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The Intergenerational Dimension of Fiscal Sustainability

Pedro Arévalo[1], Katia Berti[2], Alessandra Caretta[3] and Per Eckefeldt[1]

Abstract

Most countries, among which EU Member States, use public finances to redistribute resources from the working-age population to the old and the very young so as to smoothen resources over the life cycle of individuals. As the EU is confronted with population ageing, this societal model is facing challenges. This is particularly the case in light of public spending on pension and health care in the EU currently accounting for almost 20% of GDP and expected to remain major public spending items going forward. As such, and against the background of a rising dependency ratio, age-related public spending could lead to increasing tax burdens on future generations. This raises questions of intergenerational equity that cannot be measured by standard budgetary indicators, nor by traditional fiscal sustainability metrics (including the European Commission's fiscal sustainability gap indicators). Generational accounting allows calculating the present value of total net tax payments to the government (taxes paid minus transfers received) over the remaining lifetime of a cohort born in a specific year. Relying on harmonised data and the European Commission projections, including the Ageing Report, this paper estimates the lifetime fiscal burden and its distribution between current and future-born generations for all EU countries, disentangling the underlying determinants. Based on the generational accounts, two indicators measuring intertemporal and intergenerational imbalances are provided, the Intertemporal Budget Gap (IBG) and the Auerbach-Gokhale-Kotlikoff (AGK) indicators. The paper concludes that public finances in the EU face long-term fiscal sustainability challenges based on current policies and that there are intergenerational issues, entailing a larger adjustment for future generations.

JEL Classification: E62, H3, H5, H55, H6, I1, I3, J1, J21.

Keywords: public finance, structural reforms, generational accounting.

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CONTENTS

1. INTRODUCTION

Fiscal sustainability analysis is often conducted by analysing future developments of government debt, with focus on explicit government liabilities, while also accounting for implicit liabilities, including those due to population ageing. Both aspects are examined in e.g. the Fiscal Sustainability Report 2018[5]. Such analysis is useful for assessing the extent to which public finances are sustainable over a short-, medium- and long-term perspective. However, it does not allow for explicitly assessing possible intergenerational imbalances of fiscal policies.

Generational accounting was developed as a methodology for assessing the long-term sustainability of public finances, allowing for explicit judgements on the intergenerational distribution of the fiscal burden (Auerbach, Gokhale and Kotlikoff, 1991, 1992 and 1994). This is the more relevant in the light of the large government debt levels observed in a few EU countries. While the distributive (intergenerational) impact of government debt on a generation's wealth position may be neutralised by private transfers (bequests) from older generations towards their heirs, another potential source of generational imbalance arises in the form of implicit claims stemming from government spending programs such as pension entitlements.[6] There has been a long debate on the plausibility of considering such implicit pension liabilities as equivalent to government debt (see Franco and Sartor, 1999). This paper focuses on providing a more comprehensive picture on fiscal sustainability considering all public transfers and tax payments in addition to the challenge related to the cost of ageing. Indeed, the pay-as-you-go system in place in many EU countries, in combination with an ageing society, can be a major challenge for fiscal policy to be accounted for.

Generational accounts aim at identifying all taxes and transfers collected from and paid to the government by individuals rather than enterprises, focusing on budgetary items that can be affected by policies related to health, social security and education. By calculating the lifetime net tax burden of specific generations, one can derive the net liabilities of the government sector vis-a-vis these generations. Moreover, by summing up over current generations one can infer how much of these intertemporal implicit and explicit public liabilities are covered by current generations rather than postponed to future ones.

The paper follows the line of generational accounting (GA) developed in the 1990s by Auerbach, Gokhale and Kotlikoff, but more recently applied by the Freiburg School for estimating the Implicit Pension Debt (IPD). It benefits from the availability of the European Survey Statistics on Income and Living Conditions (SILC) and other homogenous data sources. These have the advantage of being comparable across countries, contrary to national sources on which earlier work on European countries was based (European Commission, 1999). Indeed, the added value of this paper lies in applying the GA methodology using homogenous data and comparable projections, including from the Ageing Report, both at micro and macro level for all EU Member States. This paper also includes estimates of how structural reforms carried out to ensure sustainable pension systems and the impact of reaching fiscal policy targets (Medium-Term Objectives) influences the intertemporal and intergenerational distribution of the fiscal burden.

The paper is organised as follows. The next section briefly summarises the theoretical literature on generational accounting. The third section describes the data sources and the calculation of the lifetime fiscal burden, illustrating the construction of the generational accounts. The fourth section analyses the

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[5] See European Commission (2019).

[6] This paper assesses the amount of intergenerational redistribution that materializes through fiscal policy. Redistribution taking place though private transfers, both monetary and in-kind, is beyond the scope of this paper. Such transfers could either reinforce or partially offset the generational redistribution of resources via fiscal policy. The methodology of National Transfer Accounts (NTAs) offers the possibility to study the economic life cycle at aggregate levels, including private transfers (see e.g. Lee & Mason, 2011).

evolution of the lifetime fiscal burden across current and future generations. Estimates on gender differences are also provided. The fifth section is devoted to estimating the intertemporal and intergenerational gap indicators expressed in the GA framework and to assessing to what extent the fiscal burden to close the gap is put on future generations, according to different scenarios. Section six points to some limitations (showing also sensitivity tests based on different assumptions for the interest rate) and discusses possible extensions of the analysis. The last section concludes.

2. GENERATIONAL ACCOUNTING METHODOLOGY

In their seminal work, Auerbach, Gokhale and Kotlikoff (1991, 1992, 1994) have developed the generational accounting (GA) methodology, which addresses the intertemporal welfare effects of current fiscal policy. In contrast to traditional budget indicators, generational accounting does not focus on annual cash-flow budgets, but on the intertemporal budget constraint of the government. In the long term, all government spending must be balanced by the tax payments made by either current or future generations. Generational accounts report, for each generation, the present value of rest-of-life net taxes paid to the intertemporal government budget.

The recently revamped attention to the GA literature is related to its ability to provide non-traditional fiscal indicators on the long-term impacts of fiscal policy accounting for the overall fiscal burden, e.g. explicit and implicit government debt, while allowing to evaluate how current government activity can affect the life-cycle resources of current living and future-born generations (see Rizza and Tommasino, 2010). The methodology is also used to estimate total liabilities, that is explicit liabilities (government debt) and implicit liabilities (e.g. public spending due to ageing and changes in the population structure). [7]

The starting point for the GA approach is the government's intertemporal budget constraint (*IBC*), according to which current fiscal policies are considered sustainable if they generate a flow of current and future primary budget surpluses in present value terms that covers the initial net debt. This can be expressed as follows:

$$PV(R) = PV(G) + D$$

where $PV(R)$ = present value of government revenues; $PV(G)$ = present value of government expenditures; D = net explicit debt.

As a next step, categories of expenditures and revenues that can be attributed to individual generations are identified. Government's expenditure and revenue items are then split accordingly between “distributed” and “non-distributed” items. The latter commonly include public goods, i.e. expenditures in goods and services for which consumption cannot be assigned to age-specific profiles (like national defence, infrastructure, justice). The non-distributed revenues are supposed to include all taxation components that are not directly paid by individuals or households (such as corporate taxes, see also Table 3.1 below). After splitting budgetary items between distributed and non-distributed, the *IBC* can be expressed as:

$$PV(R^D) + PV(R^{ND}) = PV(G^D) + PV(G^{ND}) + D$$

By rearranging terms, it is possible to get the net tax payments of individuals and the net government's expenditure that are non-distributable:

$$PV(R^D - G^D) = PV(G^{ND} - R^{ND}) + D$$

[7] See Bahnsen, Manthei and Raffelhuschen (2018); Raffelhuschen, Rekker and Peeters (2018).

Finally, by distinguishing between current (*cg*) and future generations (*fg*) we can rewrite:

$$PV\ (Net\ Tax)_{cg} + PV\ (Net\ Tax)_{fg} = PV\ (G^{ND} - R^{ND}) + D$$

where the first term on the right-hand side includes the categories of expenditures net of taxation items that cannot be distributed (i.e. attributed to a specific generation).

By using a more formal notation, the *IBC* at year *t* can be rewritten as follows:[8]

$$\sum_{k=t-L}^{t} N_{t,k} + \sum_{k=t+1}^{\infty} N_{t,k} = NG_t + \sum_{l=t+1}^{\infty} \frac{NG_l}{\prod_{s=t+1}^{l}(1+r_s)} + D_t \qquad (1)$$

where $N_{t,k}$ = net present value of remaining lifetime net tax payments to the government of the generation born in year *k* discounted to year *t*; *L*=maximum life length; NG_t = net government spending non-attributed to any generation in year *t*; r_s = discount rate in year *s*. The first left-hand side term of equation (1) is the aggregate lifetime net taxes paid by all generations alive in the base year *t*, while the second left-hand side term aggregates the lifetime net tax payments made by future generations (born after the base year (*t+1*)). The right-hand side of the equation reports the present value of net government spending that is not distributed across generations, plus net debt outstanding in year *t*.

The term $N_{t,k}$ in equation (1) can also be expressed as:

$$N_{t,k} = \sum_{s=\max(t,k)}^{k+L} \left(\bar{T}_{s,k} \cdot P_{s,k} \cdot \prod_{j=t+1}^{s} \frac{1}{(1+r_j)} \right) \qquad (2)$$

where $N_{t,k}$ = time *t* present value of remaining lifetime net tax payments to the government of the generation born in year *k*; $\bar{T}(s,k)$ = average net tax payment for the generation born in *k* calculated in year *s*; $P_{s,k}$ = cohort size in year *s* of individuals born in year *k*; r_j = the discount rate in year *j*. [9] A set of generational accounts can then be expressed as a set of average net tax payments to the government by each cohort. They can be calculated by dividing the present value in year *t* of the aggregate remaining lifetime net tax payments of a generation born in year *k* ($N_{t,k}$) by the number of cohort members ($P_{s,k}$) alive in the base year, for currently living generations, or by the number of new born of the cohort, for future generations.

The previous term $N_{t,k}$ covers net payments to the government that account for distributed items only. Ideally though, all government spending should be allocated to generations in this exercise. There is nonetheless no straightforward way to distribute some of these spending items. One possible approach for the remaining items, followed in some of our calculations, consists in allocating them as lump-sum net of taxes to all generations, i.e. implementing a proportional allocation of non-distributed items. [10] The term would then be re-defined as:

$$N_{t,k} = \sum_{s=\max(t,k)}^{k+L} \left(\bar{T}_{s,k} \cdot P_{s,k} \cdot \prod_{j=t+1}^{s} \frac{1}{(1+r_j)} - \frac{NGK_{k,s}}{\prod_{j=t+1}^{s}(1+r_j)} \right) \qquad (2')$$

[8] The gender dimension is considered in the analysis but to ease notation, the gender subscripts are dropped from the equations.

[9] See Section 3 for further details.

[10] See European Commission (1999).

where $NGK_{k,s}$ is the proportion of non-distributed net public taxes in year s that corresponds to the generation born in year k, i.e.:

$$NGK_{k,s} = NG_s \cdot \frac{P_{s,k}}{P_s}$$

Computing the generational accounts, and the other components of equation (1), allows assessing, in a traditional way, whether current fiscal policies are sustainable over the long run (in the sense that the left-hand side of the intertemporal budget constraint equals the right-hand side and the condition holds). It also, and more interestingly, allows evaluating how the fiscal burden is shared between current and future generations.

Government spending that is not financed by current generations must be paid at some point by future generations. In formal terms, holding the right-hand side of equation (1) fixed, a decrease in the present value of net taxes paid by existing generations (first left-hand side term) requires an increase in the present value of lifetime net taxes paid by future generations (second left-hand side term) for the budget constraint to be fulfilled.

Ex-post, equation (1) must always be fulfilled. However, the equation is rarely fulfilled ex ante when using available data, forecasts and/or projections, indicating an imbalance in fiscal sustainability terms that requires some adjustment at some point to ensure the intertemporal budget constraint holds over the long run. Of course, the adjustment can take place in several possible ways, with differences in terms of the burden faced by different generations. In generational accounting, different indicators have been developed to capture the imbalance in the intertemporal budget constraint and the related adjustment needs. In the rest of this section we present two of them.

A first indicator measures the so called *Intertemporal Budget Gap (IBG),* taking into account both explicit and implicit government liabilities - the latter stemming from commitments related to the social protection system (with spending projections based on current policies, expected demographic developments and a set of macroeconomic assumptions). Given current economic policies, the *IBG* indicates whether public finances are sustainable (i.e. the inter-temporal budget constraint of the government is fulfilled) and how the burden is shared by generation. It is calculated as follows:

$$IBG_t = \left[NG_t + \sum_{l=t+1}^{\infty} \frac{NG_l}{\prod_{s=t+1}^{l}(1+r_s)} + D_t - \sum_{k=t-L}^{t} N_{t,k} - \sum_{k=t+1}^{\infty} N_{t,k} \right] / GDP_t \qquad (3)$$

If the *IBG* is greater than zero, current policies cannot ensure that all government's payments and obligations are covered (including under projected demographic and macroeconomic developments, as indicated), highlighting the need for an adjustment at some point. In this case, the immediate and permanent change in taxes or expenditures for all generations such that the *IBG* is fulfilled can easily be computed.

A second possible indicator calculates the effort that future generations would be supposed to make to rebalance the intertemporal budget constraint. Once calculated what the government is projected to receive in revenues from current generations, its projected consumption expenditure and its current net wealth, one can estimate the amount that future generations would need to pay for the government intertemporal budget constraint to be satisfied. This is the logic behind the *Auerbach-Gokhale-Kotlikoff* (*AGK*) indicator, which also allows assessing the impact of different policy reforms on future generations.

In particular, the *AGK* indicator is calculated under the assumption that, by only changing appropriately the net payments to the government made by future generation $N_{t,k}$, equation (1) can be fulfilled. In other words, balancing the intertemporal government budget is put only on future generations. In order to calculate a unique and simple indicator, a technical assumption is made that the generational account (the lifetime net tax) of a member of a future cohort rises, with respect to the one of a member of the previous cohort, in line with labour productivity growth (*g*). To calculate the *AGK* indicator, we then need to find the value of δ such that the following version of equation (1) is fulfilled:

$$\sum_{k=t-L}^{t} N_{t,k} + \sum_{k=t+1}^{\infty} \frac{\delta \cdot \prod_{s=t+1}^{k}(1+g_s) \cdot P_{k,k}}{\prod_{s=t+1}^{k}(1+r_s)} = NG_t + \sum_{l=t+1}^{\infty} \frac{NG_l}{\prod_{s=t+1}^{l}(1+r_s)} + D_t \quad (4)$$

After solving for δ, it is possible to compare the generational accounts of current and future generation's newborns, as for both we can observe the whole lifetime net tax payments (while any comparison with any other current living cohorts is not consistent as the retrospective working history of individuals is often not known). For a given future generation *j*, its generational account, i.e. the present value lifetime net tax payments of a newborn of that generation, would be equal to:

$$N_{t,j} = \frac{\delta \cdot \prod_{s=t+1}^{j}(1+g_s)}{\prod_{s=t+1}^{j}(1+r_s)}$$

In addition, according to this indicator, $\frac{N_{t,j} \cdot \prod_{s=t+1}^{j}(1+r_s)}{\prod_{s=t+1}^{j}(1+g_s)}$ for each year *t* and generation *j* the generational account of a future generation *j* relative to labour productivity in year *j* (not discounted) remains constant for all generations.

The *AGK* indicator is indeed defined as the ratio between the growth-adjusted generational account, i.e. the lifetime net tax, of future generations and that of the current generation's newborns in the base year:

$$AGK_t = \frac{\delta}{\left(\frac{N_{t,t}}{P_{t,t}}\right)} \quad (5)$$

where $\delta \cdot (1+g_{t+1})/(1+r_{t+1})$ is the per-capita generational account of newborns of the cohort born in the year after the base year (*t+1*), and $(\frac{N_{t,t}}{P_{t,t}})$ is the per-capita generational account of current newborns in the base year. Both terms include the complete lifetime net taxes and are fully comparable. For values greater than 1, there is a generational imbalance, whereby future generations face a larger fiscal burden.

The *AGK* indicator also has some limitiations. One of its weaknesses is that when there is a very small or negative value for the denominator in equation 5 (meaning, in case of negative value, a negative lifetime net tax payment for the current generation's newborns, which identifies the latter as so-called "lifetime net tax receivers"), the indicator is not defined and cannot be calculated.

Another issue is that currently in most Member States, growth rates are higher than interest rates leading to a negative interest-growth rate differential (*r-g*). In terms of the *AGK* indicator, this entails that the net present value of the generational account for a new born in year *t*+1 could be lower than for a new born in year *t*+2, etc. Interest rates lower than productivity growth would thus help improve the government's account vis-à-vis current and future generations. However, in the longer term it is assumed in the analysis in this paper, as in the 2018 Ageing Report and the 2018 Fiscal Sustinability Report, that the long-term interest rate will rise and converge to 3% real (5% nominal) in ten years time, such that the *r-g* differential becomes positive in the medium term.

To be able to estimate the generational imbalance between a current and a future newborn (with highest generational accounts), in what follows we will estimate the *AGK* indictor according to the following equation:

$$AGK_t = \frac{\max_{i \geq t}\left(\delta \cdot \prod_{j=t+1}^{i} \frac{(1+g_j)}{(1+r_j)}\right)}{\left(\frac{N_{t,t}}{P_{t,t}}\right)} \quad (5')$$

Estimating this indicator begs the question of which discount rate should better be used for assessing intergenerational distribution issues. An obvious candidate is the interest rate on government bonds, often used as a proxy for a ‘risk-free’ rate, but other options exist, such as a 'social discount rate', i.e. an estimate of how society values consumption at different points in time.

A 'social discount rate' could be appropriate when analysing intergenerational (re)distribution in a forward-looking manner. Such a discount rate can be estimated as a social rate of time preference (*STP*), which is often referered to as the Ramsey[11] rule:

$$SDR = STP = \rho + \eta g$$

where g = annual per capita consumption growth, η = the elasticity of marginal utility of consumption, and ρ = the utility discount rate, in turn consisting of two components: δ = pure time preference and L = possible other types of risks, such that $\rho = \delta + L$. The precise estimate of the parameters of the *STP* are subject to debate, and using this type of discount rate is therefore less straightforward than an observed market rate.[12] Freeman et al. (2018) report several estimates of the *STP*, ranging from 2% to 5.5% in real terms, and their prefereed rate is 3.5%, which is close to the long-term assumption used in the 2018 Ageing Report and in the Commission’s fiscal sustainability analysis.

A negative *r-g* differential – where *r* is the risk-free rate (often proxied by the interest rate on government bonds) and *g* is output growth - does not necessarily indicate dynamic inefficiency and is commonly observed empirically over the long-term.[13] Nonetheless, current interest rates on government bonds remain exceptionally low. In the 2018 Ageing Report and 2018 Fiscal Sustinability Report, it is indeed assumed that the long-term interst rate converges to 3% real (5% nominal) in the long-term after ten years. We choose to use the same assumption for the long-term discount rate for the analysis in this paper. In addition, in section 6, we will further illustrate results from sensitivity tests, analising the impact on the generational accounts of using a higher/lower discount rate, where the higher discount rate is close to the preferred estimate of the *STP* in Freeman et al. (2018).

Further on the *AGK* indicator, a feature of this indicator is that it compares the generational account (remaining lifetime net tax) of two cohorts only, newborns and those born one year later (representing future generations) under the assumption that: i) the generational account of each future newborn is

[11] See Ramsey (1928).

[12] For a recent overview of the social discount rates and its parameters, see Freeman, Groom and Spackman (2018).

[13] Abel, Mankiw, Summers and Zeckhauser (1989) show that an economy can be dynamically efficient with low or even negative real interest rates (‘risk-free’ rates) because of asset price risk, i.e. uncertainty due to the possibility of future changes in the market value of assets. Over the very long term, safe rates of return have on average been lower than economic growth rates, while risky rates of return have on average been much higher. The average safe real rate of return over the period 1870-2015 for 16 economies was 1.9%, the average risky real rate of return was 7.2% and average real GDP growth was 3%. See Jorda, Knoll, Kuvshinov, Schularick and Taylor (2017).

uprated at the labour productivity growth rate; and, ii) the whole adjustment needed to respect the intertemporal budget constraint is placed on the future newborn (not on the current newborn) as already explained. However, with increasing life expectancy and policy measures that become effective only in the future, generational accounts of future generations cannot just be represented by the cohort born immediately after the base year, as the generational account changes for every future generation.[14] Indeed, the generational accounts for future new borns (deflated by labour productivity growth) tend to be lower than for current new borns, reflecting the impact of higher life expectancy and therefore lower lifetime net taxes. By contrast, according to the assumptions made in calculating the *AGK* indicator, the generational accounts remain constant over time (see Graph 2.1).

This conventional assumption made in generational accounting, when comparing the entire lifetime net taxes of current and future newborns, that the whole adjustment is put on the future new borns is one of several possible options of intergenerational distribution. As pointed out by Balassone et al. (2009), the intergenerational distribution of the fiscal burden is a normative question. Indeed, similar to progressive income taxation, an intertemporally rising net tax rate has sometimes been proposed in the literature in order to redistribute from (richer) future generations to (poorer) currently living ones. Moreover, some expenditure items (such as education) may have positive externalites for future generations at society level, beyond affecting net taxes. These caveats need to be borned in mind when interpreting the results of generational accounting.

Due to the changing generational accounts over time, it is possible that a country faces an intertemporal imbalance (*IBG*>0) while not facing an intergenerational gap (*AGK*<1), making its interpretation difficult in such cases. Specifically, the intertemporal budget gap may be positive even if less than the same net lifetime tax (in growth adjusted terms) is placed on the future generation's than on the current generation's newborns, because the generational accounts of future generations have a different dynamic in the baseline scenario than assumed under the *AGK* calculation (since in the baseline some net tax components are based on current policies and the ageing process changes the population structure) (see better section 5 below).

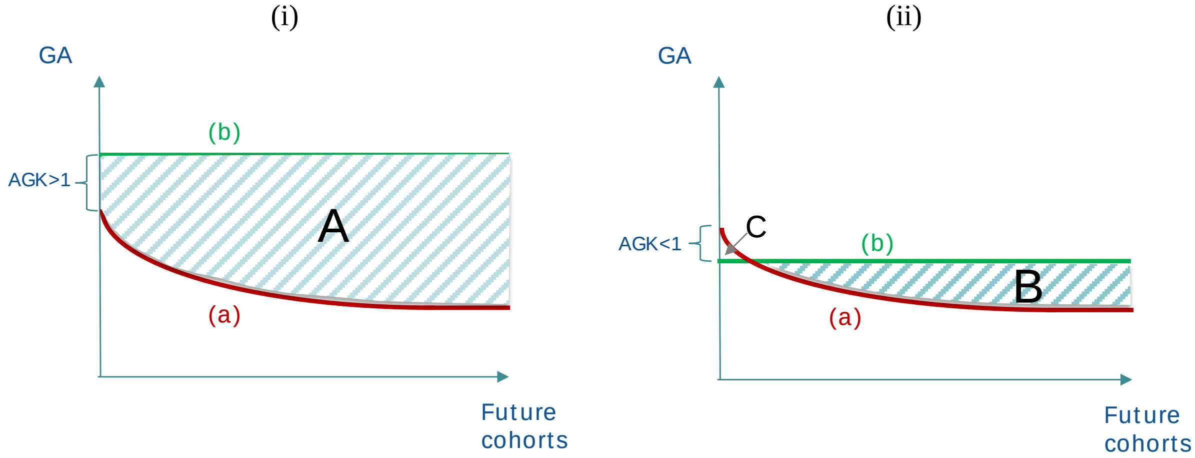
To help with the interpretation of estimates that will be obtained later for the *AGK* indicator, Graph 2.1 shows two possible hypotethical cases. The generational accounts for current and future newborn generations in a baseline scenario (a) and the generational accounts estimated under the *AGK* assumptions (b). Both generational accounts are discounted using labour productivity growth. Both therefore show the ‘effort’ (the lifetime net tax burden) for each subsequent generation. In both cases, it is assumed that the *IBG* indicator is positive (i.e. an intertemportal imbalance exists).

In the first case (i), more common across EU countries, we have an imbalance in both the *IBG* and *AGK* indicators. Area A represents the adjustment needed in future generartion’s generational accounts in order to fulfil the intertemporal budget constraint. It results from both a relatively weak starting budgetary position (the distance between linas (a) and (b) at $t=0$) and a negative impact of population ageing (the slope of line (a)).

In the second case (ii), there is still an intertemporal imbalance (*IBG*>0), but the *AGK* is lower than 1. The additional adjustment needed to fulfil the intertemporal budget constraint is equal to the area B-C. In this case, the needed additional adjustment is not triggered by the starting budgetary position but rather by the negative impact on public finances from population ageing.

[14] See Bonin (2001).

Graph 2.1. **Generational accounts for future generations with changes in life expectancy, stylised examples**



Key: Hypothetical cases: (a) GA under baseline projections, (b) GA under *AGK* assumptions.

In both cases, as *IBG*>0, an adjustment is eventually needed. An *AGK*<1 would only mean that there is a possible solution in year 0 that fulfils both the fiscal sustainability and intergenerational balance conditions in terms of net payments to the government. This would nonetheless require an additional adjustment. The more delayed this adjustment, the greater it will need to be. To analyse the impact on future generations of delaying the adjustment, we further assess the generational imbalances for future newborns at different points in time, while maintaining the assumption that the entire adjustment burden lies on all subsequent generations. We assume that generational accounts of generations up to year *W-1* are unchanged (no adjustment), and all the burden is imputed to cohorts from generation *W* onwards. Formally, we estimate equation 4’ as follows:

$$\sum_{k=t-L}^{t} N_{t,k} + \sum_{k=t+1}^{W-1} N_{t,k} + \sum_{k=W}^{\infty} \frac{\delta^W \cdot \prod_{s=t+1}^{k}(1+g_s)\cdot P_{k,k}}{\prod_{s=t+1}^{k}(1+r_s)} = NG_t + \sum_{l=t+1}^{\infty} \frac{NG_l}{\prod_{s=t+1}^{l}(1+r_s)} + D_t \qquad (4')$$

where W = the year when the future newborn generation in relation to which we assess the intergenerational imbalance is born.

This measure of intergenerational imbalance (the *AGK* with delayed adjustment until year *W*) can be written as follows:

$$AGK_{DA}(w) = \frac{\delta^W}{\left(\frac{N_{t,t}}{P_{t,t}}\right)} \qquad (5'')$$

where $\delta^W \cdot \prod_{s=t+1}^{W}(1+g_s) / \prod_{s=t+1}^{W}(1+r_s)$ is the per-capita generational account of newborns of the cohort born in year *W*, and $(\frac{N_{t,t}}{P_{t,t}})$ is the per-capita generational account at time *t* of newborns in *t*. Both terms include the complete lifetime net taxes and are fully comparable. With this indicator, $AGK_{DA}(w)$, we evaluate the generational imbalance between generation *t* and generation *W*, when the whole adjustment is made starting from generation *W*.

3. ESTIMATING GENERATIONAL ACCOUNTS

The estimation of generational accounts in equation (2) and of the eventual fiscal burden on future generations includes several steps: i) extracting from National Accounts figures the components included in the inter-temporal budget constraint (equation 1); ii) calculating the average age/sex profiles of net tax payments for the base year; iii) projecting the base year net tax age profile for the future; and iv) calculating the remaining lifetime net tax payments for all generations by discounting to the base year. The overall process heavily relies on data from different sources as better explained below.

Data sources

To account for projected demographic changes, Eurostat's latest population projections up to 2080 are used, ensuring consistency across countries.[15]

National Accounts figures for the various government revenue and expenditure categories are then used to differentiate, within the public budget, the categories that can be age-distributed from those that cannot be assigned to specific age cohorts ("non-distributed" items).

We distinguish ten groups of distributable transfers. A first group of six corresponds to items that are available both at macro (National Accounts) and micro (SILC) levels, namely: survivor benefits, unemployment benefits, family allowances, housing, social exclusion and disability allowances (including sickness). The aggregate national values for these items are taken from the COFOG classification of government expenditures and constitute the core of national tax and benefit systems. The COFOG figures can then be allocated by age and gender according to the relative profiles available in EU SILC for these specific items (see Table 3 and next section for more details).

The other four items are included in "Other items distributed" (see Table 3.2). For education allowances, as reported in EU SILC, the value from the survey is maintained in our calculations without any alignment to National Accounts for lack of clear correspondence. Old age pension, health care and long-term care expenditure are taken from the European Commission – Economic Policy Committee projections (2018 Ageing Report). Lastly, there are other items on the spending side that are not distributed by age or gender, covering mainly government's purchases of public goods (among others, general public services, defence, economic affairs or environmental protection).

On the revenue side, the public budget includes personal income taxation and corporate taxation, wealth, product and capital income taxation, social security contributions (see Table 3.3). The relative profiles derived from the EU SILC survey only record tax payments of households for 3 items: 1) personal income taxation; 2) social security contributions (employer and employee); and 3) taxes on wealth. Additionally, the values of VAT payments and corporate taxes from National Accounts are allocated by age and gender according to EU SILC profiles available for personal income taxation. Finally, other revenue items that are not distributed by age or gender are mainly government sales (market output, output for own final use and payments for non-market production), taxes on products and imports other than VAT, and capital revenue and other current revenue (i.e. property income). The non-age specific taxes and transfers are then included in the generational accounts by aggregating them in the non-distributed category (*NG* in Equation 1).

In addition to the government revenues and expenditures, the government's net debt at the beginning of the base year is also included into the government's intertemporal budget constraint. This is given

[15] See Part I, Chapter 1 of the 2018 Ageing Report for details behind the population projections.

by gross debt net of financial assets in 2016. Interest expenditure has also been added to government debt only for the base year.[16] [17]

Calculating average age profiles

To identify the age-sex profiles for the budgetary components included in the intertemporal budget constraint and selected above, we rely on the household and personal survey data from EU SILC, as a publicly available micro data source, which allows coverage of required information and cross-country comparability across EU countries.[18] We use the structure of expenditure and revenues from the 2015 wave of the EU SILC survey as a proxy for 2016 (it includes the age/sex profiles for twelve categories of the national tax and benefit system). These components are attributable by age (as they are directly transferred from/to the government to/from a certain generation), by gender and are available for all 28 EU countries.[19] [20] The only missing category is health expenditure, for which we use the Commission-Economic Policy Committee projections, as explained before, available by age and gender.[21] For the revenue side, we also rely on SILC data. Some of the revenue data are calculated at household level in EU-SILC. These payment categories were assigned to individual age groups by allocating the household amount to all household's members according to the intra-household income distribution.[22] Table 3.1 summarises the data used in this generational accounting exercise.

Formally, the estimation of the existing age profiles gives the average amount of a certain transfer (tax) received (paid) by an individual of a given age and sex alive in a given year. The sum of SILC age-specific individual tax/benefit T (in the base year 2016 of the cohort born in k), weighted by the cohort sizes P, gives total expenditure (receipts) according to SILC data.

For our calculations, the sum of SILC expenditure and receipts must equal the corresponding sum in the National Accounts, given by H. This identity only holds in theory, as the data are taken from two different sources, subject to heterogeneous methodological aspects. To solve this problem, adjusted age-sex profiles are calculated by aligning micro data to national aggregates. For each distributed variable a uniform scaling factor for all ages, genders and population groups is applied. This approach ensures consistency between absolute age-specific payment profiles drawn from SILC and the National Accounts' data.

[16] From a present-value point of view, where the discount factor is the implicit interest rate on debt, the discounted value of future interest payments and the initial stock of net debt equals the current stock of net debt. The cost of debt service has therefore been factored out from the calculation of future expenditures (primary expenditure), to avoid counting it twice.

[17] The budget aggregates for 2016 are shown for the EU average in Table A1 (Annex I) and the breakdown of distributed components are reported in Tables A1.2 and A1.3.

[18] See http://ec.europa.eu/eurostat/web/microdata/european-union-statistics-on-income-and-living-conditions.

[19] A few categories are further aggregated in the next steps to improve the comparability between SILC and the National Aggregates.

[20] Information is not available in SILC for some specific age groups (e.g. very old or very young population). In this case, we have estimated their values using available information for other age groups.

[21] See the 2018 Ageing Report for more details.

[22] The disaggregation was also required to deal with a few expenditure items like family/children allowances, social exclusion n.e.c. and housing allowances.

Table 3.1. **Synoptic table on data used**

Variables	Source	Adjustment	Projection	Including reforms	Weight in EA	Weight in EU28
Revenues						
Distributed						
Taxes on wealth	SILC	Weighted to match NA	g, r, Pop	NO	1.1%	1.6%
Tax on income and social contributions					39.5%	39.2%
Employers social contribution					14.8%	15.7%
VAT	National accounts	Distributed according to SILC data (Tax on income and social contributions)			19.5%	17.4%
Not distributed	National accounts	NA values - not distributed	G, r	NO	25.1%	26.1%
Expenditure						
Distributed						
Sickness and disability	SILC	Weighted to match COFOG	g, r, Pop	NO	6.0%	6.2%
Survivors					3.8%	3.1%
Family and children					3.8%	3.9%
Unemployment					3.5%	2.9%
Housing					0.8%	1.1%
Social exclusion n.e.c.					1.6%	2.0%
Education distributed (from SILC) (3)		SILC aggregate			0.4%	0.6%
Old age	2018AR & SILC	Not adjusted	2018AR, g, r, Pop	YES	21.2%	19.6%
Health care and Long-term care	2018AR				18.6%	19.5%
Not distributed	National accounts	NA values - distributed	G, r	NO	40.1%	41.2%
Net debt	Eurostat		NO	NO		

Key: *g* = labour productivity growth rate; *G* = GDP growth rate; *r* = interest rate; Pop = population projection.

Source: Eurostat (National Accounts), EU-SILC.

More formally, the vector of relative expenditure and revenue profiles by age taken from the SILC statistics/variables can be denoted by V. This vector shows only the relative values in the year 2016 of an individual born in year k. The estimated age distribution is aligned with the corresponding National Accounts' aggregate H by application of a proportional (non-age, nor gender specific) rescaling factor, denoted by ϕ. The relative distribution of tax/benefit by age and gender is therefore obtained from the formula: $W= \phi * V$ (and $W_i=\phi * V_i$) for all living generations, with ϕ defined as:

$$\phi = \frac{H}{\sum_{i=all\ current\ generations} V_i \cdot P_i}$$

W is therefore the vector of relative average positions observed in SILC over the total population, rescaled to match the National Accounts data.

Tables 3.2 and 3.3 provide more detailed information on a country by country basis. Table 3.2 shows that for expenditures the distributed part represents almost 59% of total expenditure in the EU, with a range from 45% or less (BG, HR, LV, RO) to more than 60% (DE, IE, IT, NL, FI). On the revenue side, the distributed part is almost 74% of total revenue in the EU, ranging from 70% or less (BG, EL, HR, CY, LV, HU, MT, RO, SI, SE) to more than 75% (BE, DK, DE, ES, LT, LU, NL), as from Table 3.3.

Table 3.2. **Total public expenditure, distributed and non distributed, in 2016 (% of GDP) and the adjustment factor applied**

						Total distributed		
	COFOG items distributed by cohort (1) (2) (as % of GDP)	Other items distributed (from SILC and AR2018) (3) (as % of GDP)	Not distributed items (as % of GDP)	Total expenditure without interest payments (as % of GDP)	Distributed / Total	Distributed. Adjusted values (as % of GDP)	Distributed. Initial estimation from SILC (as % of GDP)	Average adjustment
BE	11	19	22	52	57.1%	30	25	1.2
BG	3	13	20	36	43.6%	16	16	1.0
CZ	5	14	21	41	47.5%	19	17	1.1
DK	13	19	22	53	58.6%	31	31	1.0
DE	10	18	17	44	61.2%	27	25	1.1
EE	6	13	23	42	45.4%	19	15	1.2
IE	7	10	10	26	63.1%	17	17	1.0
EL	5	20	22	46	52.6%	24	23	1.1
ES	8	16	17	41	58.6%	24	23	1.1
FR	11	22	23	56	59.6%	33	29	1.1
HR	6	15	26	47	45.0%	21	20	1.1
IT	8	21	18	46	62.0%	29	27	1.1
CY	8	12	16	36	55.4%	20	21	1.0
LV	5	11	21	37	43.1%	16	14	1.1
LT	5	10	18	34	46.5%	16	14	1.1
LU	7	13	22	42	47.8%	20	17	1.2
HU	7	14	24	45	46.8%	21	18	1.2
MT	5	13	21	38	46.6%	18	19	0.9
NL	10	17	17	44	61.2%	27	28	1.0
AT	9	20	22	50	57.4%	29	28	1.0
PL	8	15	17	39	57.0%	22	17	1.3
PT	6	18	18	42	57.0%	24	23	1.1
RO	3	11	22	35	38.8%	14	13	1.0
SI	7	16	21	44	52.6%	23	24	1.0
SK	6	14	22	41	47.6%	20	16	1.2
FI	12	22	22	57	60.3%	34	30	1.2
SE	11	19	22	51	57.7%	29	26	1.1
UK	6	14	16	36	57.2%	21	22	0.9
EA	9	19	19	47	59.9%	28	26	1.1
EU28	9	18	18	45	58.8%	26	25	1.1

(1) it includes the following allowances: "survivors", "family and children", "unemployment benefits", "housing" and "other social exclusion allowances"

(2) it doesn't include "housing allowances" for RO and BG, "other social exclusion allowances" for DK, and "survivor allowances" for BG

(3) it includes "education allowances", and "Old age and early pensions", "HC" and "LTC" expenditure from the AR2018. Also includes "Survivor allowances" in the case of BG

Note: the adjustment is made to match SILC data with aggregate National Accounts data.

Source: Eurostat (COFOG, National Accounts), EU-SILC, 2018 Ageing Report.

Table 3.3. **Distributed percentage of total revenues in 2016 (% of GDP) and the adjustment factor applied**

	Items distributed by cohort (1) (2) (as % of GDP)	Not distributed items (as % of GDP)	Total revenue (as % of GDP)	Distributed/ Total	Total distributed: Distributed. Adjusted values (as % of GDP)	Total distributed: Distributed. Initial estimation from SILC (as % of GDP)	Total distributed: Average adjustment
BE	40	12	52	76.1%	40	29	1.4
BG	24	14	37	63.5%	24	11	2.1
CZ	31	11	42	73.6%	31	14	2.2
DK	41	14	54	75.1%	41	23	1.8
DE	37	9	47	80.1%	37	17	2.2
EE	30	12	42	71.6%	30	20	1.5
IE	20	8	28	72.2%	20	10	2.0
EL	32	18	50	64.6%	32	19	1.7
ES	29	10	39	75.2%	29	18	1.7
FR	39	15	54	71.7%	39	27	1.5
HR	32	17	49	66.3%	32	23	1.4
IT	34	13	48	71.9%	34	26	1.3
CY	28	12	40	69.0%	28	15	1.9
LV	26	13	38	67.1%	26	15	1.7
LT	27	9	36	75.5%	27	13	2.1
LU	34	10	44	77.3%	34	13	2.7
HU	31	15	47	67.3%	31	14	2.2
MT	29	13	42	69.5%	29	13	2.3
NL	35	10	46	77.3%	35	30	1.2
AT	37	14	51	73.4%	37	24	1.6
PL	28	11	38	72.1%	28	13	2.1
PT	31	13	44	70.6%	31	21	1.5
RO	22	11	34	66.0%	22	6	3.8
SI	31	14	45	68.7%	31	22	1.4
SK	29	12	41	71.6%	29	16	1.8
FI	39	17	56	70.4%	39	25	1.5
SE	33	20	53	62.3%	33	23	1.4
UK	26	10	36	73.3%	26	18	1.4
EA	36	12	48	74.9%	36	22	1.6
EU28	33	12	45	73.9%	33	21	1.6

(1) it includes the following revenues: "Taxes on wealth", "Tax on income and social contributions", "VAT" and "Employers social contribution"

Source: Eurostat (National Accounts), EU-SILC.

Estimating the base year net tax age-profile and projecting it over the future

Generational accounts estimate the expected per capita fiscal burden for different generations *assuming no-fiscal-policy change*.

To project the base year components of the intertemporal budget constraint, as defined in equation (1), the following strategy is applied: [23]

- Regarding the age-specific components drawn from SILC and other sources, the net tax payment is calculated by cohort and gender as the difference between taxes paid to and

[23] See Table 3.1 for an overall picture.

transfers received from the government. It is then assumed that, for each future year, the same net tax by age and gender observed in the base year *t* is adjusted by nominal labour productivity growth. This assumption implies that the base year fiscal policy is extrapolated indefinitely into the future, unless changes applying to the future are already legislated in the base year. The availability of long-term projections from the 2018 Ageing Report allows to define two scenarios: i) the "static" scenario, where the net tax payments profiles are projected according to the economy's labour productivity growth rate; and ii) the "baseline" scenario, based on the long-term projections (on pensions, healthcare and long-term care) of the 2018 Ageing Report.[24]

- Regarding non-distributed variables, their balance (net of interest expenditure) is projected so as to be aligned with the forecasted primary balance until 2020.[25] Beyond 2020, the non-distributed items are assumed to remain unchanged as a share of GDP.
- As of discount factor, we use the nominal implicit interest rate on debt. Data used is based on the European Commission's Autumn 2018 forecasts (using the same methodology as in the Fiscal Sustainability Report 2018).
- The projection horizon extends till year 2680, approximating an infinite horizon.

Calculating the remaining lifetime net tax

Finally, to calculate the generations' aggregate life-cycle net tax payments, the projected age-profiles are combined with population projections according to equation (2):

$$N_{t,k} = \sum_{s=\max(t,k)}^{k+L} \left(\bar{T}_{s,k} \cdot P_{s,k} \cdot \prod_{j=t+1}^{s} \frac{1}{(1+r_j)} \right) \qquad (2)$$

Where $\bar{T}_{s,k}$ denotes the average net tax paid in year *s* by a representative member of the generation born in year *k*; $P_{s,k}$ stands for the number of surviving members of a generation born in year *k* who survive until year *s*; and *r* is the discount factor.

The latest population projections by Eurostat for the period 2016-2080 are used. Beyond this year, the projection horizon is prolonged by assuming that population growth of each age group will converge to a 0% growth rate in 20 years and remain flat thereafter.[26]

Hence, based on the above, the generational account of a certain age group is defined as the sum of discounted net tax payments faced over their remaining life span. [27] To obtain it expressed in per-capita terms, the present value of remaining lifetime net taxes of the generation born in year *k* ($N_{t,k}$) is divided by the generation's size, for existing generations, or the initial population size for future generations ($P_{t,k}$).

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[24] More specifically, the country-specific nominal GDP growth rate used in the 2018 Ageing Report, based on the 2017 Spring Forecast, has been applied.

[25] Updated with European Commission Autumn Forecast 2018, see AMECO.

[26] Eurostat latest population projections covering the period 2015 to 2081 were released in March 2017, available here: http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-projections-data

[27] For current living generations, this means that the generational account depends on the age of the representative person of the cohort in the base year. As a consequence of this forward-looking nature of generational accounting, accounts of two different living cohorts cannot be compared, as for example those of elderly would look more favourable than those belonging to working-age groups.

➢ *Controlling for business cycle effects and short-term fiscal plans*

Given the assumptions made, it is important to keep in mind that the GA method is very sensitive to the information set for the base year, which is projected into an indefinite future, affecting the final intergenerational distribution of the fiscal burden. Our results therefore depend crucially on the tax and expenditure items in the year 2016. In particular, output gaps and the cyclical budget components are lower than in the years after the crisis, and they tend to be smaller at the end of the forecast horizon (until 2020). Moreover, the short-term forecasts include the fiscal plans of each national government. Not taking these elements into consideration can potentially strongly affect our intergenerational results, given the influence the initial budget balance has on the projection results (see Table A1.4 in Annex I). In order to reduce these effects, we adjust non-distributed net taxes such that the primary balance coincide with the forecast by the European Commission services in their Autumn 2018 forecast until 2020 (last forecast year) (see Table A1.4 in Annex I).[28]

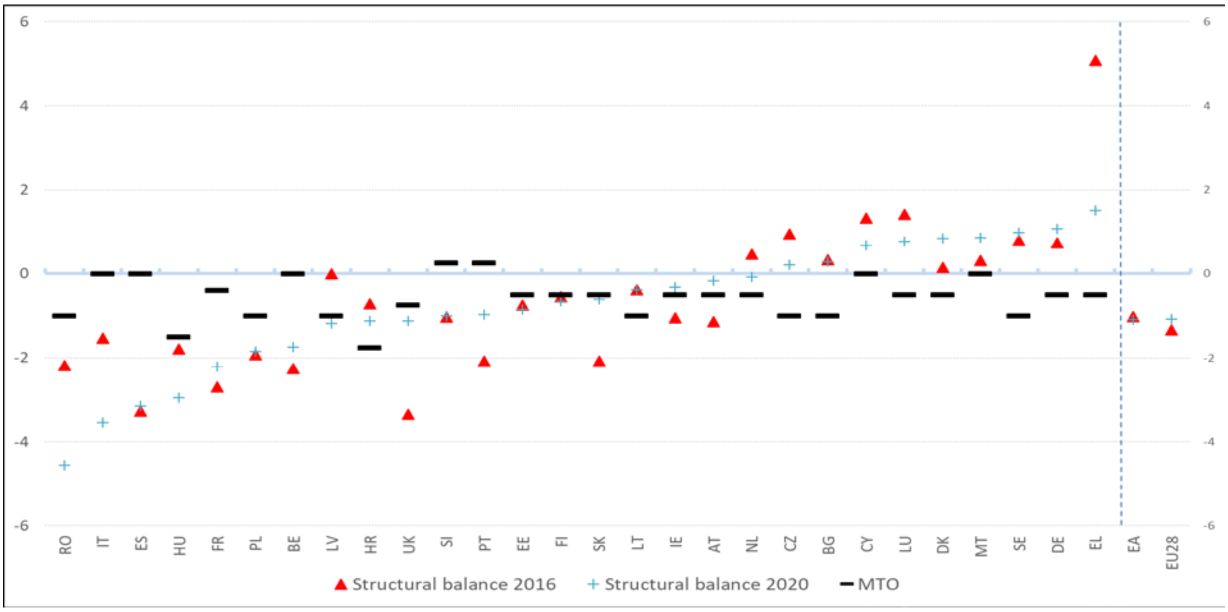
➢ *Taking account of fiscal policy targets*

In many countries, the fiscal position (structural balance) at the end of the forecast horizon falls short of the one compatible with full adherence to the Stability and Growth Pact (SGP), the medium-term budgetary objective (MTO) (see Graph 3.1). Even if this position is not reached at the end of the short-term forecast horizon, it is the target for fiscal policies in EU countries. The so-called "MTO scenario" will illustrate the impact on the intertemporal and intergenerational imbalances of assuming that all countries would reach this position, in line with the EU fiscal rules. [29] We will see that in this case the *IBG* and the *AGK* indicators improve considerably for both the EU and the EA.

[28] Alternatively, an adjustment for the cyclical component of public finances could be made. This is the approach used in the analysis in the Fiscal Susinatbility Report 2018. See also Bonin et al (2013).

[29] Specifically, it is assumed that countries not yet at the MTO would reach it gradually, and once this has been reached, the budget balance is allowed to change according to the evolution of the generational accounts. For countries above their MTO, the budget balance is allowed to change according to the evolution of the generational accounts.

Graph 3.1. **Structral balances and the Medium Term Objectives (MTO), % of GDP**



Source: AMECO, 2018 Fiscal Sustainability Report.

4. FROM THE RELATIVE PROFILES TO THE GENERATIONAL ACCOUNTS OF CURRENT AND FUTURE GENERATIONS

The present value of the total per capita net taxes that the current generation can expect to pay or receive (if negative) from the public budget during their remaining lifetime is showed in Graph 4.1 with reference to the EU average. From age 0 to +100, the generational accounts are shown (starting from the intercept on the left), i.e. the present value per capita net tax in 2016, for the cohort aged 100 still surviving in 2016 up to those born in the base year.

We develop two main scenarios:

- **A static scenario**, according to which all net taxes (revenue and expenditure) by cohort evolve in line with labour productivity growth. This scenario thus relies on a static assumption (which is commonly used in generational accounting) that net taxes per cohort follow a common trend. However, a drawback is that legislated institutional provisions, such as pension reforms taking effect in the future, are not taken into account. Most studies on generational accounting take nonetheless this apparoch. A value added of our estimates is that we additionally use the detailed demographic and macroeconomic projections of the 2018 Ageing Report, i.e. non-constant GDP growth, labour productivity growth and interest rates.

- **A baseline scenario**, according to which some expenditure items (old age and early pension, health care and long-term care) develop in line with the projections included in the 2018 Ageing Report. This scenario therefore includes current polices/legislation in place, such as the impact of pension reforms, and is therefore better suited to evaluate fiscal sustainability challenges and the intergenerational impact. [30]

The remaining lifetime net tax profiles by cohort in the EU are included in Graph 4.1 for both the static scenario and for the baseline scenario. Per capita lifetime net tax is negative (indicating net tax receivers) for living cohorts of ages 36 and above in the static scenario, and for cohorts of ages 43 and above in the baseline scenario at aggregate EU level. It is important to bear in mind that we measure remaining lifetime net taxes.This explains the general finding that remaining lifetime net taxes are higher at younger ages and lower (negative) at higher ages, when most net tax payments have already been made.

Focusing on the baseline scenario, for younger generations (aged 0-42), the imminent burden of discounted tax payments linked to employment, mostly during their working life, which dominates the present value of transfers to be received fromthe public sector, is positive, i.e. they are net taxpayers. For older working cohorts (43-65), for whom remaining working life is shorter, the tax and contribution payments faced are offset by old-age pension benefits, health care, and other public transfers, and the negative balance is increasing over the age of the cohort. Around the age of 64, the generational accounts exhibit the highest negative value corresponding to relatively small remaining labour income taxes. For older age cohorts, the generational accounts (remaining lifetime net taxes) approach zero due to shorter remaining life span.

The comparison between the static and the baseline scenarios shows that generations in the latter part of their lifetime (those aged 75-100) have not been affected by the phasing in of pension reforms already legislated. By contrast, the working-age generations and also younger cohorts can see their remaining lifetime tax profile shifted upward (Graph 4.1 shows the distance in terms of savings for the government sector). This shows how the remaining net lifetime tax for younger generations is larger after taking into account enacted pension reforms.

Tighter eligibility criteria to retire have also affected the effective retirement age, which is also reflected in Graph 4.1 in the shift of the curve to the left and the reduction of the negative peak of lifetime net taxes after reforms (the peak moves to age cohort 64 in the baseline scenario from age cohort 62 in the static scenario).

Looking now at future generations, for the EU we find that remaining lifetime net taxes become lower for future generations than for a current newborn generation. This reflects not only the fact that we take the present value of future cash flows, but also and importantly the impact of population aging; people are projected to live longer in the future and would, all else equal, become net tax recievers for longer in the latter part of their lives, which reduces the lifetime net tax (the generational account) for successive generations. For instance, the generational account in present value terms for generation 2016 (a newborn) is 174,000 euro, while for generation 2040 (a newborn 24 years ahead) it is 122,000 euro and for generation 2060 (a newborn 44 years ahead) it is 94,000 euro (see Graph 4.2).

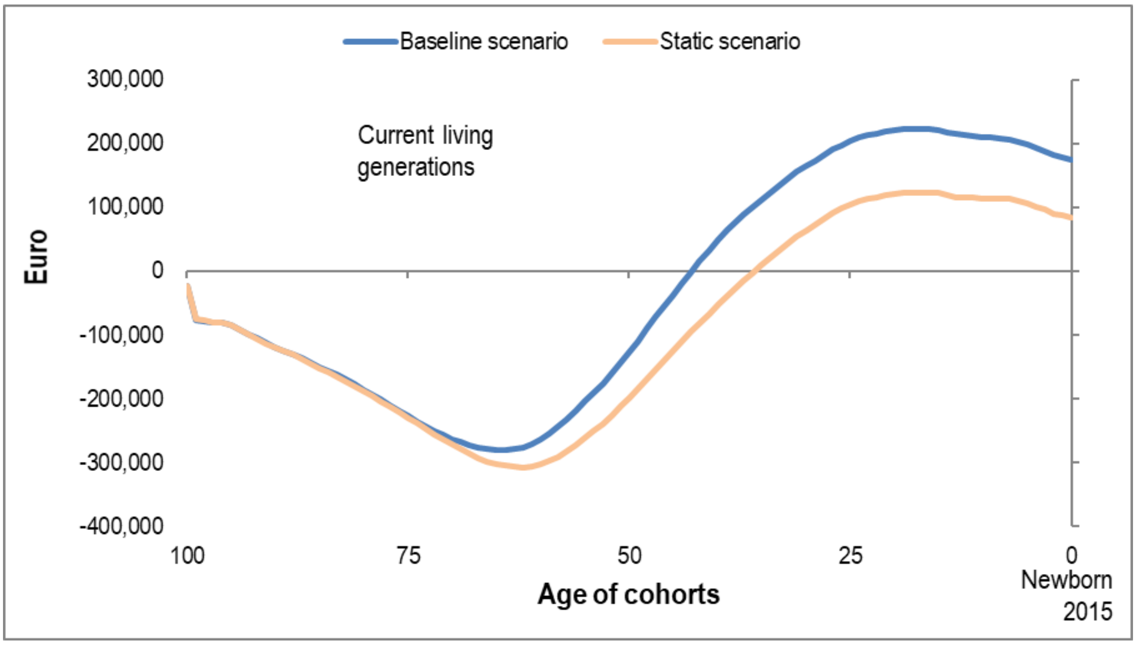
Indeed, in both baseline and static scenarios, future generations are net taxpayers. However, in the baseline scenario, lifetime net taxes for future generations would be higher than in the static scenario, reflecting structural reforms. Finally, by allocating the non-distributed expenditure and revenues equally across generations in the baseline scenario, future generations would still be net taxpayers, but less so compared with the baseline scenario calculated with only the distributed net taxes, reflecting mainly public consumption.

Overall, legislated pension reforms have ensured significant fiscal savings for governments at EU level, reducing the fiscal burden on future generations. Nevertheless, inter-generational issues arise as

[30] Balassone et al. (2009) also use detailed age-related expenditure projections for selected EU countires from a previous Ageing Report.

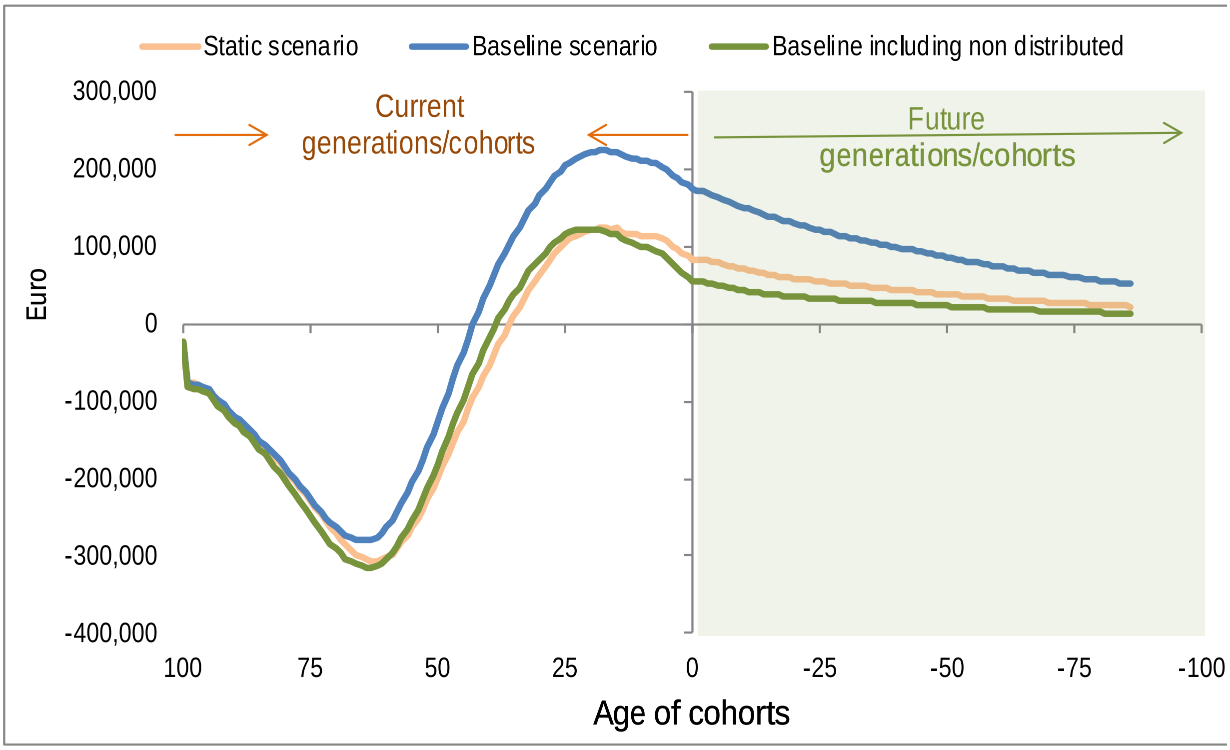
these structural interventions (pension reforms) appear to affect primarily current younger living cohorts (and future generations), for whom remaining lifetime net taxes increase, and to a lesser extent currently older workers (Graph 4.3).

Graph 4.1. **Remaining lifetime net taxes for current generations, static and baseline scenarios (EU)**



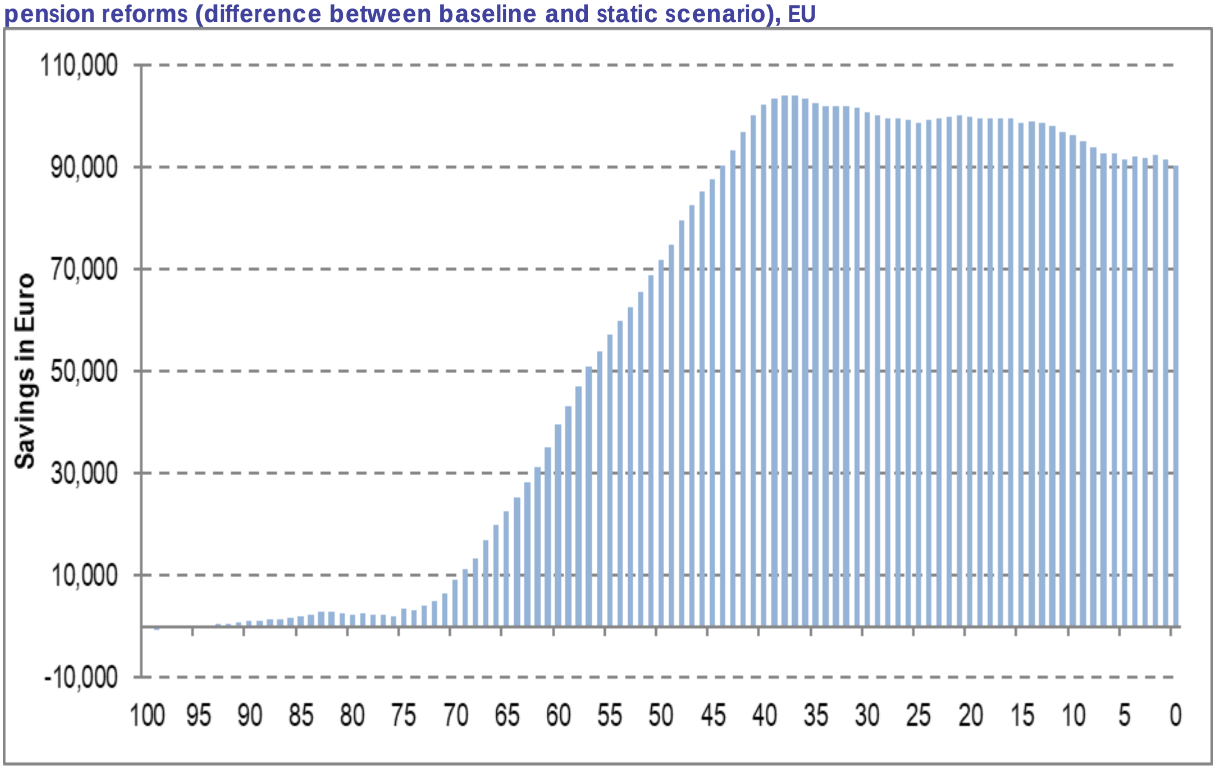
Source: Commission services

Graph 4.2. **Remaining lifetime net taxes for current and future generations, static and baseline scenarios (EU)**



Source: Commission services

Graph 4.3. **The increase in remaining lifetime net taxes for current living generations due to mainly pension reforms (difference between baseline and static scenario), EU**



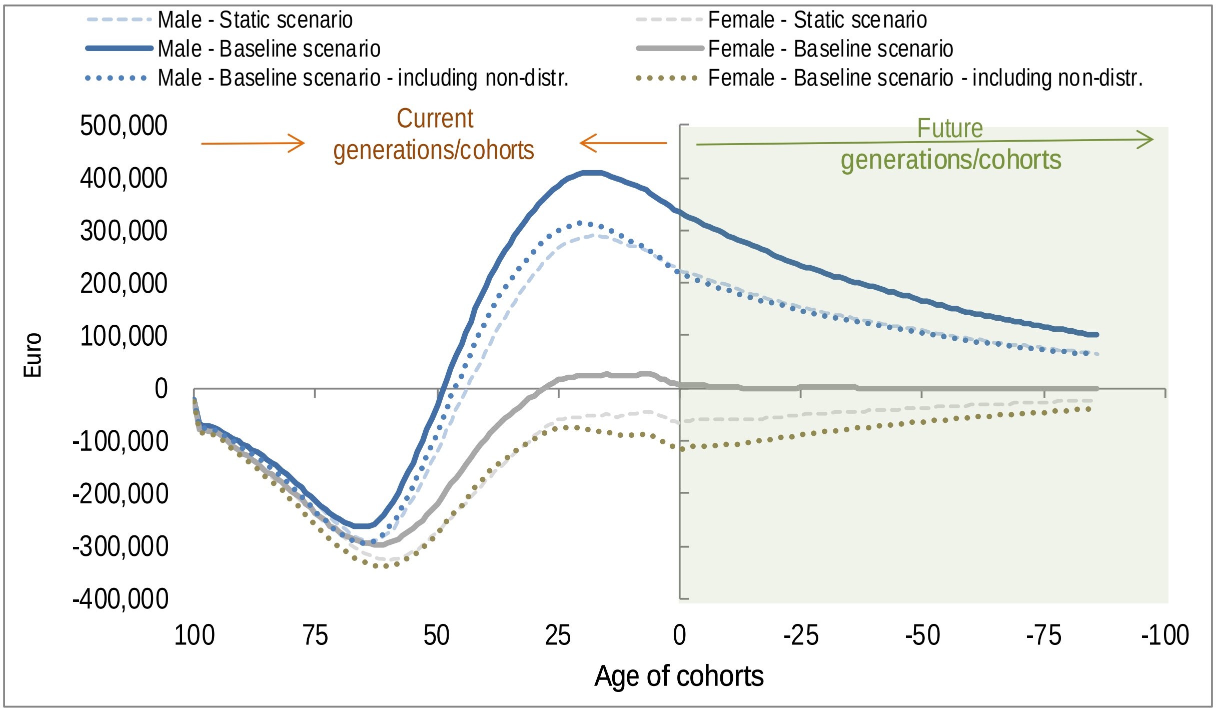
Source: Commission services.

Gender differences also emerge from lifetime net tax profiles (Graph 4.4) as the present value of net tax payments for women is generally below the males' profile. Females are net tax receivers in the static scenario. This gap stems from that fact that women in general participate less than men in the labour market in almost all countries, so the present value of lifetime revenues is below the discounted lifetime benefits received from the government sector. However, in the baseline scenario the lifetime net tax shifts upward, reflecting higher net taxes across all cohorts for both men and women. This is because the baseline scenario incorporates enacted reforms which are implemented gradually over the projection horizon. Taking into account mainly pension reforms, young women (cohorts up to age 27) would become net taxpayers, while older cohorts would remain net tax receivers. Future female cohorts would pay close to zero lifetime net taxes, while future male cohorts would still be net taxpayers.

However, aside of pension reforms being phased in over the coming decades, based on the assumptions made in the Ageing Report, labour force participation is projected to increase significantly over time. This also leads to higher GDP growth.

Moreover, if the part of net taxes that are not distributed by age and gender is added as a lump sum across all cohorts ('baseline scenario – including non-distr.'), a deterioration of the generational accounts occurs vis-à-vis the baseline scenario, since the non-distributed items consist mostly of expenditure (government consumption). Under this scenario, current males up to age 50 and future male cohorts are net taxpayers, while current and future female cohorts are net tax receivers (see Graph 4.4).

Graph 4.4. **Remaining lifetime net taxes, static and baseline scenarios, by gender, EU**



Source: Commission services.

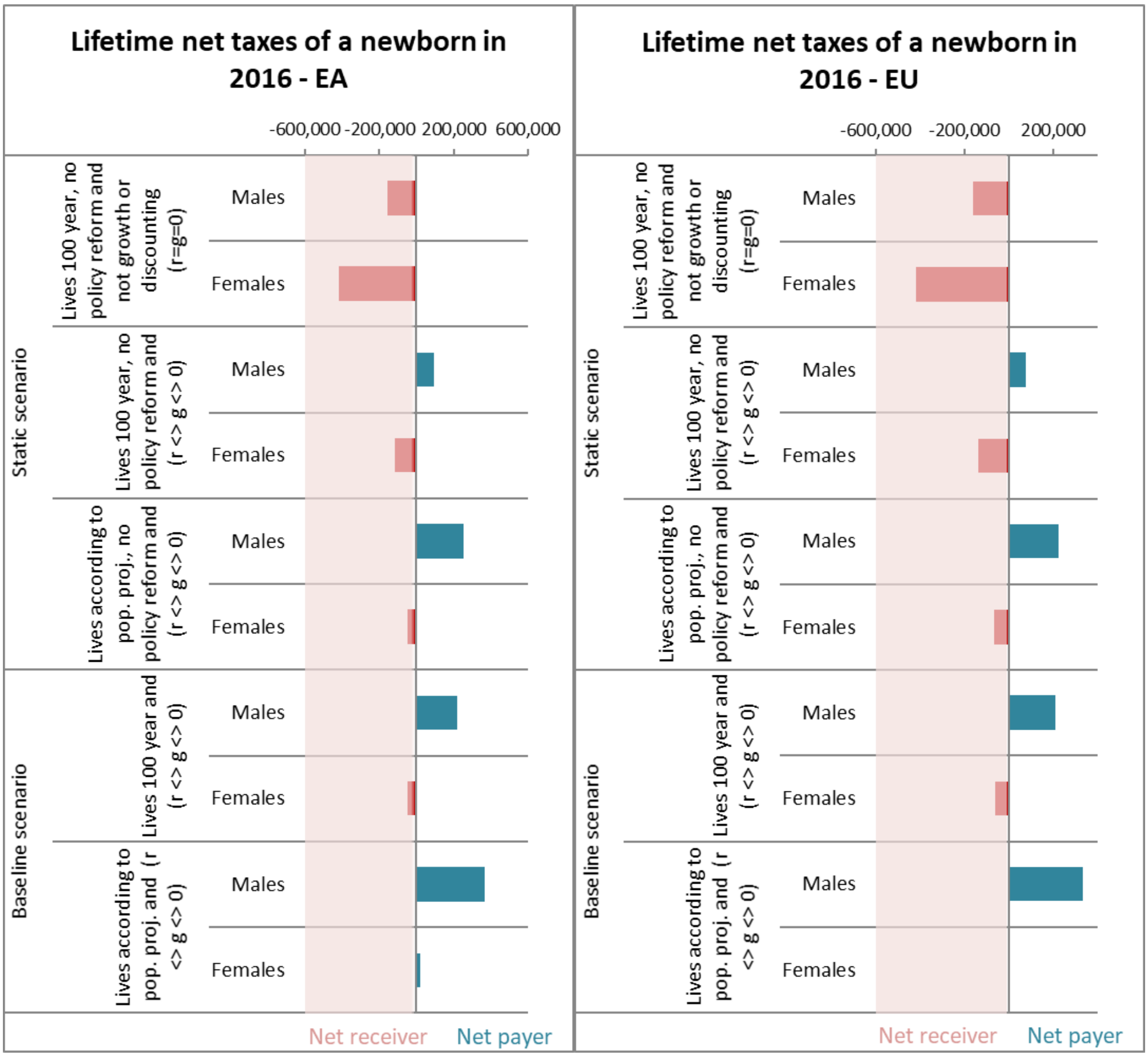
Most Member States show a similar pattern, which can be explained by the assumptions made:

- The net tax figures are calculated under two sets of assumptions, as previously explained: i) expenditure and taxes growing in line with labour productivity in the static scenario; ii) enacted pension reforms assumed to take effect over time in the baseline scenario.

- Common trends in country-specific population projections also play a role in shaping net tax profiles.
- The life-cycle profile of net tax payment in the base year is similar: tax payments are higher than allowances below retirement age, and lower beyond retirement age or in young age.
- Generational accounts are strictly forward-looking:nly taxes and transfers over the remaining life cycle are taken into account for each single generation.

The relative impact of these drivers are illustrated in Graph 4.5, showing the effect that macroeconomic, demographic and policy changes can have on the present value of the remaining lifetime net tax payment of a newborn in the base year for the EU and the EA. Graph 4.5 shows the lifetime net tax that a current newborn can expect to pay or receive (if negative) under different assumptions, also differentiating by gender (for detailed results by country, see Annex II).

Graph 4.5. **Generational accounts of a newborn under alternative scenarios**



Source: Commission services.

Based on this analysis, the following observations can be made:

- Without discounting and not incorporating mortality projections (i.e. assuming that the newborn lives 100 years), the total lifetime net tax average is negative in all countries, both for women and men.
- By discounting the average net taxes with a positive factor (*r*) and allowing for positive labour productivity growth (*g*), but maintaining the "no mortality" assumption, the lifetime averages rise for both genders. Positive values are observed for males in the EU and EA and for a few countries (see Annex II).
- By also applying the country-specific demographic trends (most of newborns are going to live less than 100 years, and demography evolving according to Eurostat projections), lifetime average net taxes increase for all, but women's average accounts are still negative at the EU and EA level.
- If the above scenarios are calculated by also including the effect of pension reforms as in the baseline scenario, generational accounts appear positive on average in the EU. However, there are still important differences by gender, with female net taxes around zero, while being positive for men.

5. INTERTEMPORAL AND INTERGENERATIONAL INDICATORS: RESULTS

Once generational accounts have been estimated for each cohort, one can analyse the intertemporal and intergenerational dimensions of current fiscal policy and the effects of implemented reforms. As mentioned in Section 2, two synthetic indicators are assessed: 1) the intertemporal budget gap *(IBG)* indicator; and 2) the Auerbach-Gokhale-Kotlikoff (*AGK)* indicator.

- The ***IBG* indicator** looks at intertemporal imbalances and the long-term sustainability of public finances, measuring the amount of intertemporal public liabilities in the base year that are unfunded claims on future governments' budgets.[31]
- The ***AGK* indicator** focuses on intergenerational imbalances, calculating the adjustment of future generations' net tax payments necessary to respect the government's intertemporal budget constraint.

The components of the *IBG* and the required permanent adjustment

To illustrate the fiscal burden passed on from living to future generations based on the current fiscal stance, the *IBG* can be disaggregated in three additive components: i) "explicit net debt"; ii) "the current living generational accounts"; and, iii) "the future generational accounts", as follows:

$$IBG_t = \left[NG_t + \sum_{l=t+1}^{\infty} \frac{NG_l}{\prod_{s=t+1}^{l}(1+r_s)} + D_t - \sum_{k=t-L}^{t} N_{t,k} - \sum_{k=t+1}^{\infty} N_{t,k} \right] / GDP_t \qquad (6)$$

IBG = net non-distributed items + explicit net debt + the current living generational accounts + the future generational accounts

[31] The two notions of debt, explicit and implicit, are different in nature as explained in the literature (see e.g. D. Franco et al (1994)), but for transparency reasons both components are part of the government's accountability and public finance sustainability in broad terms.

A positive *IBG* indicates that the intertemporal government liabilities are unfunded and current fiscal policy is, to some extent, not sustainable. By distinguishing between the contribution of current and future generations to the fiscal gap, it is possible to verify whether and how policy changes redistribute the burden of the necessary adjustment between the two. Only if the *IBG* is zero, current fiscal policy is sustainable, in that it fulfills the inter-temporal budget constraint of the government sector.

The *IBG* breakdown includes the component of "net non-distributed items". Therefore, results by country for equation 6 would depend on the structure of government expenditure and receipts, which affects the size of distributed vs. non-distributed net taxes (see Annex I, Tables A1.2 and A1.3). To take into account the total net tax paid by different cohorts, we would need to split the non-distributed component into two subcomponents and allocate it to the current or the future generations. We distribute by cohort the not-distributed net expenditure in year *i* proportionally to the living population in that year. This gives us the following alternative breakdown of the *IBG* indicator:

$$IBG_t = \frac{D_t - \sum_{k=t-L}^{t} N_{t,k} + \left(NG_t + \sum_{l=t+1}^{L} \frac{NGC_l}{\prod_{s=t+1}^{l}(1+r_s)}\right) - \sum_{k=t+1}^{\infty} N_{t,k} + \sum_{l=t+1}^{\infty} \frac{NGF_l}{\prod_{s=t+1}^{l}(1+r_s)}}{GDP_t} \qquad (7)$$

IBG = explicit net debt + the current living generation burden + the future generation burden

where NGC_l is the total net non-distributed expenditure multiplied by the share of current living generations still alive in year *l* over the total population:

$$NGC_l = NG_l \cdot \frac{P_l^{current\ generations}}{P_l},$$

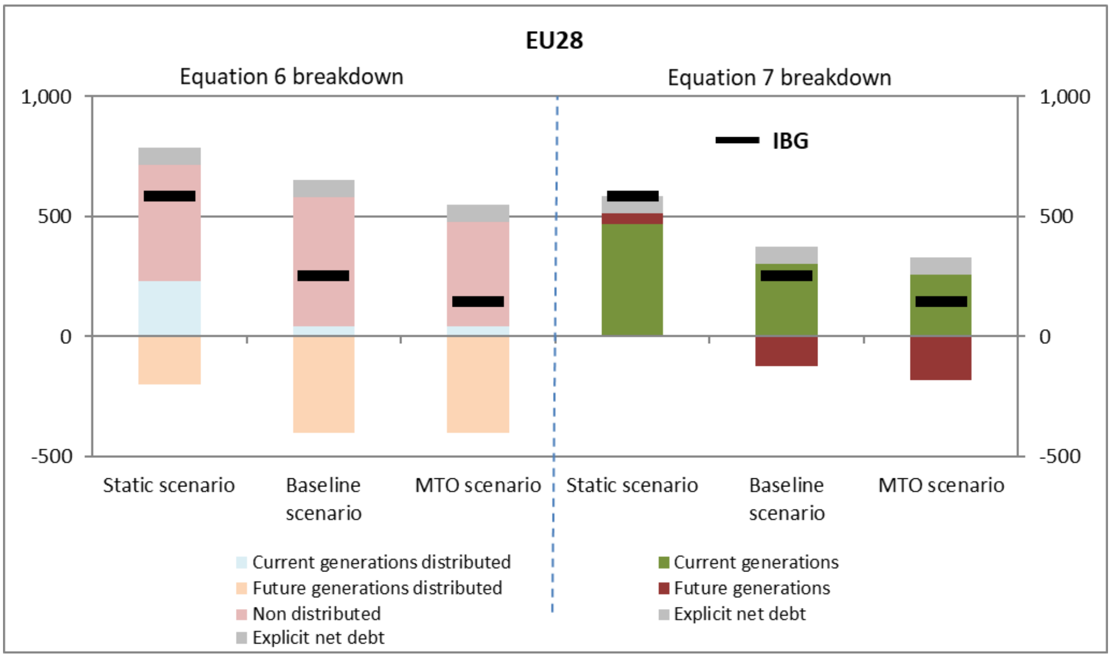
and NGF_l is the total net not-distributed expenditure multiplied by the share of future living generations still alive in year *l* over the total population:

$$NGF_l = NG_l \cdot \frac{P_l^{future\ generations}}{P_l}$$

Graph 5.1 illustrates the estimated *IBG* for the EU and its breakdown under different scenarios (static, baseline and MTO scenarios). The left-hand part of the graph shows the *IBG* breakdown according to equation 6 and the right-hand part the breakdown according to equation 7. The fiscal adjustment required in the baseline scenario appears significantly lower compared to the static scenario, reflecting mainly the impact of legislated pension reforms. The *IBG* for the EU as a whole decreases from 587% of 2016 GDP in the static scenario to 251% in the baseline. If all EU countries adhered to the EU fiscal rules achieving their medium-term fiscal targets (MTOs), the sustainability gap would be significantly lower compared to the baseline, amounting to 147% of GDP (see the 'MTO scenario' in Graph 5.1).

If we focus on the results according to equation 7 for the baseline scenario (that accounts for pension reforms), we find that the current generations contribute to the government intertemporal liabilities by 304% of GDP in the EU. By contrast, current fiscal policies already imply intertemporal liabilities for future generations by 125% of GDP. Yet, with an *IBG* of 251% of GDP, current fiscal policies still appear unsustainable in light of the extent of the challenge ensuing from population ageing. Finally, nearly half of the imbalance would consist of the current explicit net debt, amounting to 70% of GDP.

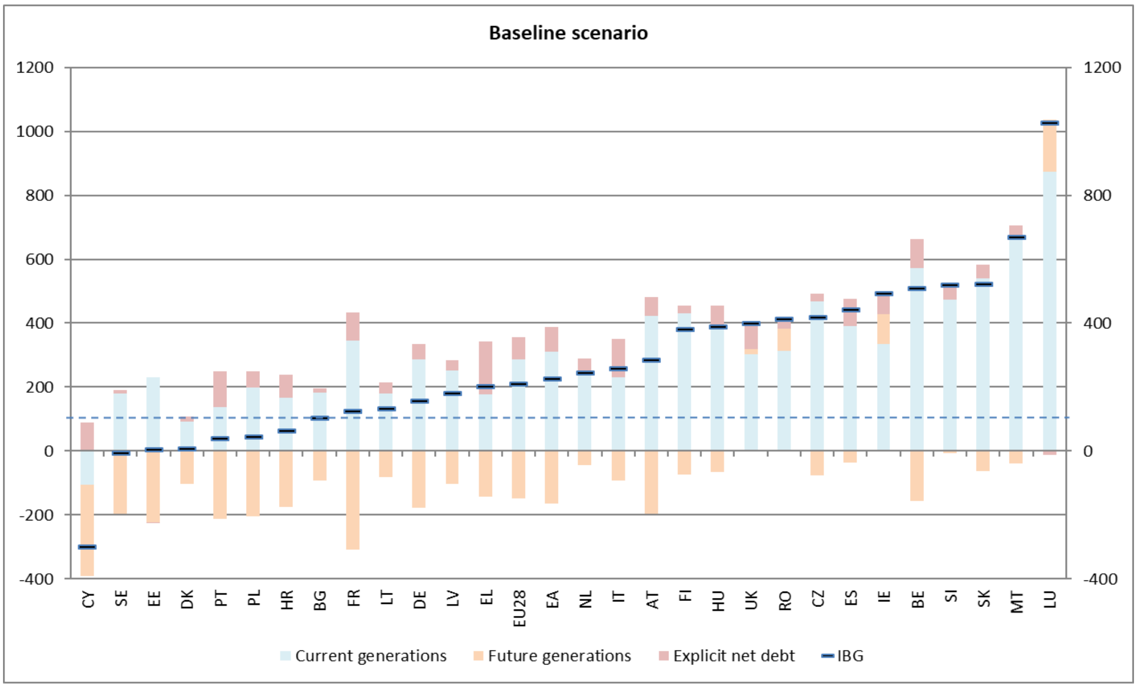
Graph 5.1. **The composition of the *IBG* in the EU, different scenarios, % of 2016 GDP.**



Note: The EU aggregate is a weighted average.

Source: Commission services.

Graph 5.2. **The composition of the *IBG* in EU countries, baseline scenario, % of 2016 GDP**



Note: Calculation according to Equation 7.

Source: Commission services.

Behind results for the aggregates, there is a large variation across EU countries. Graph 5.2 shows the estimated *IBGs* in the baseline scenario for all EU countries and its breakdown into the three components of Equation 7. Even when incorporating 2020 fiscal policies as from the Commission forecast and legislated pension reforms, generational imbalances still remain in all EU countries but Cyprus and Sweden.[32] In most of the countries with a positive *IBG*, we observe that the implicit liabilities embedded in generational accounts add to the explicit net debt. Most of the fiscal burden related to the implicit liabilities is created by current generation liabilities. Future generations are in general net taxpayers, contributing to reduce the implicit debt (see Annex III for detailed results by country). [33] As shown in Graph 5.1 above, structural reforms can significantly reduce the intertemporal gap (baseline vs. static scenario), thereby significantly impacting on the adjustment required to ensure fiscal sustainability.

The *IBG* is affected by changes in the demographic structure, which have implications both for age-related expenditure and for tax revenues. The impact of changes in age-related expenditure is assessed in traditional fiscal sustainability analysis (e.g. the Fiscal Sustainability Report, FSR, 2018). Conceptually, the sustainability gap indicators in the FSR 2018 are similar to the *IBG*, as both are derived from the intertemporal budget constraint of the government. However, the indicators differ in terms of presentation, parametrisation and calculation. For example, the long-term fiscal sustainability gap indicator (S2) in the FSR 2018 represents the immediate and permanent one-off upfront fiscal adjustment, as a share of GDP, that would ensure the intertemporal budget constraint is met, accounting for the cost of ageing (pensions, health care and long-term care). S2 is a flow measure. The *IBG* measures total intertemporal government liabilities, and is a stock measure, expressed in percentage of the base year GDP (2016).

In this paper, we also assess the impact of change in demographic structure on expenditure items other than age-related spending and revenue items, including labour income taxes. In countries where the working-age population falls significantly, other net taxes fall over time as a share of GDP, while in countries where the working-age population is projected to increase, other net taxes increase as a share of GDP. Overall in the EU, the change over time in other net taxes contribute to the change in the primary balances for about 0.3 pps of GDP. However, at country level, the impact can be larger, depending on the composition of the change in population structure over time (see Annex III, Tables A3.3 (baseline scenario) and A3.4 (MTO scenario)). By contrast, the sustainability analysis in the Fiscal Sustainability Report 2018 assumes an unchanged government revenue-to-GDP ratio. For this reason, and because of different assumptions, the fiscal gaps in this paper might not coincide with those that are estimated in the FSR 2018.

The size of the fiscal adjustment burden for future generations according to the Auerbach-Gokhale-Kotlikoff (*AGK*) indicator

The *AGK* approach to generational accounting focusses on the fulfilment of the intertemporal budget constraint by assuming that only future generations bear the burden of the adjustment. As the remaining net lifetime taxes of currently living generations is assumed as fixed by current fiscal policies, any gap in the intertemporal budget constraint is eliminated by changing the net lifetime taxes of future generations. According to equation (4), the remaining lifetime net tax payments of future generations $N_{t,k}$ is then calculated by assuming that the current net tax of newborns is constant over time for all future generations, adjusted for productivity growth (see Equations 4, 5 and 5’ in Section 2). We estimate the *AGK* indicator according to equation 5’. If *AGK*>1, the lifetime net taxes for future newborns are higher than for current newborns.

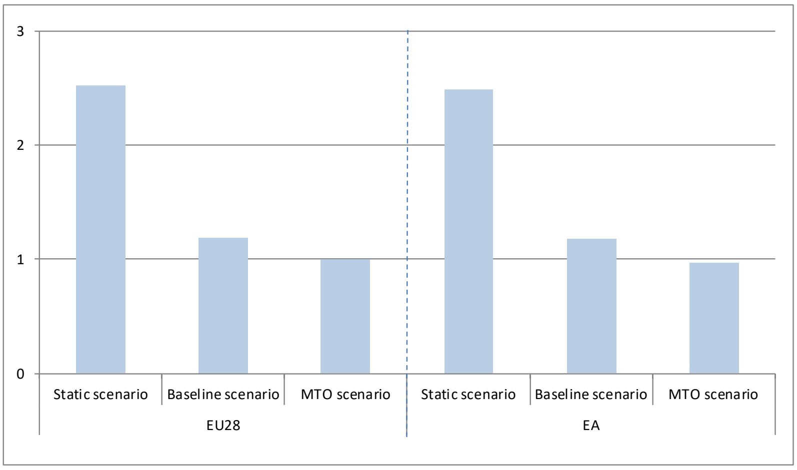
[32] The primary balance in Cyprus in 2020 is the highest by far of all EU contries (5.7% of GDP, EU average 1.1%), and could be considered to be an outlier.

[33] In the cases of Spain and Romania, reaching the MTOs would significantly reduce the fiscal gaps (see Table A3.1 in Annex III).

The *AGK* indicator measures intergenerational imbalances once current policies are included in the analysis (baseline scenario). It does not assess the intergenerational imbalances between current and previous generations, i.e. those that have contributed and benefitted based on previous policies (in terms of net taxes paid). It only compares intergenerational imbalances between current and future newborns. Moreover, with increasing life expectancy and some structural fiscal policy measures becoming effective only in the future, generational accounts of future generations cannot just be represented by the cohort born immediately after the base year, as the generational account changes for every future generation. It is therefore important to additionally look at the extent to which there is a generational imbalance not only for current newborns, but also for future newborns. These caveats need to be borne in mind when interpreting the results.

Computing the *AGK* indicator, we find that, at EU level, an imbalance occurs in the static scenario between current and future newborns. Net tax payments of future newborn generation (growth-adjusted) are estimated to be 2.5 times higher than those of current newborns to balance the government intertemporal budget constraint (see Graph 5.3). By contrast, in the baseline scenario (including the impact of pension reforms on net taxes by cohort), the generational imbalances are significantly lower. Overall at EU level, the generational imbalance almost vanishes. In the MTO scenario, the generational imbalance becomes lower still, and future generations would face lower net taxes than the current newborn generation.

Graph 5.3. **Inter-generational imbalances according to the *AGK* indicator, different scenarios, EU.**



Note: The EU and EA aggregates are weighted averages.

Source: Commission services.

Regarding results for individual countries (see Table 5.2 and Table A3.5 in Annex III), a generational imbalance appears in all countries in the static scenario (while the *AGK* is greater than 1 or not defined in the case of IE),. In the baseline scenario, the generational imbalance is reduced in all cases. In fact, in about one third of the Member States (BG, DK, DE, EE, CY, PL, PT, SE), the generational imbalance disappears, and the future generations would instead face lower lifetime net taxes than the current generation. However, in more than half of the Member States (BE, CZ, IE, EL, ES, IT, LT, LU, HU, MT, NL, RO, SI, SK, FI, UK) the generational imbalance would remain also under the baseline scenario (*AGK*>1).[34] [35]

[34] As noted before, a weakness of the *AGK* indicator is that when the generational account for current newborns is negative or small, care needs to be taken when interpreting the results due to the denominator effect. For instance, in the static scenario for IE the generational account for current newborns is negative and the indicator

Table 5.2. **Inter-generational imbalances according to the *AGK* indicator, different scenarios, EU Member States**

	Static scenario	Baseline scenario	MTO scenario
AGK<1		BG, DK, DE, EE, CY, LV, AT, PL, PT, SE	BG, DK, DE, EE, FR, IT, CY, LV, AT, PL, PT, RO, SE, EA
1<AGK<2	BE, BG, CZ, DK, DE, EE, HR, CY, LV, LT, LU, HU, MT, SE	BE, CZ, EL, FR, HR, IT, LT, LU, HU, MT, NL, RO, SI, SK, FI, EA, EU28	BE, CZ, EL, ES, HR, LT, LU, HU, MT, NL, SI, SK, FI, EU28
AGK>2	EL, ES, FR, IT, NL, AT, PL, PT, RO, SI, SK, FI, SE, UK, IE*, EA, EU28	IE, ES, UK	IE, UK

* In the static scenario, IE is undefined (see Table A3.5 in Annex III).

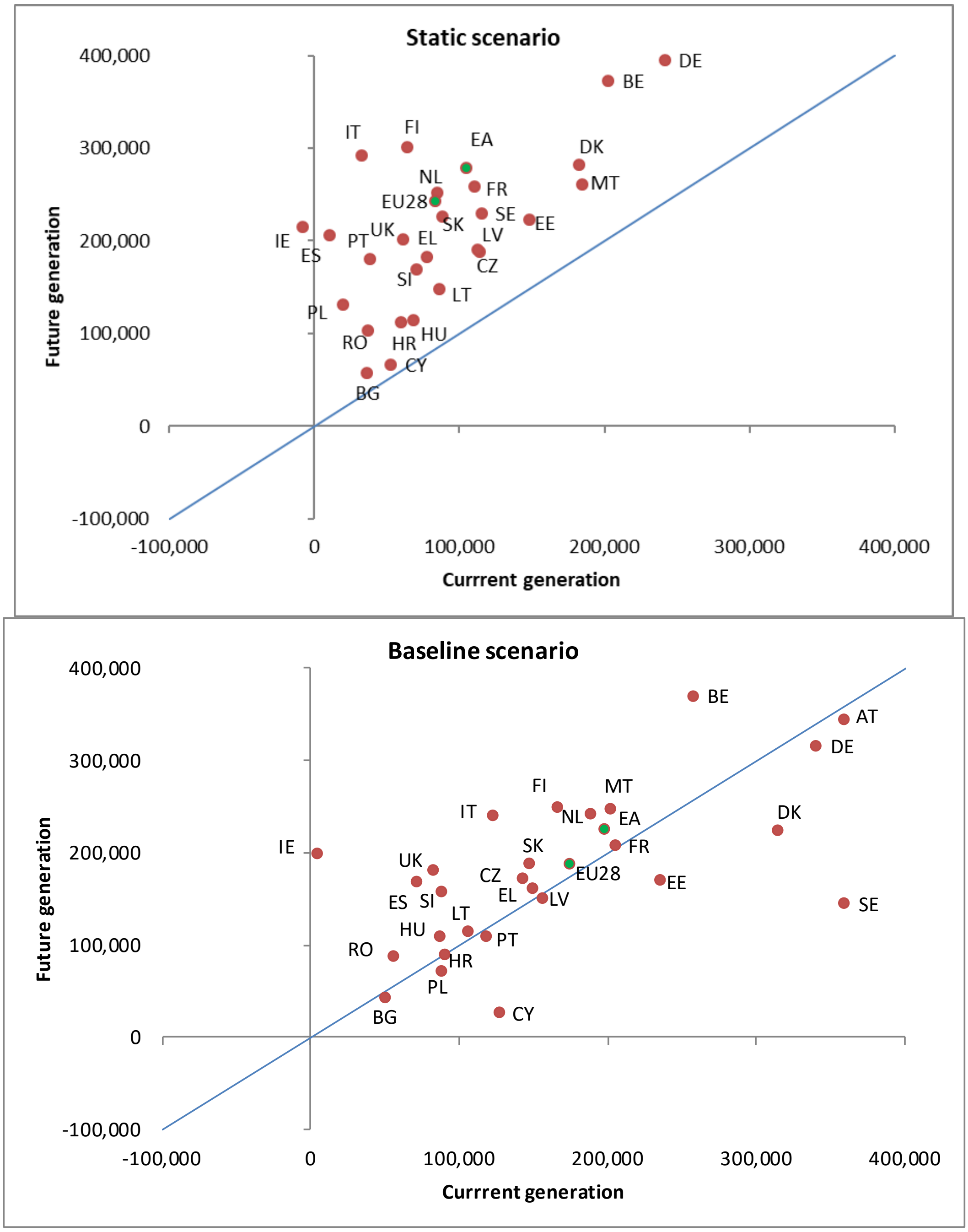
Source: Commission services.

Graph 5.4 plots all EU countries by distinguishing between current generational accounts (x-axis) and future generational account (y-axis), calculated according to both the static scenario and the baseline scenario under the *AGK* assumptions and incorporating only distributed net taxes. The diagonal line represents the combinations that imply no generational imbalance (*AGK*=1). In the static scenario, a large majority of countries have a generational imbalance such that lifetime net taxes are higher for future generations than for current generations. In the baseline scenario, the imbalance is much lower, and most countries move closer to the diagonal line. This shows that legislated pension reforms contribute to reducing the generational imbalance between current and future generations in the baseline scenario.

can thus not be calculated; for ES it is very small, leading to a very large calculated imbalance. Still, in both these cases, the difference between the generational accounts for current and future newborns are roughly 200 000 euro, which is similar to LU, where the *AGK* is quite small (1.2). This weakness of the *AGK* indicator is also visible in the baseline scenario for IE.

[35] The size (level) of the imbalance depends heavily on the structure of expenditure and revenues and in particular on the allocation between distributed and non-distributed items (see Tables 3.2 and 3.3 in Section 3).

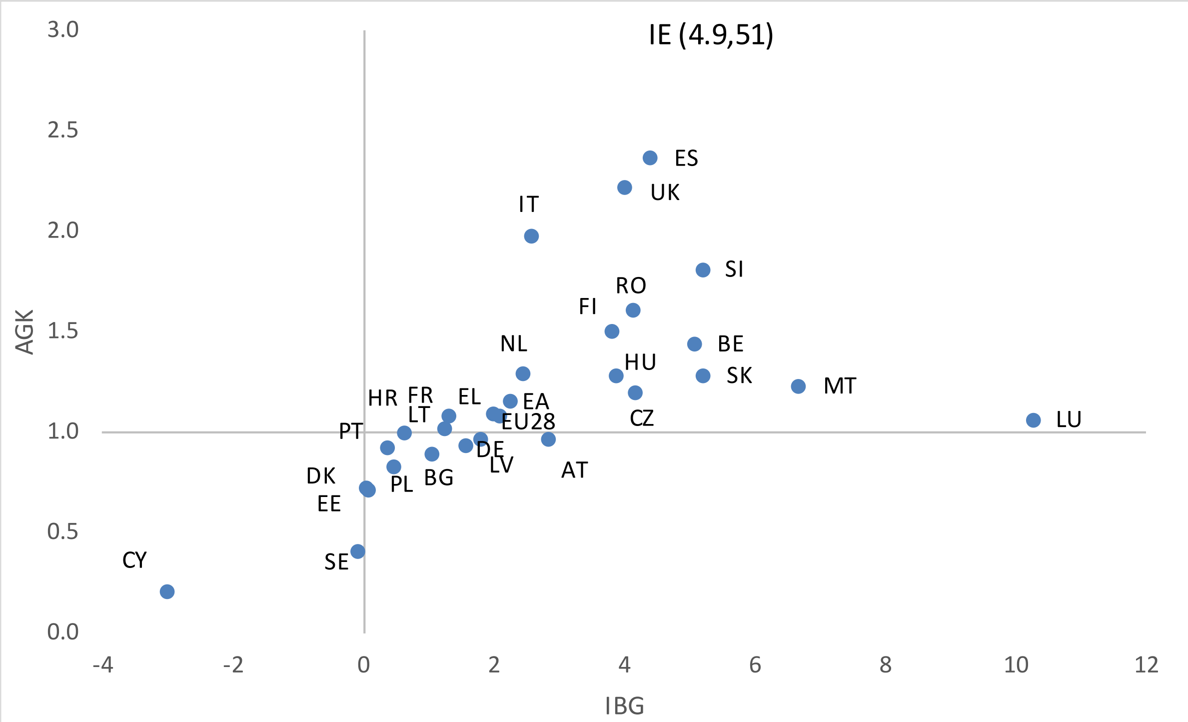
Graph 5.4. **Current and future generational accounts, Static and Baseline scenarios**



Source: Commission services.

Using traditional generational accounting techniques, reading together the results obtained for both *AGK* and *IBG* indicators, there appear to be only a small generational imbalance in the baseline scenario according to the *AGK*, thus the EU as a whole seems to fare well in terms of intergenerational imbalances, while the *IBG* indicator remains highly positive in that scenario, pointing at remaining fiscal sustainability challenges (a sustainability gap of 251% of 2016 GDP for the EU as a whole). This is also the case for several Member States where the *AGK* is below but close to 1, but there is at the same time an intertemporal gap, indicated by a positive *IBG* (see Graph 5.5). These findings are consistent in that the computed generational imbalance refers to one particular generation, namely generation 2016.

Graph 5.5. **The *AGK* and the *IBG* indicators compared, Baseline scenario**

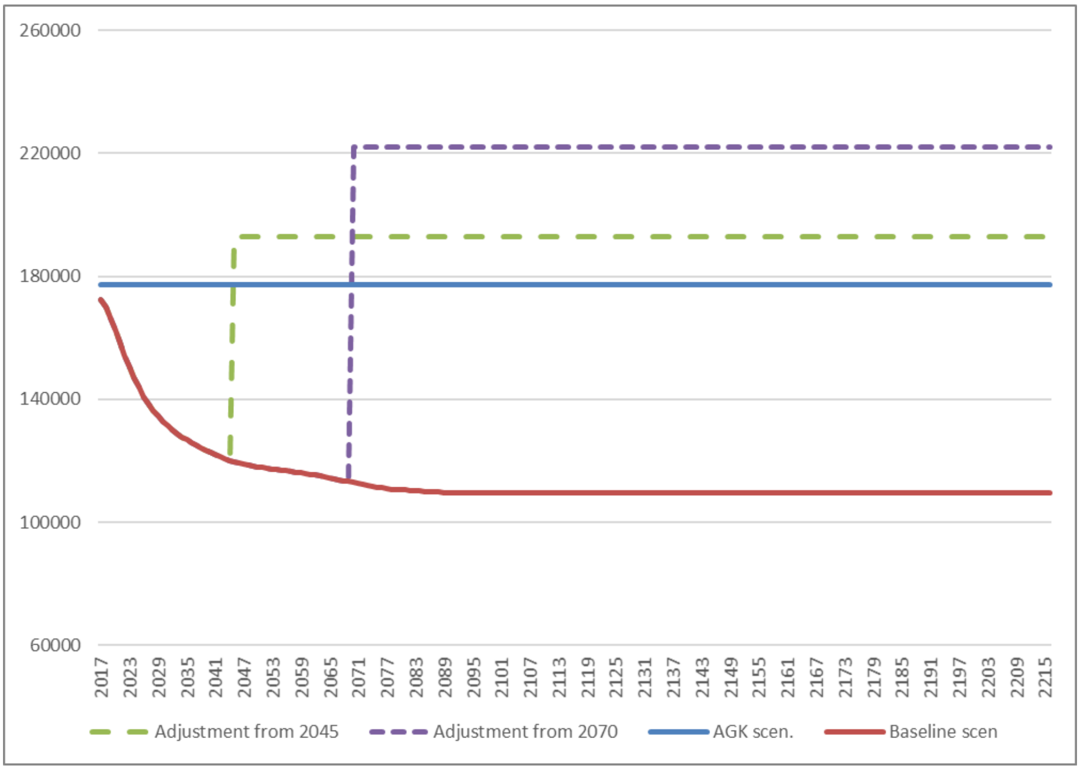


Source: Commission services.

As noted above, the generational accounts of subsequent future generations can well have different dynamics than assumed under the *AGK* (since some net tax components are based on current policies and population ageing changes the population structure going forward). Indeed, the generational accounts for future newborn generations are lower than for the current newborn generation (in relation to labour productivity). For the EU as a whole, and under the assumption that the required adjustment to balance the government intertemporal budget is put equally on all future generations, the generational imbalance becomes higher for future newborns than for current newborns (see Graph 5.6).

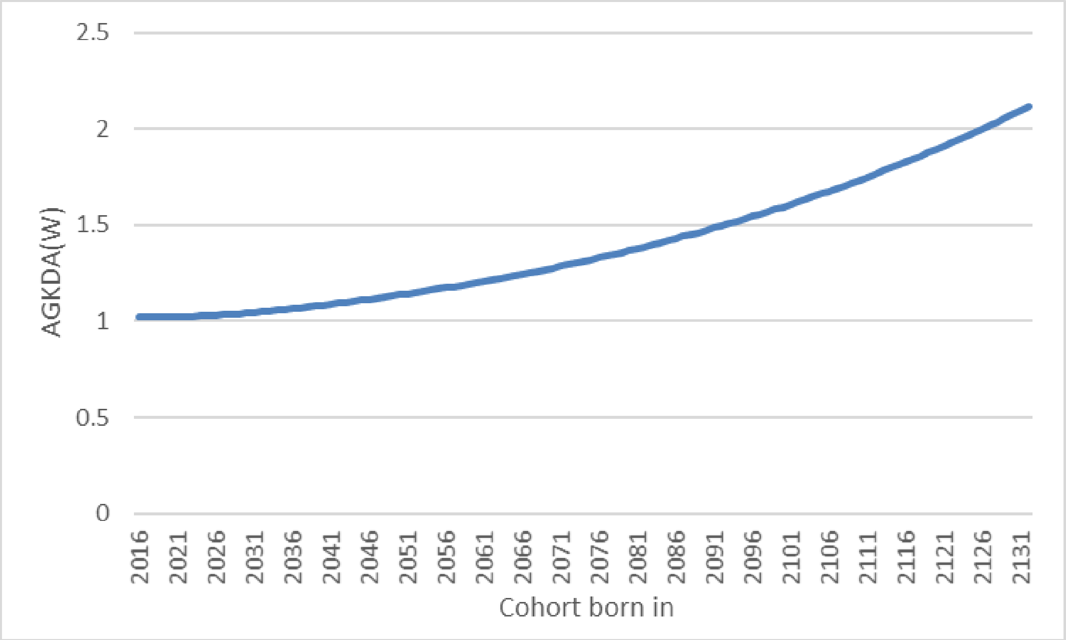
As already explained before, the more the required adjustment to fulfil the government intertemporal budget constraint (and cope among others with ageing) is delayed, the higher the additional adjustment on subsequent future generations can be expected to be. For example, if we delayed the adjustment till the generation born in year 2045, the generational account of all future generations from 2045 onwards, in relative terms to nominal labour productivity, would be 12% higher than the generational account of a newborn in year 2016 and 60% higher than the generational account of a newborn in year 2044. Postponing the adjustment longer, to 2070 for instance, would require an even larger adjustment, posing a higher imbalance on those future generations. For the EU as a whole, the intergenerational imbalance, as measured by the $AGK_{DA}(w)$ (see equations 4’ and 5’’) would be 25% higher if no adjustment is made until 2066, and it would become 50% higher if postponed until 2092 (see Graph 5.7).

Graph 5.6. **Generational accounts for current and future newborns in relation to labour productivity, Baseline, *AGK* scenario and $AGK_{DA}(w)$ scenarios**



Source: Commission services.

Graph 5.7. **The $AGK_{DA}(w)$ indicator for future newborn generations, EU, Baseline scenario assumptions**



Source: Commission services.

These results point at the fact that intergenerational imbalances as measured by the traditional *AGK* indicator need to be interpreted with caution, also in light of the impact of rising life expectancy and policies with future effects on net taxes. Our analysis suggests that it is useful to additionally look at intergenerational imbalances assuming that the adjustment takes place at different points in time, as done with the $AGK_{DA}(w)$ indicator.

As pointed out by Balassone et al. (2009), the intergenerational distribution of the burden imposed by government budgetary activity is a normative question. Our analysis enables us to assess the extent to which different assumptions would lead to higher or lower intergenerational imbalances. However, whether current fiscal policies are intergenerationally fair remains a normative question.

6. LIMITATIONS AND POSSIBLE EXTENSIONS

It has been recognised in the literature that generational accounting is characterised by some technical drawbacks going from data limitation to the severe and sometimes simplistic assumptions needed to develop the methodology. Critique include, among others: i) incomplete allocation by age and gender of all public expenditure and revenue items; ii) too simplistic assumptions for the dynamics of net taxes; iii) lack of macro-economic feedback effects; iv) the crucial choice of the discount rate. Such methodological issues are comprehensively summarised in Auerbach, Gokhale and Kotlikoff (1994), Ruffing, Van de Water and Kogan (2014) and Raffelhüschen (1996).

Generational accounting is very informative with regard to intertemporal imbalances and intergenerational fairness under the standard assumption of a continuation of current policies. Nonetheless, these results must be carefully interpreted in light of their main drivers, which include the general features of the European tax and benefit systems, the initial level of public debt and the country-specific demographics, as well as the assumptions underlying the analysis (like the no-fiscal policy change assumption in the baseline scenario). In particular, in our analysis we have uprated net taxes by gender and age with productivity growth for most items except pensions, health care and long-term care, while more granular assumptions could be explored also for other expenditure and revenue items. Moreover, scenarios could be developed according to which the parameters for taxes or spending programmes are modified in the future, like Auerbach et al. (1994) did, assessing i.a. a tax cut or an increase in social security payments. In addition, there is a strong negative correlation between the percentage of revenues distributed by cohort and the size of intergenerational imbalances. This can be an actuarial result when discounting the amount of average lifetime revenues compared to the present value of lifetime benefits, which are strongly related to the population ageing.

The extent to which the results are comparable across countries depends on a range of factors, including the countries' population projections and the amount of revenues that are distributed and not distributed between generations. This simple methodological aspect is in turn directly related to the institutional features of national taxation systems. For instance, if the system is relying relatively more on personal income taxes than on other revenue items, then there is a larger coverage of the intertemporal balance by means of generational resources that are distributed across the cohorts. Results across countries are also affected by differences in this respect.

As shown in section 3, in our analysis we have paid special attention to the calibration of parameters and the analysis of available data. However, it is impossible to avoid dependence of final results on parameter assumptions.

Following previous literature on the topic, see e.g. Auerbach et al. (1991), Franco et al. (1994), Rizza et al. (2010), we have nonetheless assessed the sensitivity of our results to changes in the discount rate, for which findings are briefly reported here below. Taking the baseline scenario as the starting point, we have designed two new sensitivity scenarios: a permanent increase and a permanent decrease of 0.5 pps. on market interest rates on government bonds and T-bills from the year 2019.[36] [37] We have

[36] Note that an increase in market interest rates has a delayed impact on the implicit interest rate on government debt. It sets in progressively as the government issues new debt to cover maturing debt and new deficits.

calculated the *IBG* and the *AGK* indicators for these scenarios to assess the impact. As in previous contributions to the literature, we do not consider any feedback effects from the change of the rate of returns to any other variables, such as GDP growth rates or public deficits. Changing the rate of return affects results by varying only the discounting of future government deficits and cohort net taxes.

Table 6.1 compares the *IBK* and *AGK* indicators under the two sensitivity scenarios. For the EU as a whole, varying the interest rate by ±0.5 pps. changes the *IBG* indicator by around ±30 to 40 pps., and the *AGK* indicator by ±0.1 pps. A higher discount factor leads to a lower present value of future government deficits, therefore a lower *IBG* value. However, the *AGK* indicator would be higher in this scenario than in the baseline. This is because higher discount rates reduce also the value of future generations' net taxes, offsetting the positive effect of a lower *IBG* on the *AGK* indicator.

Table 6.1. **The *IBG* and *AGK* indicator. Sensitivity scenarios.**

	IBG		
	Baseline scenario	Higher discount factor scenario	Lower discount factor scenario
EA_w	238	210	273
EU28_w	251	219	290
	AGK		
	Baseline scenario	Higher discount factor scenario	Lower discount factor scenario
EA_w	1.2	1.3	1.1
EU28_w	1.2	1.3	1.1

Note: The EU and EA aggregates are weighted averages.

Source: Commission services.

An interesting extension could be to further analyse the sensitivity of the analytical findings with respect to other main assumptions. Moreover, an adjustment of the budget balance for cyclical factors could be explored. In addition, assessing the impact of other assumptions for budgetary policy going forward could be explored.

7. CONCLUSIONS

Most countries, among which EU Member States, use public finances to redistribute resources from the working-age population to the old and the very young to smoothen resources over the life cycle of individuals. Yet, as the EU is facing a demographic transition to an older population, this societal model is facing challenges, influenced by the fact that public spending on pension and healthcare account for almost 20% of GDP currently in the EU and are expected to remain major public spending items going forward.

A key policy question is how the fiscal adjustment is distributed over time, i.e. across generations. We address this issue by carrying out a generational accounting exercise, which allows calculating the

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Therefore, the 0.5 pps variation is not immediately translated in 2019 into the implicit interest rate. The delay depends on the public debt structure of the country. For the estimation of the rate of discount for our projections, we use the European Commission debt projection model that is the basis of the Fiscal Sustainability Report 2018 (European Commission (2019)).

[37] Nevertheless, in the generational accounting methodology a sensitivity scenario with an increase (decrease) of the discount rate could be equivalent to a sensintivity scenario with a reduction (increase) in the GDP growth rate, ceteris paribus.

present value of total net tax payments to the government (taxes paid minus transfers received) over the (remaining) lifetime of a cohort born in a specific year.

In the EU as a whole, we find that younger generations (up to age 42) who are relatively early into their working life, appear as net taxpayers. For older working-age cohorts (aged 43 to 65), for whom the remaining working life is shorter, the tax and contribution payments are offset by old-age pensions, health care, and other transfers from the public sector, which makes them net tax receivers. Individuals around the age of 64 appear to be the highest net tax receivers according to our estimates, on the basis of the lower labour income taxation and higher reliance on public spending programmes. It is important to bear in mind that we measure *remaining* lifetime net taxes, which are naturally higher at younger age and lower (negative) at higher age. In addition, we find a noticeable gender gap, as net taxes for women remain negative or very small for all age cohorts (i.e. they are net tax receivers) and are generally lower than for men, reflecting generally lower income due to lower labour market participation.

Overall, already legislated pension reforms have ensured significant savings for governments at aggregate EU level, reducing the fiscal burden for future generations. Nevertheless, these structural measures (pension reforms) appear to be primarily borne by current younger living cohorts and future generations, for whom remaining lifetime net taxes increase, and to a lesser extent to current older generations.

We find that public finances in the EU face fiscal sustainability challenges based on current policies, confirming findings from other studies (see e.g. the 2018 Fiscal Sustainbility Report). In the baseline scenario, under unchanged policies, the fiscal sustainability gap (as measured by the *IBG* indicator) is estimated at 251% of 2016 GDP. Current generations account for even more than this, 304%, while future generations contribute to reduce the imbalance. Implemented pension reforms in particular contribute very significantly to this finding: had their impact not been considered, the gap would be more than twice as high, amounting to 587% of GDP. Furthermore, if all EU countries were to adhere to the EU fiscal rules and reach their medium-term budgetary objectives (MTOs), the sustainability gap would be lower, amounting to 147% of GDP. Almost half of the imbalance would consist of the current explicit net debt, amounting to 70% of GDP.

Behind the aggregates, there is a large variation across EU countries. Under current fiscal policies, even with legislated pension reforms factored in (baseline scenario), generational imbalances remain in almost all EU countries, though to varying degrees.

On average in the EU, we find that under current policies (baseline scenario), there is a small intergenerational imbalance according to the *AGK* indicator. However, if structural reforms embedded in current policies, notably pension reforms, were undone (static scenario), a larger generational imbalance would emerge and future generations would face a much larger fiscal burden than current generations. Moreover, due to projected longer life experctancy and based on the continuation of current policies into the future, postponing the adjustment needed to balance the intertemporal budget constraint would result in a larger intergenerational imbalance, thus imposing an even higher burden on future generations. Again, important differences are observed also in this respect across EU countries.

REFERENCES

Abel A. B., N. G. Mankiw, L. H. Summers and R. J. Zeckhauser, (1989), “Assessing Dynamic Efficiency: Theory and Evidence”, Review of Economic Studies (1989) 56, 1-20.

Auerbach A.J., J. Gokhale, and L.J. Kotlikoff, (1991), "Generational accounts: A meaningful alternative to deficit accounting" In D. Bradford, editor, Tax Policy and the Economy, Chicago University Press.

Auerbach A.J., J. Gokhale, and L.J. Kotlikoff, (1992), "Generational Accounting: A New Approach to Understanding the Effects of Fiscal Policy on Saving", Scandinavian Journal of Economics, 1992, vol. 94, issue 2, 303-18.

Auerbach A.J., J. Gokhale, and L.J. Kotlikoff, (1994),"Generational accounting: A meaningful way to evaluate fiscal policy", Journal of Economic Perspectives 8, no. 1 (winter): 73-94.

Bahnsen, L., G. Manthei and B. Raffelhuschen, (2018), “Ehrbarer Staat? Die Generationenbilanz: Gorsse Koalition, Grosse Kosten”Argumente zu Marktwirtschaft und Politik, Nr 142, Stiftung Marktwirtschaft.

Balassone, F., J. Cunha, G. Langenus, B. Manzke, J. Pavot, D. Prammer, P. Tommasino (2009), “Fiscal Sustainability and Policy Implications for the Euro Area”, ECB Working Paper No. 994, January.

Bonin, H. (2001), “Generational Accounting, Theory and Application”, Springer.

Bonin, Holger and Patxot Cardoner, Concepcio and Souto, Guadalupe, (2013), ‘Cyclically Neutral Generational Accounting’. ZEW - Centre for European Economic Research Discussion Paper No. 13-099. Available at SSRN: https://ssrn.com/abstract=2359373 or http://dx.doi.org/10.2139/ssrn.2359373

European Commission (1999), 'Generational Accounting in Europe', European Economy, Reports and Studies No .6.

European Commission (2006), “The Long-term Sustainability of Public Finances in the European Union”, European Economy, No. 4.

European Commission (2016), 'Fiscal Sustainability Report 2015', European Economy, Institutional Papers No. 18.

European Commission (2017), 'Employment and Social Developments in Europe 2017'.

European Commission (2018a), "Debt Sustainability Monitor 2017", European Economy Institutional Paper 71.

European Commission (DG ECFIN) – Economic Policy Committee (AWG) (2018b), '2018 Ageing Report: Economic & Budgetary Projections for the 28 EU Member States (2016-2070)’, European Economy, Institutional Papers No. 79, May 2018.

European Commission (2019), 'Fiscal Sustainability Report 2018', European Economy, Institutional Papers No. 94.

European Commission (DG ECFIN) – Economic Policy Committee (AWG) (2015), "The 2015 Ageing Report. Economic and budgetary projections for the EU 28 Member States (2013-2060)", European Economy 3/2015.

European Commission (DG ECFIN) – Economic Policy Committee (AWG) (2017), “2018 Ageing Report: Underlying Assumptions & Projection Methodologies”, European Economy, Institutional Papers No. 65.

Franco D., J. Gokhale, L. Guiso, L.J. Kotlikoff and N. Sartor (1994), “Generational Accounting: The Case of Italy”, in A. Ando, L. Guiso and I. Visco (eds.), Saving and the Accumulation of Wealth, Cambridge University Press, Cambridge (UK).

Franco D., and N. Sartor (1999), “Italy: High Public Debt and Population Aging” in Generational Accounting in Europe, European Economy, Reports and Studies No .6.

Freeman M., Groom B., and Spackman M. (2018), Social Discount Rates for Cost-Benefit Analysis: A Reoprt for HM Treasury.

Jorda O., Knoll K., Kuvshinov D., Schularick M. and Taylor A. M. (2017), “The Rate of Return on Everything, 1870-2015”, Federal Reserve Bank of San Francisco Working Paper 2017-25.

Lee R. and A. Mason (2011) (eds.): “Population Ageing and the Generational Economy: A Global Perspective”, Cheltenham: Edward Elgar Publishing.

Ramsey F. (1928). “A Mathematical Theory of Saving,” The Economic Journal, 38(152): 543–559.

Rizza P. and P. Tommasino, (2010), "Will we treat future generations fairly? Italian fiscal policy through the prism of generational accounting", Giornale degli Economisti.

Ruffing, Van de Water, and Kogan (2014), “'Generational Accounting' Is Complex, Confusing, and Uninformative”, CBPP, February 2014, https://www.cbpp.org/sites/default/files/atoms/files/2-6-14bud.pdf

Raffelhüschen B. (1996), “A Note on Measuring Intertemporal Redistribution in Generational Accounting”, Institut für Finanzwissenschaft der Universität Freiburg, Discussion Paper, No. 53/96.

Raffelhauschen B., G. Rekker and F. Peeters, (2018), “Ehrbare Staaten? EU-Nachhaltigkeitsranking 2018“, Press release and presentation, November 2018, Stiftung Marktwirtschaft.

ANNEX I

The budget aggregates for the base year 2016

Primary government expenditures (net of interest expenditure) in 2016 amounted to around EUR 6,600 billion, of which about 3,880 have been distributed by age. Among age-distributed expenditures, the total amount of expenditure devoted to social expenditure is around 60 per cent of total primary expenditure. Old age and survivor pension benefits represent together one fourth of the primary expenditure. Health care is the second largest aggregate among social expenditure (16% of primary expenditure) (see also Table A1.3).

Table A1.1. **Government revenue and expenditure for the EU28 in 2016**

Total primary government expenditure (E.Mln)		**6,904,148**	**Total general government revenue (E.Mln)**	**6,662,757**
Distributed expenditure		3,879,822	1. Revenues distributed by age-specific profiles:	4,926,323
1.1. Expenditure distributed by age-specific profiles:		1,266,345	Wealth taxes	2%
Sickness and disability	% of primary exp	6%	Personal income tax	39%
Survivors		3%	VAT	16%
Family and children		4%	Employer's social contribution	17%
Unemployment		3%		
Housing		1%		
Social exclusion n.e.c.		2%	2. Revenues not distributed:	1,736,434
1.2. Other distributed		2,613,477		26%
Old age	% of primary exp	20%		
Health care		16%		
LTC		4%		
Other items distributed (from SILC)		1%		
2. Expenditure not distributed		2,714,503		
	% of primary exp	41%		
3. Interest expenditure		309,822		

Source: Commission services using Eurostat data (as of October 2018) and 2015 EU SILC.

Table A1.2 shows the average amount of assigned and adjusted revenues in percentage of total revenues for all countries. This percentage is slightly below 75% for EU and EA aggregates, but with a wide range going from 66% for Romania to above 77% for the Netherlands. Nevertheless, among the distributed variables, taxes on personal income represent the overwhelming category followed by VAT and employers' social contributions. On the other hand, the percentage of distributed expenditures over the total is slightly below 60% (Table A1.3) with a smaller variation across countries. More interestingly, the percentage of old age pension benefits earning related represents 20% of primary expenditures with a minimum in Ireland (less than 9 percent of primary distributed expenditures) and the maximum for Italy, Portugal and Greece (above 27%).

Table A1.2. **Breakdown of distributed revenues (in % of total)**

	Taxes on wealth	Tax on income and social contributions	VAT	Employers social contribution	Not distributed items	Total revenue	Distributed/ Total
BE	0.3%	41.7%	13.4%	20.8%	23.9%	100.0%	76.1%
BG	0.5%	23.6%	26.1%	13.4%	36.5%	100.0%	63.5%
CZ	0.2%	31.4%	18.5%	23.5%	26.4%	100.0%	73.6%
DK	1.3%	55.4%	18.0%	0.4%	24.9%	100.0%	75.1%
DE	0.6%	46.9%	15.5%	17.2%	19.9%	100.0%	80.1%
EE	0.1%	20.6%	23.2%	27.7%	28.4%	100.0%	71.6%
IE	0.1%	43.8%	17.5%	10.8%	27.8%	100.0%	72.2%
EL	1.5%	31.4%	16.4%	15.2%	35.4%	100.0%	64.6%
ES	0.5%	34.0%	17.1%	23.6%	24.8%	100.0%	75.2%
FR	2.1%	31.9%	13.0%	24.8%	28.3%	100.0%	71.7%
HR	0.1%	24.8%	28.0%	13.4%	33.7%	100.0%	66.3%
IT	0.7%	39.4%	13.1%	18.8%	28.1%	100.0%	71.9%
CY	0.7%	30.1%	23.5%	14.8%	31.0%	100.0%	69.0%
LV	0.3%	27.6%	21.9%	17.3%	32.9%	100.0%	67.1%
LT	0.1%	27.7%	22.7%	24.9%	24.5%	100.0%	75.5%
LU	2.4%	46.7%	14.8%	13.4%	22.7%	100.0%	77.3%
HU	0.2%	29.1%	20.7%	17.2%	32.7%	100.0%	67.3%
MT		41.8%	18.8%	9.0%	30.5%	100.0%	69.5%
NL	2.5%	46.2%	15.8%	12.9%	22.7%	100.0%	77.3%
AT	1.7%	40.9%	15.7%	15.0%	26.6%	100.0%	73.4%
PL	1.1%	37.5%	18.2%	15.3%	27.9%	100.0%	72.1%
PT	0.7%	32.0%	19.8%	18.0%	29.4%	100.0%	70.6%
RO	0.9%	28.9%	20.4%	15.8%	34.0%	100.0%	66.0%
SI	0.1%	36.2%	18.9%	13.5%	31.3%	100.0%	68.7%
SK	0.3%	33.4%	17.0%	20.8%	28.4%	100.0%	71.6%
FI	1.4%	36.1%	16.8%	16.1%	29.6%	100.0%	70.4%
SE	1.4%	36.6%	18.2%	6.1%	37.7%	100.0%	62.3%
UK	4.7%	38.8%	17.7%	12.1%	26.7%	100.0%	73.3%
EA	1.1%	39.5%	14.8%	19.5%	25.1%	100.0%	74.9%
EU28	1.6%	39.2%	15.7%	17.4%	26.1%	100.0%	73.9%

Source: Eurostat (National Accounts), EU-SILC.

Table A1.3. **Breakdown of distributed expenditures (in % of total)**

	Sickness and disability	Old age	Survivors	Family and children	Unemployment	Housing	Social exclusion n.e.c.	Health care	LTC	Other items distributed (from SILC) (3)	Not distributed items	Total expenditure	Distributed/ Total
BE	7.0%	19.5%	3.5%	4.4%	3.7%	0.3%	2.3%	11.6%	4.6%	0.1%	42.9%	100.0%	57.1%
BG	0.6%	22.6%		7.0%	0.2%		0.2%	11.3%	1.2%	0.6%	56.4%	100.0%	43.6%
CZ	5.4%	17.5%	1.5%	2.7%	0.5%	0.7%	1.3%	14.3%	3.4%	0.1%	52.5%	100.0%	47.5%
DK	8.9%	11.5%	0.0%	8.7%	4.7%	1.3%		15.7%	4.9%	2.9%	41.4%	100.0%	58.6%
DE	7.5%	18.4%	4.3%	3.9%	3.9%	0.7%	1.5%	17.7%	2.9%	0.5%	38.8%	100.0%	61.2%
EE	5.4%	16.9%	0.2%	6.2%	2.9%	0.1%	0.4%	10.7%	2.2%	0.5%	54.6%	100.0%	45.4%
IE	7.5%	8.1%	2.4%	5.6%	5.0%	3.0%	1.9%	23.2%	5.4%	1.0%	36.9%	100.0%	63.1%
EL	3.3%	28.2%	3.8%	1.4%	1.1%	0.0%	0.5%	14.1%	0.2%	0.0%	47.4%	100.0%	52.6%
ES	6.0%	22.1%	5.8%	1.8%	4.5%	0.1%	0.8%	14.7%	2.4%	0.5%	41.4%	100.0%	58.6%
FR	5.1%	22.5%	2.8%	4.4%	3.6%	1.8%	1.9%	14.1%	3.2%	0.2%	40.4%	100.0%	59.6%
HR	4.6%	15.7%	3.2%	4.0%	1.1%	0.0%	0.0%	14.1%	2.0%	0.2%	55.0%	100.0%	45.0%
IT	4.1%	28.1%	5.9%	3.4%	2.6%	0.1%	0.7%	13.1%	3.8%	0.3%	38.0%	100.0%	62.0%
CY	1.5%	24.4%	4.3%	8.8%	2.2%	0.0%	4.3%	8.0%	0.8%	1.0%	44.6%	100.0%	55.4%
LV	6.1%	18.3%	0.5%	3.4%	1.5%	0.3%	1.0%	10.5%	1.2%	0.4%	56.9%	100.0%	43.1%
LT	9.5%	14.9%	1.0%	3.1%	1.5%	0.2%	0.7%	12.5%	3.1%	0.2%	53.5%	100.0%	46.5%
LU	4.3%	16.0%	0.0%	8.6%	2.6%	0.1%	1.7%	11.0%	3.1%	0.3%	52.2%	100.0%	47.8%
HU	6.5%	18.4%	2.4%	4.4%	0.7%	0.4%	1.7%	10.5%	1.6%	0.2%	53.2%	100.0%	46.8%
MT	3.0%	14.3%	3.9%	2.9%	1.0%	0.5%	0.7%	15.7%	2.5%	2.1%	53.4%	100.0%	46.6%
NL	10.0%	12.6%	0.2%	2.9%	3.8%	1.1%	4.4%	16.8%	8.3%	1.2%	38.8%	100.0%	61.2%
AT	3.9%	21.8%	3.0%	4.7%	3.0%	0.2%	2.4%	14.1%	3.9%	0.2%	42.6%	100.0%	57.4%
PL	6.7%	25.1%	4.5%	6.3%	1.4%	0.1%	0.6%	10.8%	1.2%	0.2%	43.0%	100.0%	57.0%
PT	3.2%	27.6%	4.4%	2.6%	2.4%	0.1%	0.5%	14.5%	1.3%	0.4%	43.0%	100.0%	57.0%
RO	3.3%	18.0%	0.2%	4.1%	0.4%		0.5%	11.3%	0.9%	0.1%	61.2%	100.0%	38.8%
SI	5.4%	19.7%	3.2%	4.4%	1.3%	0.1%	2.0%	13.1%	2.2%	1.3%	47.4%	100.0%	52.6%
SK	7.3%	16.8%	2.0%	3.1%	0.5%	0.0%	1.1%	14.3%	2.3%	0.1%	52.4%	100.0%	47.6%
FI	6.2%	20.4%	1.4%	5.8%	4.6%	0.9%	2.1%	14.0%	4.0%	0.8%	39.7%	100.0%	60.3%
SE	8.6%	14.0%	0.6%	5.0%	2.6%	0.6%	3.5%	13.7%	6.6%	2.5%	42.3%	100.0%	57.7%
UK	6.4%	12.6%	0.2%	3.5%	0.3%	3.1%	4.1%	22.1%	3.8%	1.0%	42.8%	100.0%	57.2%
EA	6.0%	21.2%	3.8%	3.8%	3.5%	0.8%	1.6%	15.1%	3.5%	0.4%	40.1%	100.0%	59.9%
EU28	6.2%	19.6%	3.1%	3.9%	2.9%	1.1%	2.0%	15.9%	3.6%	0.6%	41.2%	100.0%	58.8%

Note: interest expenditure is not included in the total amount of government expenditure.

Source: Eurostat (COFOG, National Accounts), EU-SILC.

Table A1.4. **Primary and structural balances, % of GDP**

	Primary balance 2016	Primary balance 2020	Structural balance 2016	Structural balance 2020	MTO	
RO	-1.4	-3.5	-2.2	-4.6	-1.0	RO
IT	1.4	0.9	-1.5	-3.5	0.0	IT
ES	-1.7	0.2	-3.3	-3.1	0.0	ES
HU	1.6	0.6	-1.8	-3.0	-1.5	HU
FR	-1.7	0.1	-2.7	-2.2	-0.4	FR
PL	-0.5	0.4	-1.9	-1.8	-1.0	PL
BE	0.4	0.8	-2.3	-1.7	0.0	BE
LV	1.1	0.0	0.0	-1.2	-1.0	LV
HR	2.1	2.3	-0.7	-1.1	-1.8	HR
UK	-0.5	1.3	-3.4	-1.1	-0.8	UK
SI	1.1	1.9	-1.0	-1.0	0.3	SI
PT	2.2	3.1	-2.1	-1.0	0.3	PT
EE	-0.3	0.2	-0.7	-0.9	-0.5	EE
FI	-0.6	0.8	-0.5	-0.7	-0.5	FI
SK	-0.6	1.0	-2.1	-0.6	-0.5	SK
LT	1.6	0.9	-0.4	-0.4	-1.0	LT
IE	1.7	1.7	-1.0	-0.3	-0.5	IE
AT	0.5	1.6	-1.1	-0.2	-0.5	AT
NL	1.2	1.7	0.5	-0.1	-0.5	NL
CZ	1.6	1.5	0.9	0.2	-1.0	CZ
BG	1.1	1.3	0.3	0.3	-1.0	BG
CY	3.1	5.7	1.3	0.7	0.0	CY
LU	2.0	1.1	1.4	0.8	-0.5	LU
DK	0.9	1.4	0.1	0.8	-0.5	DK
MT	3.1	2.1	0.3	0.9	0.0	MT
SE	1.5	1.1	0.8	1.0	-1.0	SE
DE	2.1	1.9	0.7	1.1	-0.5	DE
EL	3.7	3.9	5.1	1.5	-0.5	EL
EA	0.6	1.2	-1.0	-1.1		EA
EU28	0.4	1.1	-1.3	-1.1		EU28

Note: Commission autumn 2018 forecast.
Source: AMECO, 2018 Fiscal Sustainability Report.

ANNEX II

Table A2.1. **Generational accounts of a newborn under alternative scenarios**

	Static scenario							Baseline scenario					
	Lives 100 year, no policy reform and not growth or discounting (r=g=0)		Lives 100 year, no policy reform and (r <> g <> 0)		Lives according to POP2015, no policy reform and (r <> g <> 0)			Lives 100 year and (r <> g <> 0)		Lives according to POP2015 and (r <> g <> 0)			
	Males	Females	Males	Females	Males	Females	Average person	Males	Females	Males	Females	Average person	
BE	-137,415	-562,812	187,809	-112,899	405,811	-12,668	202,693	252,000	-89,102	480,852	20,534	257,426	BE
BG	-19,080	-11,991	25,871	19,456	46,114	25,123	35,927	50,064	31,644	63,575	35,010	49,713	BG
CZ	-80,383	-206,042	91,905	-41,138	202,109	20,492	114,000	118,951	-9,289	227,852	52,763	142,910	CZ
DK	48,959	-572,923	245,922	-162,437	450,989	-102,654	182,242	367,602	-51,779	583,662	27,060	313,479	DK
DE	-69,476	-457,541	228,788	-122,150	493,750	-25,139	241,522	361,543	-42,817	607,601	56,680	339,803	DE
EE	-615	-77,334	143,762	29,040	214,624	77,407	148,011	261,569	142,270	296,231	170,351	235,121	EE
IE	-435,392	-855,496	-49,069	-345,214	161,197	-187,261	-7,961	-37,315	-342,727	177,692	-180,249	3,931	IE
EL	-41,741	-143,904	97,386	-23,643	155,036	-5,103	77,388	208,576	14,538	256,679	33,920	148,668	EL
ES	-308,283	-323,631	-40,239	-87,676	55,942	-38,073	10,346	61,525	-75,083	159,494	-22,063	71,441	ES
FR	-228,488	-474,334	79,979	-120,705	211,206	-49,714	84,672	243,021	-13,942	348,426	51,513	204,437	FR
HR	3,225	-55,670	58,247	17,741	83,366	34,246	59,529	100,524	41,192	121,082	57,952	90,447	HR
IT	-171,403	-372,398	35,694	-89,946	128,941	-70,463	32,202	125,941	-33,526	236,644	304	121,985	IT
CY	-51,994	-155,884	45,563	-23,420	110,167	-8,075	52,747	135,595	10,219	209,622	37,919	126,241	CY
LV	-13,603	4,377	92,928	85,900	126,851	97,842	112,803	168,226	151,086	171,163	139,714	155,933	LV
LT	15,650	-49,465	101,265	35,019	110,105	60,484	86,037	142,149	73,827	128,441	81,105	105,481	LT
LU	59,308	-842,794	694,783	-67,007	1,742,842	394,839	1,087,258	795,514	-109,028	1,869,341	327,806	1,119,635	LU
HU	-21,840	-55,538	50,421	13,024	96,044	38,411	68,072	76,254	30,523	117,016	54,328	86,590	HU
MT	-78,973	-263,411	154,416	-66,495	359,000	626	184,691	199,902	-85,604	408,782	-18,510	200,953	MT
NL	-42,692	-704,025	182,491	-255,877	390,066	-185,843	110,708	263,633	-191,571	473,236	-114,887	187,953	NL
AT	-338,582	-752,979	114,698	-260,956	444,078	-190,963	135,824	375,361	-112,995	702,572	-6,152	358,552	AT
PL	-87,730	-134,647	5,992	-43,203	50,727	-13,534	19,516	109,800	29,834	125,401	47,430	87,532	PL
PT	-111,569	-152,637	27,375	-18,320	73,106	690	37,991	128,626	39,681	169,755	63,470	118,217	PT
RO	5,777	-9,933	43,665	17,877	50,448	23,145	37,182	78,755	31,494	75,069	34,437	55,326	RO
SI	-118,568	-243,453	39,421	-58,103	128,120	9,194	70,384	51,813	-42,137	143,479	28,352	87,588	SI
SK	-34,597	-162,870	99,762	-40,608	163,101	9,455	88,552	163,379	20,334	220,899	68,214	146,817	SK
FI	-439,078	-633,935	-33,761	-196,633	189,532	-69,437	63,923	76,346	-116,956	304,146	19,553	166,108	FI
SE	-181,693	-738,797	156,049	-562,682	590,576	-388,339	115,372	406,997	-333,358	826,822	-137,198	358,849	SE
UK	-104,453	-624,420	114,170	-234,952	277,332	-168,770	60,970	153,896	-217,670	304,378	-154,165	81,982	UK
EA	-158,018	-419,592	96,188	-116,059	250,255	-48,424	105,307	217,816	-50,159	364,368	20,056	197,274	EA
EU28	-163,042	-419,189	75,322	-138,725	224,194	-65,545	83,582	206,715	-62,429	333,349	5,072	174,035	EU28

Source: Commission services.

ANNEX III

Table A3.1. **The composition of intertemporal budget gap (IBG), with non distributed items reported separately, % of 2016 GDP**

	Static scenario					Baseline scenario					MTO scenario				
	IBG	Current generations distributed	Future generations distributed	Non distributed	Explicit net debt	IBG	Current generations distributed	Future generations distributed	Non distributed	Explicit net debt	IBG	Current generations distributed	Future generations distributed	Non distributed	Explicit net debt
BE	643	210	-465	805	92	508	155	-597	858	92	313	155	-597	663	92
BG	361	88	-200	460	13	104	-78	-332	500	13	104	-78	-332	500	13
CZ	635	174	-360	796	25	416	25	-498	865	25	416	25	-498	865	25
DK	330	-111	-281	705	18	7	-297	-480	766	18	7	-297	-480	766	18
DE	502	128	-323	650	48	157	-42	-505	656	48	157	-42	-505	656	48
EE	696	18	-507	1188	-3	5	-452	-924	1383	-3	-44	-452	-924	1335	-3
IE	549	296	58	132	63	493	281	33	116	63	493	281	33	116	63
EL	505	292	-159	206	165	200	-60	-401	496	165	200	-60	-401	496	165
ES	759	407	-90	355	86	440	187	-259	425	86	154	187	-259	139	86
FR	606	351	-267	434	89	124	75	-598	558	89	-60	75	-598	374	89
HR	356	43	-277	518	72	63	-138	-451	581	72	63	-138	-451	581	72
IT	544	243	-50	230	121	258	89	-232	280	121	-45	89	-232	-23	121
CY	116	30	-128	125	90	-301	-217	-401	228	90	-301	-217	-401	228	90
LV	711	32	-382	1030	31	181	-304	-692	1145	31	162	-304	-692	1126	31
LT	413	-26	-298	703	34	131	-179	-424	700	34	131	-179	-424	700	34
LU	1198	-65	-1103	2378	-11	1026	-158	-1155	2350	-11	1026	-158	-1155	2350	-11
HU	543	103	-388	759	69	388	-38	-514	872	69	309	-38	-514	792	69
MT	796	284	-515	982	44	667	214	-581	991	44	667	214	-581	991	44
NL	430	65	-220	535	51	245	-63	-367	624	51	245	-63	-367	624	51
AT	946	429	-165	624	58	283	76	-560	709	58	283	76	-560	709	58
PL	841	443	2	346	50	45	-48	-419	461	50	-10	-48	-419	406	50
PT	538	292	-56	188	113	38	17	-324	231	113	-47	17	-324	147	113
RO	699	-19	-281	971	28	412	-212	-436	1032	28	59	-212	-436	679	28
SI	629	358	-146	365	53	520	264	-215	417	53	415	264	-215	313	53
SK	1042	449	-231	780	43	520	78	-564	963	43	507	78	-564	950	43
FI	729	438	-62	330	22	381	252	-286	393	22	361	252	-286	374	22
SE	821	361	13	438	9	-7	-31	-519	534	9	-7	-31	-519	534	9
UK	525	166	-144	423	80	400	105	-205	420	80	354	105	-205	375	80
EA	585	263	-222	467	78	226	52	-435	531	78					
EU28	624	265	-190	478	71	209	26	-426	538	71					
EA_w	587	247	-219	482	76	238	51	-433	544	76	113	51	-433	419	76
EU28_w	587	230	-198	483	72	251	43	-401	537	72	147	43	-401	434	72

Source: Commission services.

Table A3.2. **The composition of intertemporal budget gap (IBG), with non distributed items allocated to all cohorts as lump-sum net taxes,% of 2016 GDP**

	Static scenario				Baseline scenario				MTO scenario			
	IBG	Current generations	Future generations	Explicit net debt	IBG	Current generations	Future generations	Explicit net debt	IBG	Current generations	Future generations	Explicit net debt
BE	643	604	-54	92	508	571	-156	92	313	482	-261	92
BG	361	329	19	13	104	183	-92	13	104	183	-92	13
CZ	635	586	24	25	416	469	-77	25	416	469	-77	25
DK	330	251	61	18	7	91	-102	18	7	91	-102	18
DE	502	455	0	48	157	287	-178	48	157	287	-178	48
EE	696	608	90	-3	5	232	-224	-3	-44	208	-249	-3
IE	549	359	127	63	493	336	93	63	493	336	93	63
EL	505	399	-59	165	200	178	-143	165	200	178	-143	165
ES	759	579	94	86	440	390	-36	86	154	265	-197	86
FR	606	564	-47	89	124	345	-309	89	-60	261	-410	89
HR	356	319	-35	72	63	167	-175	72	63	167	-175	72
IT	544	362	61	121	258	230	-92	121	-45	91	-257	121
CY	116	94	-68	90	-301	-106	-285	90	-301	-106	-285	90
LV	711	536	144	31	181	251	-102	31	162	243	-112	31
LT	413	335	44	34	131	180	-82	34	131	180	-82	34
LU	1198	979	231	-11	1026	874	164	-11	1026	874	164	-11
HU	543	474	0	69	388	385	-66	69	309	349	-109	69
MT	796	731	20	44	667	663	-39	44	667	663	-39	44
NL	430	329	50	51	245	240	-45	51	245	240	-45	51
AT	946	736	151	58	283	423	-197	58	283	423	-197	58
PL	841	630	161	50	45	199	-204	50	-10	171	-231	50
PT	538	392	33	113	38	137	-213	113	-47	96	-257	113
RO	699	476	195	28	412	313	70	28	59	144	-113	28
SI	629	542	34	53	520	473	-7	53	415	424	-62	53
SK	1042	843	155	43	520	540	-63	43	507	534	-70	43
FI	729	596	111	22	381	432	-73	22	361	423	-84	22
SE	821	536	276	9	-7	181	-197	9	-7	181	-197	9
UK	525	366	79	80	400	302	18	80	354	282	-7	80
EA	585	494	14	78	226	312	-163	78				
EU28	624	499	54	71	209	286	-148	71				
EA_w	587	486	24	76	238	317	-155	76	113	261	-224	76
EU28_w	587	468	47	72	251	304	-125	72	147	257	-182	72

Source: Commission services.

Table A3.3. **Primary balance and its components, 2020 and 2070, % of GDP, Baseline scenario.**

	Baseline scenario													
	2020							2070						
	Primary balance	Non distributed	Distributed	of which: Pensions	HC	LTC	Rest	Primary balance	Non distributed	Distributed	of which: Pensions	HC	LTC	Rest
BE	0.8%	-8.2%	9.0%	-10.2%	-5.9%	-2.4%	27.5%	-4.1%	-8.2%	4.1%	-13.0%	-6.3%	-2.5%	27.4%
BG	1.3%	-5.6%	6.9%	-7.4%	-5.0%	-0.4%	19.7%	-0.8%	-5.6%	4.8%	-9.4%	-5.2%	-0.4%	19.9%
CZ	1.5%	-9.0%	10.5%	-6.7%	-5.4%	-1.3%	24.0%	-5.4%	-9.0%	3.6%	-9.3%	-6.3%	-1.6%	22.1%
DK	1.4%	-7.6%	9.0%	-6.0%	-7.0%	-2.6%	24.7%	0.8%	-7.6%	8.3%	-5.3%	-8.0%	-3.0%	26.4%
DE	1.9%	-7.0%	8.9%	-8.1%	-7.5%	-1.5%	26.0%	-1.2%	-7.0%	5.7%	-10.4%	-8.3%	-1.6%	26.5%
EE	0.2%	-10.4%	10.6%	-5.6%	-5.0%	-0.9%	22.1%	0.5%	-10.4%	10.9%	-4.3%	-5.4%	-0.9%	21.9%
IE	1.7%	-0.9%	2.6%	-2.1%	-4.3%	-1.4%	10.4%	-4.1%	-0.9%	-3.3%	-3.6%	-5.3%	-1.6%	8.9%
EL	3.9%	-5.3%	9.3%	-10.0%	-5.1%	-0.1%	24.5%	-0.6%	-5.3%	4.8%	-7.0%	-6.2%	-0.1%	18.1%
ES	0.2%	-4.3%	4.5%	-8.8%	-6.0%	-1.0%	20.4%	-4.3%	-4.3%	0.0%	-7.4%	-6.5%	-1.2%	16.1%
FR	0.1%	-5.2%	5.3%	-12.2%	-7.9%	-1.8%	27.2%	0.8%	-5.2%	6.0%	-9.7%	-8.3%	-1.8%	26.3%
HR	2.3%	-7.7%	10.0%	-7.0%	-5.1%	-0.9%	23.0%	0.1%	-7.7%	7.8%	-4.7%	-5.6%	-0.9%	19.3%
IT	0.9%	-4.0%	4.9%	-12.9%	-6.1%	-1.8%	25.7%	-1.3%	-4.0%	2.8%	-12.4%	-7.0%	-1.9%	25.1%
CY	5.7%	-2.4%	8.1%	-8.1%	-2.8%	-0.3%	19.3%	4.4%	-2.4%	6.8%	-8.2%	-3.1%	-0.3%	18.7%
LV	0.0%	-8.8%	8.8%	-6.1%	-3.8%	-0.4%	19.2%	-0.8%	-8.8%	8.0%	-4.1%	-4.2%	-0.5%	16.9%
LT	0.9%	-8.0%	8.9%	-5.0%	-4.2%	-1.0%	19.0%	-0.6%	-8.0%	7.4%	-3.9%	-4.4%	-1.2%	17.7%
LU	1.1%	-11.7%	12.8%	-6.6%	-4.1%	-1.4%	24.9%	-6.0%	-11.7%	5.8%	-13.9%	-5.2%	-1.5%	29.1%
HU	0.6%	-8.9%	9.5%	-7.4%	-5.0%	-0.7%	22.5%	-3.7%	-8.9%	5.2%	-9.6%	-5.7%	-0.7%	21.5%
MT	2.1%	-6.4%	8.5%	-4.9%	-5.9%	-0.9%	20.3%	-5.2%	-6.4%	1.3%	-7.1%	-8.2%	-1.2%	18.9%
NL	1.7%	-5.8%	7.5%	-5.0%	-6.3%	-3.6%	22.5%	-1.3%	-5.8%	4.5%	-5.8%	-7.0%	-4.1%	23.2%
AT	1.6%	-6.5%	8.1%	-10.6%	-6.9%	-1.9%	27.6%	-1.9%	-6.5%	4.6%	-11.3%	-8.3%	-2.1%	27.9%
PL	0.4%	-5.2%	5.6%	-9.8%	-4.1%	-0.5%	20.1%	-0.1%	-5.2%	5.1%	-9.9%	-5.0%	-0.6%	21.2%
PT	3.1%	-3.0%	6.1%	-11.1%	-6.2%	-0.6%	24.0%	1.7%	-3.0%	4.7%	-8.6%	-8.4%	-0.7%	23.1%
RO	-3.5%	-11.5%	8.0%	-5.5%	-4.4%	-0.3%	18.2%	-4.5%	-11.5%	7.0%	-5.8%	-5.2%	-0.3%	18.6%
SI	1.9%	-4.2%	6.1%	-8.3%	-5.7%	-0.9%	21.1%	-5.7%	-4.2%	-1.5%	-10.9%	-6.6%	-1.0%	17.8%
SK	1.0%	-7.5%	8.5%	-6.5%	-5.8%	-0.9%	21.7%	-5.2%	-7.5%	2.3%	-7.7%	-6.8%	-1.0%	18.3%
FI	0.8%	-3.3%	4.0%	-11.7%	-6.2%	-2.3%	24.2%	-2.8%	-3.3%	0.4%	-12.0%	-6.8%	-2.7%	23.5%
SE	1.1%	-2.2%	3.3%	-6.5%	-7.1%	-3.3%	20.3%	0.9%	-2.2%	3.1%	-6.0%	-7.8%	-3.7%	21.9%
UK	1.3%	-3.9%	5.1%	-4.8%	-8.3%	-1.6%	19.8%	-3.2%	-3.9%	0.7%	-6.4%	-9.7%	-1.8%	19.7%
EA	1.2%	-5.5%	6.6%	-9.7%	-6.9%	-1.7%	24.9%	-1.5%	-5.5%	4.0%	-9.7%	-7.5%	-1.9%	24.0%
EU28	1.1%	-5.3%	6.4%	-8.6%	-6.9%	-1.7%	23.6%	-1.4%	-5.3%	3.9%	-8.8%	-7.8%	-1.8%	23.3%

Source: Commission services.

Table A3.4. **Primary balance and its components, 2020 and 2070, % of GDP, MTO scenario.**

	MTO scenario													
	2020							2070						
				of which:							of which:			
	Primary balance	Non distributed	Distributed	Pensions	HC	LTC	Rest	Primary balance	Non distributed	Distributed	Pensions	HC	LTC	Rest
BE	1.8%	-7.2%	9.0%	-10.2%	-5.9%	-2.4%	27.5%	-2.1%	-6.2%	4.1%	-13.0%	-6.3%	-2.5%	27.4%
BG	1.3%	-5.6%	6.9%	-7.4%	-5.0%	-0.4%	19.7%	-0.8%	-5.6%	4.8%	-9.4%	-5.2%	-0.4%	19.9%
CZ	1.5%	-9.0%	10.5%	-6.7%	-5.4%	-1.3%	24.0%	-5.4%	-9.0%	3.6%	-9.3%	-6.3%	-1.6%	22.1%
DK	1.4%	-7.6%	9.0%	-6.0%	-7.0%	-2.6%	24.7%	0.8%	-7.6%	8.3%	-5.3%	-8.0%	-3.0%	26.4%
DE	1.9%	-7.0%	8.9%	-8.1%	-7.5%	-1.5%	26.0%	-1.2%	-7.0%	5.7%	-10.4%	-8.3%	-1.6%	26.5%
EE	0.6%	-10.0%	10.6%	-5.6%	-5.0%	-0.9%	22.1%	0.9%	-10.0%	10.9%	-4.3%	-5.4%	-0.9%	21.9%
IE	1.7%	-0.9%	2.6%	-2.1%	-4.3%	-1.4%	10.4%	-4.1%	-0.9%	-3.3%	-3.6%	-5.3%	-1.6%	8.9%
EL	3.9%	-5.3%	9.3%	-10.0%	-5.1%	-0.1%	24.5%	-0.6%	-5.3%	4.8%	-7.0%	-6.2%	-0.1%	18.1%
ES	1.4%	-3.1%	4.5%	-8.8%	-6.0%	-1.0%	20.4%	-1.2%	-1.2%	0.0%	-7.4%	-6.5%	-1.2%	16.1%
FR	0.7%	-4.6%	5.3%	-12.2%	-7.9%	-1.8%	27.2%	2.6%	-3.4%	6.0%	-9.7%	-8.3%	-1.8%	26.3%
HR	2.3%	-7.7%	10.0%	-7.0%	-5.1%	-0.9%	23.0%	0.1%	-7.7%	7.8%	-4.7%	-5.6%	-0.9%	19.3%
IT	2.0%	-2.8%	4.9%	-12.9%	-6.1%	-1.8%	25.7%	3.5%	0.7%	2.8%	-12.4%	-7.0%	-1.9%	25.1%
CY	5.7%	-2.4%	8.1%	-8.1%	-2.8%	-0.3%	19.3%	4.4%	-2.4%	6.8%	-8.2%	-3.1%	-0.3%	18.7%
LV	0.0%	-8.8%	8.8%	-6.1%	-3.8%	-0.4%	19.2%	-0.6%	-8.6%	8.0%	-4.1%	-4.2%	-0.5%	16.9%
LT	0.9%	-8.0%	8.9%	-5.0%	-4.2%	-1.0%	19.0%	-0.6%	-8.0%	7.4%	-3.9%	-4.4%	-1.2%	17.7%
LU	1.1%	-11.7%	12.8%	-6.6%	-4.1%	-1.4%	24.9%	-6.0%	-11.7%	5.8%	-13.9%	-5.2%	-1.5%	29.1%
HU	1.0%	-8.5%	9.5%	-7.4%	-5.0%	-0.7%	22.5%	-2.9%	-8.0%	5.2%	-9.6%	-5.7%	-0.7%	21.5%
MT	2.1%	-6.4%	8.5%	-4.9%	-5.9%	-0.9%	20.3%	-5.2%	-6.4%	1.3%	-7.1%	-8.2%	-1.2%	18.9%
NL	1.7%	-5.8%	7.5%	-5.0%	-6.3%	-3.6%	22.5%	-1.3%	-5.8%	4.5%	-5.8%	-7.0%	-4.1%	23.2%
AT	1.6%	-6.5%	8.1%	-10.6%	-6.9%	-1.9%	27.6%	-1.9%	-6.5%	4.6%	-11.3%	-8.3%	-2.1%	27.9%
PL	0.9%	-4.7%	5.6%	-9.8%	-4.1%	-0.5%	20.1%	0.5%	-4.6%	5.1%	-9.9%	-5.0%	-0.6%	21.2%
PT	3.8%	-2.3%	6.1%	-11.1%	-6.2%	-0.6%	24.0%	2.9%	-1.8%	4.7%	-8.6%	-8.4%	-0.7%	23.1%
RO	-1.7%	-9.7%	8.0%	-5.5%	-4.4%	-0.3%	18.2%	-0.3%	-7.3%	7.0%	-5.8%	-5.2%	-0.3%	18.6%
SI	2.8%	-3.4%	6.1%	-8.3%	-5.7%	-0.9%	21.1%	-4.6%	-3.1%	-1.5%	-10.9%	-6.6%	-1.0%	17.8%
SK	1.1%	-7.4%	8.5%	-6.5%	-5.8%	-0.9%	21.7%	-5.1%	-7.4%	2.3%	-7.7%	-6.8%	-1.0%	18.3%
FI	0.9%	-3.1%	4.0%	-11.7%	-6.2%	-2.3%	24.2%	-2.7%	-3.1%	0.4%	-12.0%	-6.8%	-2.7%	23.5%
SE	1.1%	-2.2%	3.3%	-6.5%	-7.1%	-3.3%	20.3%	0.9%	-2.2%	3.1%	-6.0%	-7.8%	-3.7%	21.9%
UK	1.7%	-3.4%	5.1%	-4.8%	-8.3%	-1.6%	19.8%	-2.8%	-3.4%	0.7%	-6.4%	-9.7%	-1.8%	19.7%
EA	1.6%	-5.0%	6.6%	-9.7%	-6.9%	-1.7%	24.9%	0.3%	-3.7%	4.0%	-9.7%	-7.5%	-1.9%	24.0%
EU28	1.5%	-4.9%	6.4%	-8.6%	-6.9%	-1.7%	23.6%	-0.1%	-4.0%	3.9%	-8.8%	-7.8%	-1.8%	23.3%

Source: Commission services.

Table A3.5. **Inter-generational imbalances according to the AGK indicator**

	Static scenario			Baseline scenario			MTO scenario		
	MAX Future generations (1)	New born base year (2)	AGK indicator (1)/(2)	MAX Future generations (1)	New born base year (2)	AGK indicator (1)/(2)	MAX Future generations (1)	New born base year (2)	AGK indicator (1)/(2)
BE	372,709	202,693	1.8	370,976	257,426	1.4	305,590	257,426	1.2
BG	57,295	35,927	1.6	44,340	49,713	0.9	44,340	49,713	0.9
CZ	188,055	114,000	1.6	172,139	142,910	1.2	172,139	142,910	1.2
DK	281,694	182,242	1.5	224,617	313,479	0.7	224,617	313,479	0.7
DE	394,971	241,522	1.6	316,542	339,803	0.9	316,542	339,803	0.9
EE	222,512	148,011	1.5	171,498	235,121	0.7	162,535	235,121	0.7
IE	214,561	-7,961		200,320	3,931	51.0	200,320	3,931	51.0
EL	182,746	77,388	2.4	162,725	148,668	1.1	162,725	148,668	1.1
ES	206,468	10,346	20.0	168,990	71,441	2.4	99,779	71,441	1.4
FR	251,667	84,672	3.0	208,155	204,437	1.0	154,957	204,437	0.8
HR	111,670	59,529	1.9	90,815	90,447	1.0	90,815	90,447	1.0
IT	292,299	32,202	9.1	241,716	121,985	2.0	92,088	121,985	0.8
CY	66,420	52,747	1.3	26,916	126,241	0.2	26,916	126,241	0.2
LV	190,871	112,803	1.7	151,534	155,933	1.0	148,209	155,933	1.0
LT	147,793	86,037	1.7	114,830	105,481	1.1	114,830	105,481	1.1
LU	1,257,610	1,087,258	1.2	1,191,736	1,119,635	1.1	1,191,736	1,119,635	1.1
HU	114,390	68,072	1.7	110,957	86,590	1.3	101,156	86,590	1.2
MT	260,932	184,691	1.4	247,538	200,953	1.2	247,538	200,953	1.2
NL	258,326	110,708	2.3	242,767	187,953	1.3	242,767	187,953	1.3
AT	454,251	135,824	3.3	345,276	358,552	1.0	345,276	358,552	1.0
PL	130,960	19,516	6.7	72,264	87,532	0.8	63,701	87,532	0.7
PT	180,469	37,991	4.8	109,949	118,217	0.9	84,173	118,217	0.7
RO	103,219	37,182	2.8	89,290	55,326	1.6	52,119	55,326	0.9
SI	168,671	70,384	2.4	158,812	87,588	1.8	136,259	87,588	1.6
SK	226,172	88,552	2.6	188,472	146,817	1.3	186,177	146,817	1.3
FI	300,870	63,923	4.7	250,852	166,108	1.5	243,612	166,108	1.5
SE	229,630	115,372	2.0	145,451	358,849	0.4	145,451	358,849	0.4
UK	201,277	60,970	3.3	181,824	81,982	2.2	168,292	81,982	2.1
EA	278,210	105,307	2.6	227,550	197,274	1.2			
EU28	242,722	83,582	2.9	189,155	174,035	1.1			
EA_w	308,274	124,065	2.5	256,059	218,278	1.2	211,328	218,278	1.0
EU28_w	276,438	109,732	2.5	229,684	194,073	1.2	194,377	194,073	1.0

Source: Commission services.

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