tendenze di medio-lungo periodo del sistema pensionistico e socio-sanitario”, Report N° 18 – Update note; for IMF, data are those used by Andrieu *et al.* (2018), IMF WP/18/59, kindly supplied by the authors.

(1) The product of the variables shown in graphs (1) and (2) equals the projections of pension expenditure to GDP ratio with an approximation of less than 0.2 percentage points of GDP.

These trends are explained by the rate and old-age dependency ratio; fig. 2, breakdown of the ratio into its three components (coverage ratio, employment rate and old-age dependency ratio; fig. 2, graphs 3-5). The coverage ratio is almost perfectly aligned in all three exercises (fig.



2, graph 3). In particular, IMF directly borrows the values of the ratio in the national exercise.

Important differences emerge instead when we move on to consider employment rate (fig. 2, graph 4). National exercise implies a dynamics of employment clearly more favourable than the other two, passing from 56.3 percent in 2015 to a long term value slightly above 66 percent, reached as early as 2040 (see also paragraph 4.2). On the contrary, the long term value of the other two exercises remain significantly lower (AWG just above 62 percent and IMF slightly more than 59 percent).<sup>12</sup>

Lastly, the old-age dependency ratio reveals appreciable differences between national and AWG exercises, on the one hand, and IMF, on the other (fig. 2, graph 5). In all three cases it is confirmed that in the upcoming decades there will be a continuous process of population ageing. For IMF, which uses UNPD demographic projections,<sup>13</sup> this process will be more acute in comparison with national and AWG projections. In 2045, the peak year for all three exercises, 66.1 percent of IMF stands against figures of national and AWG exercises lower by more than 4 GDP percentage points. From 2045 onwards differences shrink to the same value and in 2070 all three exercises show the same value of little more than 60 percent.

#### **4. Demographic and economic hypotheses underlying the projections**

In the long term the evolution of pension spending to GDP ratio and of its components depend on the interaction of three factors: pension legislation, demographic patterns and economic dynamics. The first is common to all three exercises presented in this Focus. It contributes explaining the gradual but continuous reduction of the pension spending to GDP ratio as from 2040 due to the automatic raising of the minimum requirements to retire and to the progressive disappearance of pensions with a relevant wage-related quota. The other factors, i.e. demographic and economic hypotheses, differ across exercises, influencing the components of the expenditure to GDP ratio.

##### *4.1. Comparison of demographic scenarios*

In all the exercises the Italian population is expected to shrink (fig. 3) and, as already mentioned, a rapid ageing process is projected (fig. 4, graphs 5 and 6). However, demographic hypotheses underlying the projections have some crucial differences.

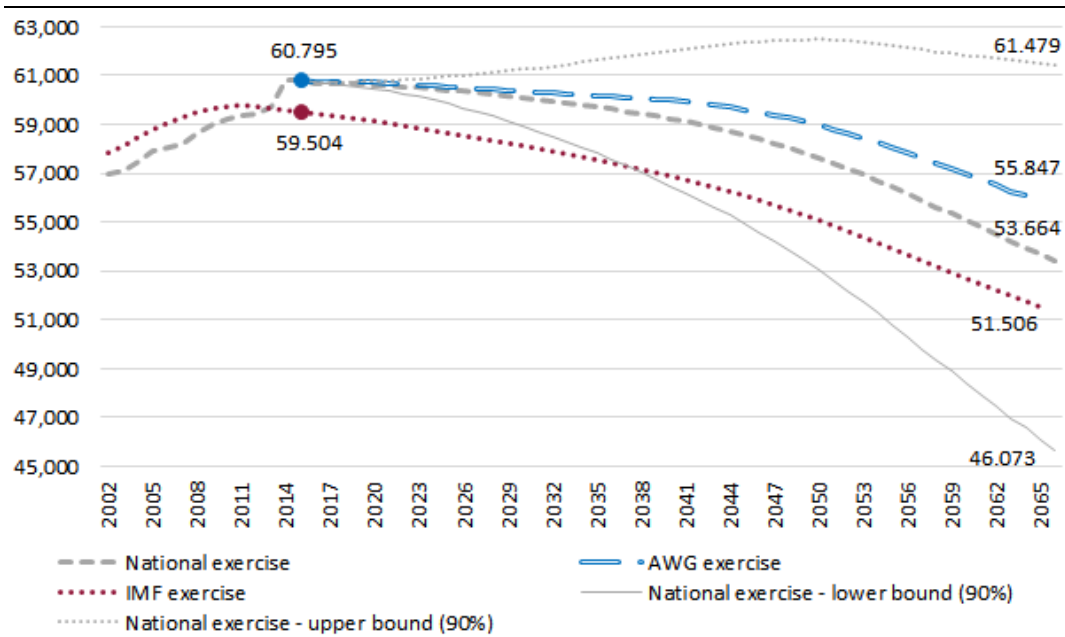
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<sup>12</sup> For a description of economic hypotheses see also paragraph 4.2.

<sup>13</sup> For a description of demographic hypotheses see also paragraph 4.1.



**Fig. 3** – Comparison between population projections (thousands)



Source: based on Istat (2017), Eurostat/Europop (2017) and UNPD (2017) online dataset data.

The national exercise uses demographic projections with base year 2016 issued by Istat in 2017,<sup>14</sup> while AWG refers to projections with base year 2015 developed by Eurostat in 2017.<sup>15</sup> IMF, on its side, adopts projections with base year 2015 carried out by the Population Division of the United Nations Department of Economic and Social Affairs (UNPD).<sup>16</sup>

included<sup>17</sup>. Istat and Eurostat projections refer to resident population as at the 1<sup>st</sup> January of every year, while UNPD projections to the *de facto* population as at the 1<sup>st</sup> July (mid year), i.e. the population physically present on Italian soil at the reference date.<sup>18</sup> Also for this reason, the comparison between national and AWG projections with IMF ones is not so straightforward.

Figure 3 shows the central demographic projections for the different sources. For Istat the lower and upper limits of the 90 percent confidence interval are also

<sup>17</sup> Since 2017 Istat has been using a new projection methodology of stochastic type, while Eurostat maintains a deterministic approach with alternative scenarios. The UNPD makes both stochastic and deterministic type projections available, which share one and the same central scenario.

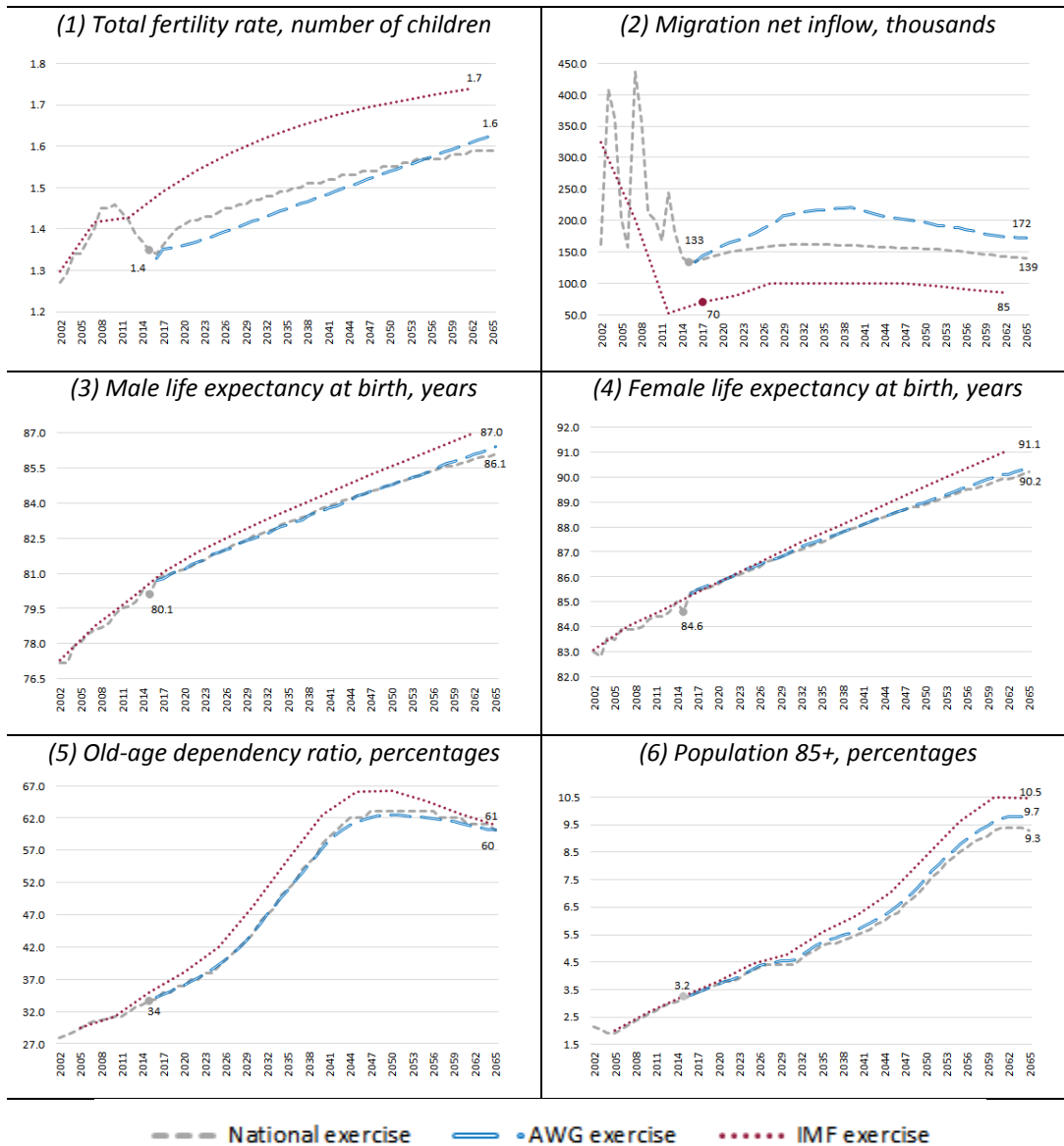
<sup>14</sup> Istat (2017), "Il futuro demografico del Paese", <https://www.istat.it/it/archivio/199142>. In the meantime Istat has also updated the document (<https://www.istat.it/it/archivio/214228>).

<sup>18</sup> "The *de facto* population consists of all persons who are physically present in the country or area at the reference date, whether or not they are usual residents. The *de jure* population consists of all usual residents, whether or not they are present at the time of the enumeration" (UNPD (2018), "Population and Vital Statistics Report", Department of Economic and Social Affairs Statistics Division, <https://unstats.un.org/unsd/demographic-social/products/vitstats/sets/Series A 2018.pdf>).

<sup>15</sup> Europop version 2015 (<http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-projections-data>).

<sup>16</sup> UNPD (2017), "World Population Prospects", <http://www.un.org/en/development/desa/population/theme/trends/index.shtml>.

**Fig. 4 – Comparison of demographic indicators (1)**



Source: based on Istat (2017), Eurostat/Europop (2017) and UNPD (2017) online dataset data, with access in April 2017.

(1) With regards to graphs 1, 3 and 4 it is pointed out that original UNPD data are available only as five-year averages, and for graph 2 as five-years sums. For the sake of comparison with Istat and Eurostat, the average or the sum are attributed to the third year of every five-years interval and they are interpolated.

According to Istat and Eurostat, the Italian population would reduce from 60.8 million in 2015 to respectively 53.7 million (-11.7 percent) and 55.8 million (-8,1 percent) in 2065. On the basis of UNPD projections population would decline from 59.5 million in 2015 to 51.5 (-13.4 percent) in 2065.

These differences are due to different trends expected for basic demographic variables. In particular, as regards total fertility rate (fig. 4, graph 1), while Istat and Eurostat appear more or less aligned, UNPD adopts higher levels.

Looking at Istat historical data (also shared by Eurostat) it emerges a contraction of

the fertility rate in the years immediately following the economic crisis (2010-15); this dynamic is absent in UNPD data which would seem to stay in greater continuity with respect to recent historical trends. Despite the different levels the rate assumes in the first years of projection, we may observe dynamics that are by and large aligned across the three sources.

There are only small differences between Istat and Eurostat also with regard to life expectancy at birth for both males and females (fig. 4, graphs 3 and 4). In UNPD scenario life expectancy is longer over the entire projection, with the difference that remains of small magnitude in the first years and gradually increases thereafter until reaching the value of around one year at the end of the projection horizon (for both males and females).

Significant differences across exercises do however emerge on the side of migration flow projections (fig. 4, graph 2). Starting from the last historical net inflow of around 133.000 people, central Istat scenario remains substantially stable at that level, touching a peak of just over 160.000 between 2030 and 2040 before starting a trend of slow but continuous decrease until 2065 when net migration is projected to amount to an inflow of slightly less than 140.000 people.

Eurostat projects net migration flows that are always greater than those of Istat. Starting from the last historical figure, net inflows would increase until reaching a peak of around 220.000 people in 2030, before gradually adjusting down to 172.000 in 2065. Overall, throughout the projection horizon, Eurostat sees a greater average annual net inflow of around

38.000 people, for a cumulate total of just under 1.9 million individuals.

The greatest differences emerge in the comparison with UNPD projections, which assume net migration inflows significantly lower than both Istat and Eurostat figures. Overall, throughout the projection horizon, UNPD sees an average annual net inflow significantly lower than Istat, amounting to around 60.000 people with a cumulated total of just under 3 million people. But these data should be read keeping in mind that part of the difference arises from the fact that Istat and Eurostat adopt the resident population principle while UNPD *de facto* population.

Overall, UNPD demographic scenario (incorporated in IMF spending projections) describes a more intense process of ageing, clearly shown by the already mentioned old-age dependency ratio<sup>19</sup> (fig. 4, graph 5; see paragraph 3) and by the ratio of people aged 85 and more to total population (fig. 4, graph 6).

As regards the latter component, also in this case Istat and Eurostat show very similar trends, especially up to 2040-45, while there is a clearly greater incidence of people aged 85 and more in UNPD projections. It is possible also to appreciate here a salient trait common to all three exercises, namely a significant increase in incidence of very old people which rises from an initial value of roughly 3.2 percent in 2015 to values in 2065 of, respectively, around 9.3 percent for Istat, 9.7 for Eurostat and 10.5 for UNPD.

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<sup>19</sup> Population aged 65 years and more as percentage of population aged between 15 and 64.

Overall, taking into account both the absolute level and the composition of the population, it is possible to conclude that in UNPD demography the ageing effect is significantly more pronounced than in Istat and Eurostat central scenarios.

#### 4.2. Comparison of economic hypotheses

There are also noticeable differences in macroeconomic hypotheses underlying the projections, which convey different visions of RGS, AWG and IMF above all about the degree of persistence of the most recent history on the future trends of the main economic variables. These differences are reflected in the medium-long term evolution of all components of the pension expenditure to GDP ratio (Fig. 2), with the exception of the coverage ratio.

Evolution of the GDP derives from the combination of the hypotheses on employment and labour productivity (GDP per employed). Employment is determined – besides demographic hypotheses (see paragraph 4.1) – by specific hypotheses concerning employment rate.<sup>20</sup> Figure 5 shows GDP growth rates for all three exercises.<sup>21</sup>

In the national exercise, GDP growth rate rises from an annual average of 1.3

percent during the period 2015-2020, to an annual average of approximately 1.6 during the period 2020-2030. It then reaches 1.2 percent during the period 2030-35, decreases to 0.9 percent in the period 2040-45, and finally stabilises at over 1.2 percent as from 2050.

In comparison with the national exercise, AWG incorporates a significant slowdown until 2040. In particular, between 2025 and 2040, when GDP is expected to maintain an average annual growth rate lower than half a percentage point, far below historical pre-crisis levels (see Box 1, “T+10” methodology). In the long term, after 2045, the annual growth rate of GDP would stand on average at around 1.4 percent, more optimistic than the national exercise (about 1.2 percent) but in any case not much lower than the average annual growth rate before the crisis (about 1.5 percent between 1995 and 2007).

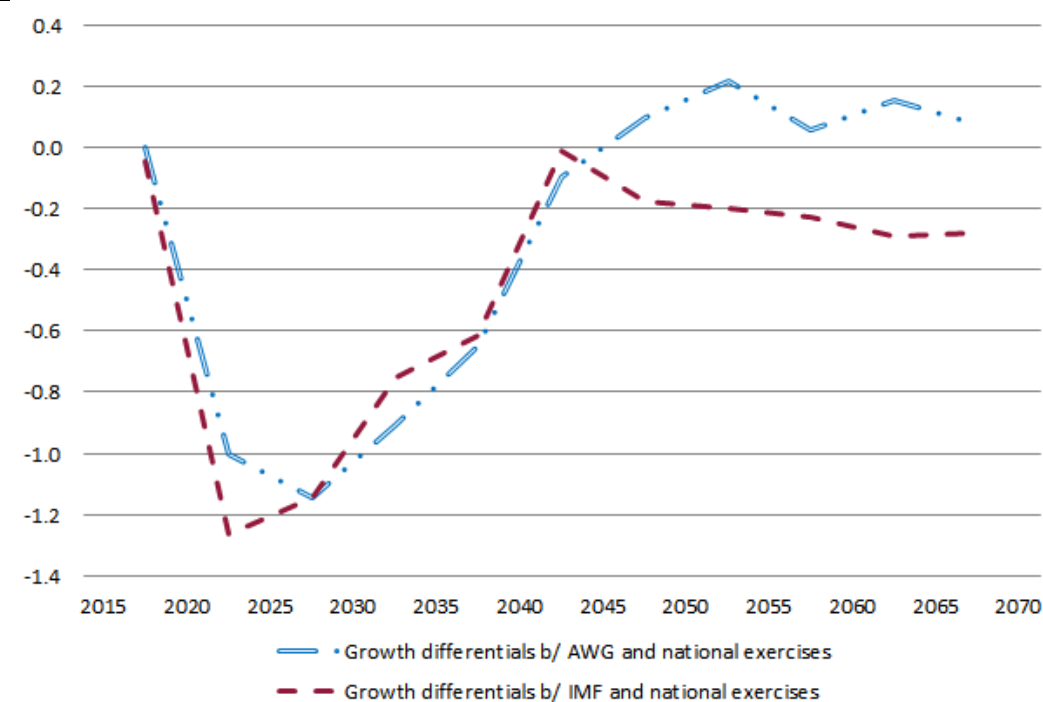
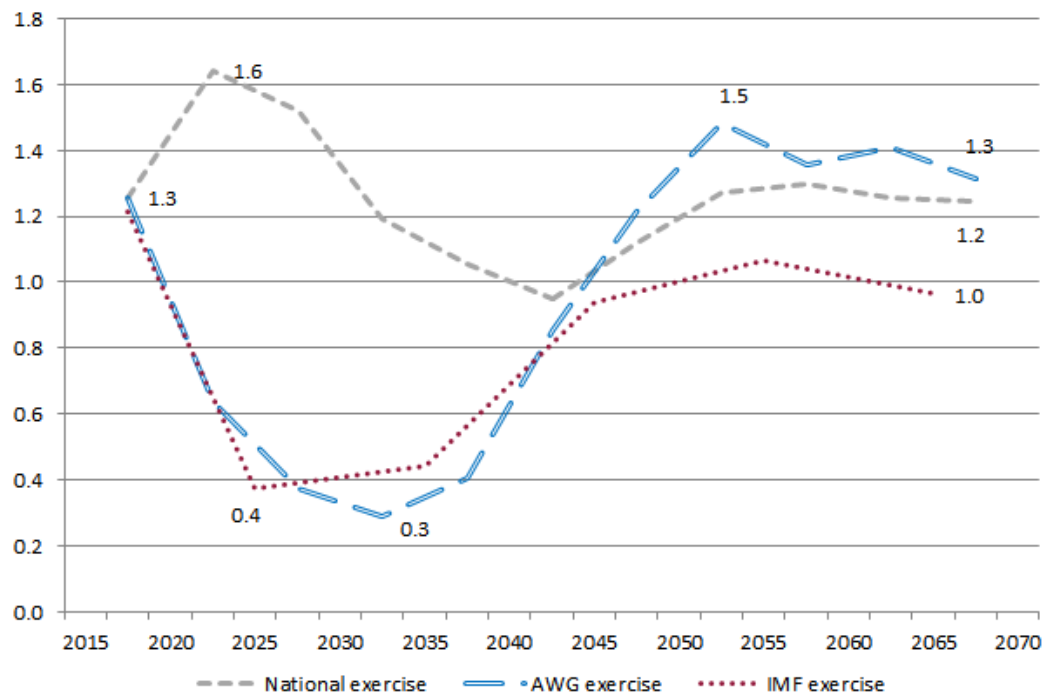
Lastly, in IMF exercise GDP growth rate stands prevalently below the one assumed by AWG and constantly below the national exercise. In the very short term (until 2020) the average annual growth rate stands at a level comparable with the other two exercises, then it drops markedly to around 0.4 percent in the 2020-2030 average. As from 2040, the growth increases gradually to reach a long term value of around 1 percent, less than the long term trends of the other two exercises (around 0.3 percentage points below the national and 0.4 below the AWG exercise). For the first half of the projections (until 2045) the dynamics of IMF appears very similar to that of AWG, before differentiating in the second half.

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<sup>20</sup> The employment rate is determined in turn by hypotheses on the activity rate and by the unemployment rate.

<sup>21</sup> For national and AWG exercises average annual growth rates are shown over five-years intervals. For IMF exercise average annual growth rates are shown over ten-years intervals, except for the first figure which is the annual average of the five years period 2015-2020.

**Fig. 5** – Comparison of GDP dynamics (1)



Source: based on RGS (2017b) and Andrieu, M. *et al.* (2018) data.

(1) For national and AWG exercises the average annual growth rates are shown over five-years intervals. For IMF exercise the average annual growth rates are shown over ten-years intervals, kindly supplied by the authors of the working paper, with the exception of the first figure which is the annual average of the five-years period 2015-2020.

### Box 1 – The “T+10” methodology

In the national and AWG exercises potential GDP is obtained using the same production function.<sup>1</sup> In this context, differences between the potential GDP growth rates in the two exercises depend on the various sets of hypotheses on the dynamics of labour productivity and employment. In turn, differences in productivity growth rates mainly depend on the various methodologies for calculating Total Factor Productivity (TFP),<sup>2</sup> while those in employment growth rates depend on differences in the demographic projections and in hypotheses concerning labour market.

In the AWG exercise the economic hypotheses are drawn up on the basis of the methodology defined by the Output Gap Working Group (OGWG) which distinguishes the medium and the long term trend.<sup>3</sup> In the medium term AWG adopts the so-called “T+10” methodology: TFP and unemployment trends are first obtained by applying the Kalman filter to historical series and then they are projected onto a 10 year horizon. Unemployment rate has also a medium term “anchor” estimated with a panel regression model. Between the eleventh year of projection and 2045 TFP growth rate converges to a long term value assumed equal to 1 percent, while unemployment rate (in the age range of 15 years and over) converges to 7.3 percent.

<sup>1</sup> The production function is Cobb-Douglas with constant returns to scale. See AWG (2017) (page 92 and foll.) and European Commission (2014), “The Production Function Methodology for Calculating Potential Growth Rates & Output Gaps”, Economic paper 535.

<sup>2</sup> A second element of difference is given by the evolution of capital deepening (RGS, 2017a, *op. cit.*, page 38).

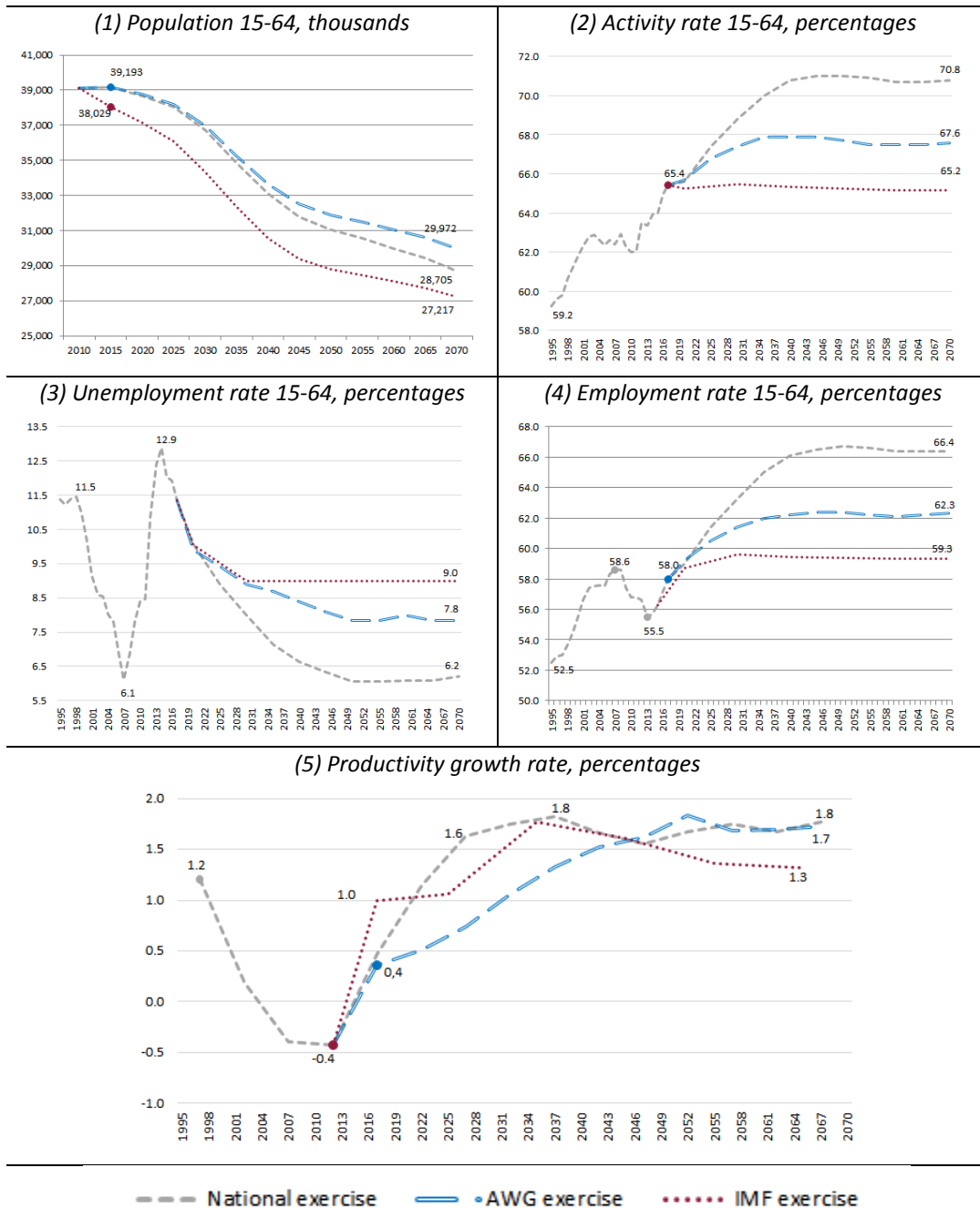
<sup>3</sup> In the short term the hypotheses are those of the Update to EFD 2017.

GDP evolution is co-determined by demographic (active age population in particular), employment and productivity dynamics (fig. 6). AWG is the one that sees active population shrinking the least (fig. 6, graph 1), from roughly 39 million in 2015 (base year) to around 30 million in 2070. On the contrary, IMF projects a drop from about 38 million in 2015 (1 million less than AWG) to just over 27 million in 2070. Midfield, but closer to AWG than to IMF especially in the first decades, stands the national exercise, which in 2070 is just under 29 million. All three sources envisage, as for the other demographic variables examined previously, the same demographic transition with a process of depletion of population aged 15-64 years

that first accelerates between 2025 and 2045, and then gradually slows down.

As for employment rate, determined by the hypotheses on activity rate and unemployment rate (fig. 6, graphs 2 and 3), the national exercise projects an improvement from the current level of 58 percent to 66.7 percent in 2050, followed by a substantial stabilisation (fig. 6, graph 4). The AWG exercise also prefigures an improvement, but less pronounced and with a gradual convergence towards a long term level that would settle above 62 percent.

**Fig. 6 – Labour market and productivity projections (1)**



Source: based on Istat (2017), Eurostat/Europop (2017) and UNPD (2017) online dataset data, with access in April 2017; RGS (2017b), “Le tendenze di medio-lungo periodo del sistema pensionistico e socio-sanitario”, Update note to Report N° 18; Andrle *et al.* (2018), IMF WP/18/59.

(1) With reference to graph 5, for national and AWG exercises the average annual growth rates are shown over five years intervals. For IMF exercise the average annual growth rates are shown over ten years intervals, kindly supplied by the authors of the working paper, with the exception of the first figure which is the annual average of the five years period 2015-2020.

IMF confirms as more pessimistic, with an employment rate that in the long term would remain slightly above 59 percent, marking only a moderate improvement in comparison with current value (only one percentage point). Looking at the



historical series from 1995 onwards, it is possible to recognize, behind the most favourable dynamics of the national and AWG exercises, an hypothesis of substantial convergence towards average levels already experienced today by the EU and the Euro area. On the contrary, IMF assigns more emphasis to the evidence that in its recent history Italy has never reached employment rates higher than 60 percent (which was gained only in the years immediately before economic crisis), and that there are no ongoing reforming processes that can be thought capable of influencing current dynamics in such a substantial way.

Lastly, with regard to the productivity growth rate (measured as GDP per employed aged 15-64<sup>22</sup>), the national exercise prefigures a continuous recovery – more rapid in the initial phases and then with gradually milder rhythms – which would take it from current values of around 0.5 percent to 1.8 percent in 2040, thereafter to values between 1.5 and 1.8 percent until the end of the projection horizon, when it would return to 1.8 (fig. 6, graph 5).

Some improvements are projected also in AWG exercise. In the first half of the projections the recovery path stands well below that of national exercise, with a difference reaching almost 1 percentage point in the period 2025-2030 and then reabsorbed until 2045. In the long term, from 2045 onwards, the hypotheses on

growth rates are substantially aligned to those of the national exercise. In AWG exercise a longer persistence of the consequences of the past economic crisis is assumed, which would imply persisting stagnant productivity also during upcoming years and then a slower recovery towards the long term level (see Box “The T+10 methodology”).

As for IMF, until roughly 2035 productivity dynamics will stand by and large halfway between that of national and AWG exercises. From 2040 onwards, the dynamics assumed by IMF will instead lie below the other two, with the difference reaching about half a percentage point in 2070. As already observed with regard to employment and activity rates, IMF exercise implies a less optimistic viewpoint on Italy’s long term growth prospects.

Overall, in the light of the economic variables examined, national exercise is slightly more optimistic than AWG. Indeed even if both exercises glimpse an alignment at average European levels in the long term,<sup>23</sup> AWG differs for its greater prudence in the first half of the projection horizon, when a more protracted persistence of the consequences of the crisis and a tougher recovery of a long term regime is taken into account. Contrarily, IMF’s macroeconomic hypotheses tend to give even greater weight to historical data recorded over the past twenty years and

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<sup>22</sup> The canonical breakdown involves recourse to total employment (15 years and over) and not to employment of those aged 15-64 years. In this case however it was necessary to use the latter in order to permit full comparability with data available for IMF exercise.

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<sup>23</sup> According to the grouping of hypotheses drawn up in the context of the AWG, in the long term the productivity growth rate should converge at around 1.5 percent in the EU countries (AWG, 2017, *op. cit.*, page 72).

to exclude the possibility of significant improvements in the future.

One of the consequences of OGWG methodology is the persistence over time of the low productivity growth rates and high unemployment rates experienced in the years after the economic crisis of 2008. In fact AWG exercise envisages a

TFP dynamics significantly lower than in national exercise up to 2045, when convergence towards the same long term level (1 percent<sup>24</sup>) is completed. As for unemployment, AWG hypotheses remain worse than national ones throughout the projection horizon. This explains the differences in GDP growth rates between the two exercises (fig. 5).

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<sup>24</sup> It is hypothesised that in the long term there will be convergence of all EU countries to a TFP growth rate of 1 percent.

## Appendix 1

### The RGS Sensitivity Scenarios

RGS (2017a), like all previous publications of the same type, contains a series of sensitivity exercises around the baseline scenario; table A1 shows some of the most significant<sup>25</sup> ones. These exercises – analytical instrument and normative framework being equal – are useful for assessing alternative scenarios.

It is worth underlining that the peak of pension expenditure to GDP ratio (16.9 percent) is reached between 2040 and 2045 within the “low productivity” scenario, where it is assumed that, with respect to the baseline scenario, productivity growth rate is lower by 0.25 percentage points throughout the entire projection horizon. As a term of comparison, it is useful to remind that in IMF exercise the same growth rate settles, in the long term, at about half a percentage point below the national one.

The second highest scenario for the extent of peak (16.8 percent in 2040) is the “low demography” one, where the hypotheses include: a lower annual average net migration flows of 52.000 people; a 0.25 percentage points lower fertility rate by 2070; a life expectancy at birth lower by 2.1 years for males and 2.4 for females by 2070. This sensitivity exercise incorporates a migration hypothesis similar to that of IMF (-60.000 people on annual average although referred to a smaller overall

population corresponding to the *de facto* and not to the residence definition).

The third highest scenario for incidence on GDP (16.5 percent between 2040 and 2045) is the “low activity rate” one, where with respect to the baseline scenario, it is assumed a lower activity rate for the period 2017-2045 with the difference reaching 2 percentage points as from 2045. Even after this downward correction, the activity rate would remain higher in comparison to that of AWG exercise (roughly 1 percentage point in the long term) and IMF exercise (more than 3 percentage points in the long term).

In the “high unemployment” sensitivity scenario the peak of incidence of 16.5 percent is reached in 2040. The hypothesis is that, with respect to the baseline scenario, unemployment rate is increasingly higher, reaching a difference of 2 percentage points in 2070. With this correction, the long term hypothesis on unemployment would stand just above the one incorporated in AWG exercise (where however it is part of a distinct group of hypotheses on other variables). Even after this correction, in the long term, unemployment in IMF exercise remains higher by almost 1 percentage point.

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<sup>25</sup> RGS (2017b) does not show sensitivity scenarios. We recall however that the pension expenditure to GDP ratio differs by not more than 0.1 percentage points from the basic scenario in RGS (2017a) throughout the projection horizon.

**Tab. A1** – Pension expenditure to GDP ratio; sensitivity analysis (1)

	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070
RGS - National baseline	14.8%	15.7%	15.4%	15.5%	15.5%	16.0%	16.3%	16.2%	15.6%	14.8%	14.1%	13.5%	13.1%
Low immigration	14.8%	15.7%	15.5%	15.5%	15.6%	16.2%	16.5%	16.6%	16.1%	15.3%	14.7%	14.1%	13.7%
High immigration	14.8%	15.7%	15.4%	15.4%	15.5%	15.8%	16.0%	15.9%	15.2%	14.3%	13.6%	13.0%	12.6%
Low demography	14.8%	15.7%	15.5%	15.6%	15.9%	16.4%	16.8%	16.7%	16.0%	15.3%	14.7%	14.1%	13.8%
High demography	14.8%	15.7%	15.4%	15.4%	15.4%	15.6%	15.8%	15.7%	15.2%	14.3%	13.5%	13.1%	12.6%
Low productivity	14.8%	15.7%	15.5%	15.7%	15.9%	16.5%	16.9%	16.9%	16.3%	15.4%	14.7%	14.1%	13.6%
High productivity	14.8%	15.7%	15.4%	15.2%	15.2%	15.5%	15.7%	15.7%	15.0%	14.2%	13.6%	13.0%	12.6%
Low rate of activity	14.8%	15.7%	15.5%	15.6%	15.7%	16.2%	16.5%	16.5%	15.9%	15.0%	14.4%	13.7%	13.3%
High rate of activity	14.8%	15.7%	15.4%	15.3%	15.4%	15.8%	16.0%	16.0%	15.4%	14.5%	13.9%	13.3%	12.9%
High unemployment	14.8%	15.7%	15.4%	15.5%	15.5%	16.1%	16.5%	16.4%	15.8%	15.0%	14.3%	13.7%	13.3%

Source: RGS (2017a), “Le tendenze di medio-lungo periodo del sistema pensionistico e socio-sanitario”, Report N° 18, pp. 143-172 and 412-424.

(1) Compared to the basic scenario: by low (high) immigration is intended a lower (higher) net flow of immigrants (-/+52.000 units per year on average); by low (high) demography is meant a 0.25 points lower (higher) fertility rate in 2070, a lower (higher) life expectancy (-/+ 2.1 years for males and 2.4 for females), lower (higher) net flows of immigrants (-/+ 52.000 units per year on average, with a growing profile that rises from an annual average of around 25.000 units in the first decade of the forecasting period to around 66.000 units in the final years); by low (high) productivity is intended a 0.25 points lower (higher) productivity rate per year; by low (high) activity rate is intended a 2 percentage points lower (higher) activity rate in 2045.