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In the mid2030s, the health of the baby boomers will have deteriorated and many in these large cohorts will be in need of formal and/or informal long-term care.

This "**care wave**" will transform two generations: the baby boomers in need of care and their children who may supply care. It will have significant implications for labour supply, especially for women, saving behaviour, and therefore for productivity, economic growth and its inclusiveness.

The overarching objective of BB-Future is to understand the size and the implications of the care wave on economic and social outcomes, to appreciate the quality of this second ageing-related transformation and to develop policy recommendations for advance planning on the EU and Member State levels.

This deliverable describes the social insurance model which expands and further develops the capabilities of the MEA-PENSIM model for the calculation of the expenditures of, and the contribution rates to, the statutory health and social long-term care insurance.

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The Social Insurance Model

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Abstract:

The aim of this deliverable is to expand and develop the capabilities of the MEA-PENSIM model for the calculation of the expenditures of, and the contribution rates to, the statutory health and social long-term care insurance. For this purpose, the modeling of these two social systems is presented. The extension of the model is taken into account by renaming it in MEA-SOCSIM. In addition to calculating the costs to be borne by the social insurance schemes, the informal monetary costs of long-term care are estimated. These can be determined relatively precisely for stationary care. In ambulatory care, however, the data basis is limited.

At this stage of the project, the MEA-SOCSIM describes the German case. Other countries will follow later in the project. Our main result is that in general, social security contributions for health, nursing care and pension insurance will have to be increased in the future. However, the projected increase is lower than under previous forecasts. This is mainly due to the newest official population forecast, which assumes higher immigration on the one hand and a lower increase in life expectancy on the other hand. Care costs not covered by the long-term care insurance account for around 30% of stationary care and 40% of ambulatory care.

1. INTRODUCTION

In both the German statutory health insurance (GKV) and the German social long-term care insurance (SPV), contribution rate increases are expected for the future. There are various reasons for this development. One is that the demographic development is worsening the numerical ratio between contributors and pensioners. As pensioners on average incur higher expenditure and pay fewer contributions, both the income side and the expenditure side will contribute to increases in contribution rates. Particularly strong pressure is, thereby, expected from the expenditure side in the long-term care insurance sector, as the number of over-80s and therefore the number of long-term care cases will increase sharply. At the same time, the comparatively cheaper care within the family circle could be lower in the future, as many people in need of care either do not have children who could take over the care (low fertility rate) or as the care normally provided by female relatives is in greater competition with own employment (higher female employment).

In addition, there are uncertainties in the development of per capita health and care expenditure. This relates firstly to the question of how the ageing population (increase in life expectancy) will affect morbidity of the older age groups. There are two contradictory assumptions in the literature to this topic. On the one hand, a compression of morbidity (see Fries, 1980) is propagated, which is essentially based on the observation that the majority of healthcare expenditure occurs shortly before death. On the other hand, there is the assumption of an expansion of morbidity (see Verbrugge, 1984), which is based on the assumption that the additional years of life gained through new forms of treatment are generally spent in illness.

Besides the ultimately unresolved question of the development of morbidity, the treatment costs of new medical-technical procedures are also crucial for the future financial development of health and long-term care insurance. In contrast to many other fields, medical technological progress was identified as a cost-increasing factor in the healthcare sector (see Newhouse, 1992)

An appropriate simulation model is required to estimate the financial development of social long-term care insurance and statutory health insurance, as well as any expenditure not covered by the systems. The main goal of this deliverable is to expend the public health insurance and social long-term care insurance modules of MEA- SOCSIM,[1] which forecasts the development of revenues and expenses of both systems under specific assumptions to fit into the modeling structure of BB-Future. However, the insurances do not cover the entire health and care expenses. This is particularly the case for the long-term care insurance, which is designed as a partial coverage insurance. Health insurance, on the other hand, follows the principle of need, but also require co-payments for some services. Compared to previous calculations, we also try to quantify the unfunded care expenditures as far as possible. With regard to stationary care, the most important cost factors are known and can be placed in relation to the expenditures of the long-term care insurance. On the other side, there are no available information on the actual amount of privately financed ambulant care in official statistics. The only information on this topic comes from scientific surveys, which have a high degree of uncertainty due to the complexity of the cost composition of ambulatory care.

[1] Due to the now explicit consideration of all social insurance schemes with the exception of statutory unemployment insurance, we are renaming our simulation model. From MEA-PENSIM (PENion SIMulation) to MEA-SOCSIM (SOCial insuarnce SIMulation)

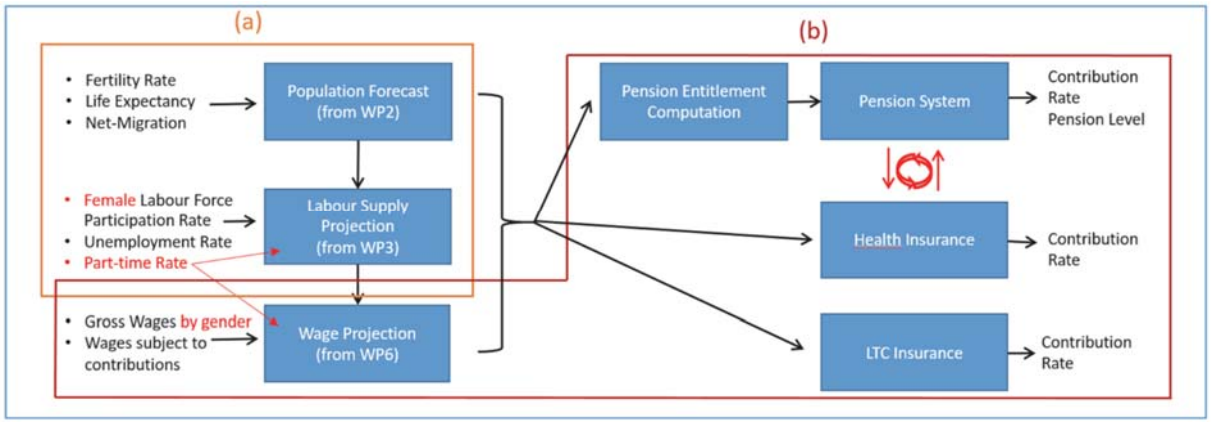
The deliverable is structured into 4 section. The first one is this introduction. The second one presents the simulation model MEA-SOCSIM. This begins with a brief description of the basic structure of the model, which is needed for the projection of the statutory health insurance and social care insurance. In particular, this includes the population and labor market projections. This is followed by a brief presentation of the already mentioned hypotheses of the compression of morbidity and the expansion of morbidity and their consideration in MEA-SOCSIM. At last, we present the modules for the projection of the statutory health insurance and the social long-term care insurance in more detail. In the course of these explanations, we provide brief introductions to the organization of both systems. The third section presents our assumption of the forecast, which are finally discussed in the last section

2. The Simulation Model MEA-SOCSIM and the simulation of the health care systems

2.1 The basic structure of MEA-SOCSIM

Figure 1 shows the main structure of MEA-SOCSIM, which consists of several modules, some of which build on each other, while others are only loosely connected. The latter applies primarily to the modules for the prediction of the social systems.

Figure 1: Structure of MEA-SOCSIM



Source: Own picture

Originally the main purpose of MEA-SOCSIM was the sole projection of the German statutory pension system including all its crucial determinants (therefore MEA-PENSIM). It is, thereby, structured in such a way that reforms can be easily implemented (Wilke, 2004; Holthausen et al., 2012; Rausch, 2017). The modules for the projection of statutory health insurance and social long-term care insurance were added in 2012 (see Rausch and Gasche, 2016). Their main purpose were to solely model interactions between the pension system and the other social insurances (e.g. in respect to the pension adjustment formula). However, they have recently been used rather rarely as official forecasts for the health insurance and care insurance from other studies were used. All model calculations are based on a detailed revenue and expenditure calculation. The calculation of these amounts and the projection of contribution rates and pension levels require assumptions regarding the development of the population and the labor market, with the labor market development depending on the population projection.

The population projection requires assumptions regarding the future development of life expectancy at the time of birth, future net (im)migration and future female fertility. The base year of the population projection is 2022. Alternatively, the official 15th Coordinated Population Projection of the Federal Statistical Office can be used.

The labor market is determined by multiplying the population by German labor force participation rates. MEA-SOCSIM distinguishes between gender, age and the new and old federal states. The latter is necessary as until 2024 the statutory pension insurance evaluates work in the old federal states differently than in the new federal states. The base year of our labor market simulations is 2022. The labor force participation rates are taken from the German national account ("Volkswirtschaftliche Gesamtrechnung"), whereby the age-structure is taken from the German Microcensus. For the future, the labor force participation rates can be varied to simulate the effects of changing labor force participation or to take into account changes in labor market conditions. The number of unemployed, (compulsorily insured) employed, self-employed and civil servants is then determined using age-specific rates based on the labor force. Over the simulation period, these rates can be increased or reduced (independent of age).

Finally, the number of pensioners must be calculated. MEA-SOCSIM considers, therefore, a retirement period between age 51 and age 80, i.e. the first person receives a statutory pension at age 51, while the last person applies for a pension at age 80. In the retirement period, the number of retirees of a given age depends on the presumed retirement behavior of the population. In MEA-SOCSIM it is assumed that the non-compulsorily insured individuals (e.g. self-employed, civil servants, housewives) apply for their pension at the statutory retirement age, although they may leave the labor market earlier or later. Regarding the retirement of compulsorily insured individuals (unemployed and compulsorily insured employees), MEA-SOCSIM considers a more complex procedure, which depends on the labor force participation of these labor market groups. Basically, it is assumed that the time of labor market exit coincides with the time of first receipt of a statutory pension. Based on this assumption, MEA-SOCSIM includes two methods for calculating and adjusting the retirement behavior of compulsorily insured individuals.

The first method calculates the share of pensioners at a certain age based on the decline in the share of compulsorily insured individuals in the population since age 50. From the statutory retirement age, the share of the population drawing a pension is consequently given by (1 minus the rate of compulsorily insured individuals in the population), since by definition all non-compulsorily insured individuals claim their statutory pension at this point. Thus, the first method depends on the assumptions regarding the future evolution of labor force participation rates. The number of pensioners is obtained by multiplying the calculated rates by the population of the age under consideration.

The second method reverses the just presented procedure. The starting point is now exogenously given assumptions regarding the future development of the retirement behavior of the compulsorily insured. Consequently, the number of pensioners is given, while the share of unemployed and compulsorily insured persons in the elderly population has to be determined by applying the procedure of the first method inversely. Finally, the distribution of the calculated compulsorily insured persons between the unemployed and the compulsorily insured employees is based on the future general unemployment rates.

Following the labor market projection, MEA-SOCSIM continues with the projection of wages and salaries. MEA-SOCSIM distinguishes here several wage variables, such as the gross salary per employee according to the national accounts, the wages subject to pension insurance as well as the wages subject to health insurance. The projections themselves are based on exogenously specified growth rates.

Based on all these projections, MEA-SOCSIM then first determines the development of the average pension entitlements of a cohort by gender and region. These depend mainly on the labor market history and the contributory wages of an individual. Afterwards, the number of pensioners and their pension entitlements determine the expenditures of the pension insurance. For a precise description of the computation of the pension insurance income and expenditure (calculation), see Holthausen et al. (2012).

2.2 PROJECTIONS OF MORBIDITY

Compared to projection of the pension insurance, the development of health and long-term care insurance is subject to greater uncertainties and ambiguities. Pension expenditure, for example, follows clear statutory guidelines. A certain amount of money is paid out for each pension entitlement acquired, which develops according to a defined pension adjustment formula. In health and long-term care insurance, on the other hand, expenditure depends on the health development of the population. If this improves, for example due to a healthier lifestyle, healthcare expenditure decreases and fewer people are dependent on care. Accordingly, the development of health morbidity is of great relevance for the projection of long-term care insurance and health insurance. This applies in particular to the issue of the development of morbidity among the older population with regard to the ageing of the population, as the majority of health and care costs are incurred by the older population. In Germany, for example, per capita healthcare expenditure increases steadily after age 40 (see Figure 2) and the probability of needing long-term care rises sharply with higher ages.

In the literature, there are essentially two opposing hypotheses regarding the development of morbidity during the process of population ageing. Both concern the morbidity of the elderly population in the view of the ageing population due to the increase in life expectancy. The first assumes a compression of morbidity (see Fries, 1980), while the second assumes an expansion of morbidity (see Verbrugge, 1984). Both hypotheses were primarily formulated for the healthcare sector. However, Pu (2011) pointed out that they can also be applied to long-term care. In the following we will shortly present both hypotheses and their simulation approach.

Compression of morbidity (Compression hypothesis)

The idea of the compression of morbidity is based on the observation that individual health care spending jumps up in the last year(s) of life. Proponents of this hypothesis, therefore, assume that the relevant determinant of a person's health insurance expenditure is not age alone but also his or her remaining life expectancy. An increase in ("remaining") life expectancy thus results in lower per capita health care spending in a given age group. According to the compression hypothesis, average spending for 70-year-olds, for example, will decrease c.p. in the future because they have a lower probability of dying, i.e., a higher remaining life expectancy, than 70-year-olds today. The population ages, therefore, in a health way, which is why it is also talked about healthy aging.

Graphically speaking, the per capita expenditure profiles by age would shift to the right in line with the increase in life expectancy.

In MEA-SOCSIM, the compression hypothesis is modeled accordingly by shifting the expenditure profiles of the over 40-year-olds.[2] The number of ages by which the expenditure profiles are shifted to the right, as well as the reference year up to which the shift takes place, can be chosen freely. Between the reference year and the base year, the annual age-specific expenditure profiles are determined by linear interpolation. In the case of social long-term care insurance, MEA-SOCSIM considers instead of the average expenditures per age the probability of being in the need of care and adjusted this curve accordingly.

Expansion of morbidity (Expansion hypothesis)

The expansion hypothesis, on the other hand, is based on the observation that morbidity (apparently) increases with age. Proponents of this hypothesis therefore assume that the additional years of life gained through new forms of treatment are more likely to be spent in illness. One can speak accordingly of unhealthy aging. An increase in life expectancy would correspondingly lead to an increase in health insurance expenditure in the additional years of life.

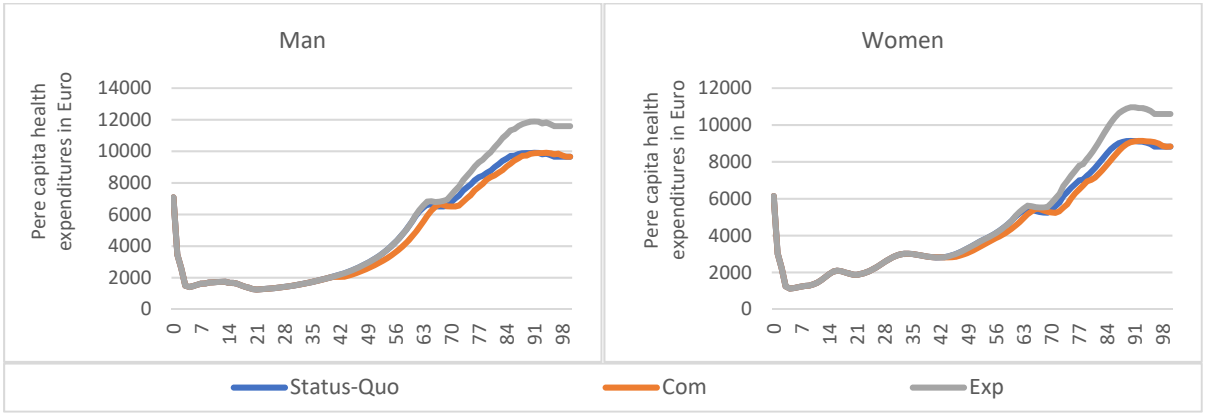
In MEA-SOCSIM, the expansions hypothesis is implemented by steepening the expenditure profiles/curve of the probability to be in need of care of the over 60-year-olds. For this purpose, a percentage change from the base year can be specified for each age between 60 and 100 for a specific reference year. Linear interpolation is then performed between the base year and the reference year.[3]

Figure 2 shows the per capita expenditure profiles of the German public health insurance and the profiles adjusted for the expansion hypothesis and compression hypothesis, respectively.

[2] A more explicit modeling of the compression hypothesis would be the separate consideration of age-related health care costs in the case of death and survival. However, health profiles in this respect are not provided in official statistics.

[3] Theoretically, the computation of the expansion hypothesis in MEA-SOCSIM can be also used to change the expenditure profiles of the over 60-year-olds in any other way.

Figure 2: Per capita health expenditures for men and women divided by Status Quo, Expansions hypothesis and Compression hypothesis



Status quo: no change in expenditure profiles, Exp: expansions hypothesis with continuous increase in expenditure profiles between age 60 and 90 from 0% to 20%, from age 90 onwards constant at 20%, Com: compression hypothesis with shift in expenditure profiles by 2.86 years (men) and 2.37 years (women).

Source: own calculation based on BAS (2023).

2.3 The German Statutory Health Insurance (GKV) in MEA-SOCSIM

Although the modeling of social care insurance is of greater interest for this deliverable, we will first introduce the German statutory health insurance and its implementation. We choose this approach as the principle “long-term care insurance follows health insurance” applies in Germany. This means that the social long-term care insurance (SPV) follows the statutory health insurance (GKV) to a large extent in its organization, which is why both systems are also referred to as sister systems. Actually, the SPV more or less emerge out of the statutory health insurance. Therefore, despite the project's focus on long-term care, it is reasonable to start with the GKV.

The statutory health insurance is the oldest branch of German social insurance and represents the central pillar of the German healthcare system. It currently covers around 90% of the German population. The GKV is organized as a structured health insurance system. That means, there is not a single insurance institution. Instead, there are a large number of different types of health insurance providers with historically different orientations (regional, professional or industry-specific orientation). For each type of provider there are then again, several individual insurers. Since 1996, each citizen (members) is generally free to choose any health insurance provider. Every statutory health insurance provider is obliged to insure every citizen and ensure the provision of medical services.[4] There are legally guaranteed minimum services, whereby the health insurance companies are entitled to offer additional services. Thus, there is open competition between the insurance companies. Some treatments require a personal contribution. This applies, for example, to dentures or additional payments for medication.

In order to prevent health insurance companies from gaining a competitive advantage by recruiting as many healthy and well-off members as possible and neglecting the care of sick and chronically ill insured persons, a morbidity-oriented "risk structure compensation"

[4] An exception to the obligation exists for persons who previously opt out from the public system and have insured themselves privately. For these, a return to the public system is only possible under certain conditions.

(Risikostrukturausgleich (RKA)) was introduced. Since then, each health insurance provider receives a uniform basic flat rate per insured person from the so-called "health fund" (Gesundheitsfond), as well as supplementary surcharges and deductions depending on the age, gender and morbidity of its insured persons. The "health fund" receives its resources from the general contribution rate of the statutory health insurance, which is fixed at 14.6%. If the allocations from the "health fund" are not sufficient for a health insurance provider to cover its expenses, it has to charge an additional contribution rate from its own members. In fact, health insurers have had to levy an additional contribution since 2015, which has risen steadily since then and is in average by 1.6% in 2023.

Simulation of the Statutory Health Insurance

As already mentioned, the extension of MEA-PENSIM already happened in 2012 in the context of the work Rausch and Gasche (2016). The following description follows, therefore, strongly this work. However, the modeling was refined since then in some aspects and interim reforms were incorporated.

The development of the German statutory health insurance system itself depends on the development of:

- the community of insured persons,
- the average health care expenditure per insured person (by age and gender) and
- the average insurable income.

The insured community can be further divided into insured persons paying contributions and co-insured family members (e.g. non-working spouses and children). The latter do not pay contributions to the system themselves although receiving the same benefits as members with contribution payments. In the following, the calculation and projection of these quantities are presented.

Composition and projection of the insured community:

The composition of the group of insured persons in the base year of the projection is taken from the GKV membership statistics of the Federal Ministry of Health (BMG, 2023a). These statistics include the insured group differentiated by age groups, gender, federal state, and type of insurance relationship. The latter distinguishes between compulsory members, voluntary members, pensioners and non-contributory family members.[5]

Based on the distribution of the insured population in the base year, MEA-SOCSIM then projects the future number of insured persons using the previously determined population and labor market projections. At first, the group of future beneficiaries is determined by multiplying the base year ratio of beneficiaries to the total population (by age) with the future population (by age). It is thus assumed that in the future the relative division of the population into GKV-insured and privately insured persons will remain the same.

On the other side, for the determination of the number of contributors a more differentiated view is necessary. First at all we have to distinguish between employed, unemployed and pensioners.

[5] Voluntarily insured persons include, in particular, all employed persons with an annual income above the statutory health insurance contribution assessment ceiling ("Beitragsbemessungsgrenze").

The number of unemployed and pensioners can be taken directly from the labor market projection. For the number of the remaining compulsory and voluntary members, on the other hand, we use again the BMG statistics to calculate their share on the workforce (excluding civil servants) by age for the base year. Their future number is then given by multiplying this rate with the number of employees and self-employed persons.

The use of the labor market projection guarantees a direct consideration of changes at the labor market on the structure of the insured population. This includes, for example, an increase in female labor force participation or an increase in the average retirement age. By contrast, the separate consideration of beneficiaries and contributors is unproblematic as long as the ratio of the statutorily insured to the privately insured does not change in general. If, for example, women increase their employment, the number of non-contributory insured family members decreases, while the number of insured women remains the same.

Calculation of expenditures:

GKV expenditures are derived from age- and gender-specific per capita expenditure profiles multiplied by the number of insured persons (beneficiaries). The age-specific expenditures per insured person separately for men and women are calculated from data provided from the Federal Office for Social Security (BAS, 2023). In MEA-SOCSIM, the age-specific expenditure per insured person is scaled up so that multiplying it by the number of beneficiaries results in the total health insurance expenditure for the base year.[6] For this purpose, we multiply the age-specific expenditure profiles by a suitable age-independent factor. As a result, the per capita health care expenditures do not only include health insurance expenditures related to illness anymore. In particular, the administrative costs are then also considered in the profiles. The future development of the expenditure profiles depends on the assumptions to be made on:

1. The general impact of population aging on morbidity. Here, it is essentially necessary to decide whether the (age) distribution of expenditure profiles is assumed to remain constant or to change in accordance with the compression hypothesis or expansion hypothesis (see section 2.2).
2. The elasticity of health spending with respect to income growth.
3. The impact of medical and technological progress on health spending.

Point 1 and its implementation in MEA-SOCSIM is discussed in section 2.2. The correspondingly modified expenditure profiles are adjusted in accordance with the assumptions regarding the elasticity of health care spending and the impact of medical and technical progress on the health spending. Both are carried out independently of age at rates to be determined externally. The rates can, for example, be set equal to the wage growth assumptions.

Theoretically, however, it is also conceivable that the costs of medical technical progress affect age groups differently. This is especially the case if innovations in diseases of old age are con-

[6] We exclude the expenditures attributable to the Corona pandemic from this calibration as they are likely to be only temporary and disappear in the next years. We consequently consider the remaining costs of the pandemic separately.

cerned. In this case, these assumptions must be taken into account as part of the expansion hypothesis. Expenditure profiles would then steepen not because of unhealthy aging, but because of higher treatment expenses among the elderly due to new but more costly therapeutic procedures.

Calculation of revenues:

The revenues of the statutory health insurance system consist primarily of the contributions in accordance with the general contribution rate of the statutory health insurance system of 14.6% and the contributions based on the additional contribution rates of the different health insurers. In addition, there is a federal subsidy of 14.5 billion euros, which covers about 5% of the total expenditure.[7] Since there is no general dynamization rule for the federal subsidy, the simulations consider a constant federal subsidy which will make up less and less of the total expenditures of the health system.

In order to calculate the future revenues of the statutory health insurance and, in particular, to determine the average additional contribution rate of the health insurers, which is necessary to cover the future expenditures, the contribution basis of the health insurance is required. This contribution basis consists of the income of employees subject to GKV, the statutory pensions of pensioners insured in the GKV, and the basis on which contributions are paid for unemployed.

The age-specific incomes of employees can be estimated using information from the pension insurance statistics portal (GRV, 2023). Among other things, it contains the number of employees subject to compulsory insurance in the GRV, broken down by income class, age class, gender, and by West and East Germany. Compared with the income to be taken into account for the pension insurance, however, it must be taken into consideration that the contribution ceiling for health insurance (and long-term care insurance) is lower than for pension insurance. Income above the GKV contribution ceiling is consequently to be equated with the ceiling value. The average incomes subject to GKV contributions are then forecast with the same growth rates that are used to forecast the age-specific average wages subject to GRV. The sum of the contributory labor income is obtained by multiplying it by the number of contributors.

The pension income subject to contributions can be taken more or less directly from the pension calculation. We only need to control for pensioners who do not live in Germany or are privately health insured. For this purpose, the total pension expenditure, the reported health insurance expenditure of the pension insurance scheme and the actual contributions received for pensioners according to the BMG's financial report are compared, resulting in a correction factor of 9%.

The Federal Employment Agency (BA) pays health insurance contributions for unemployment benefit I recipients based on 80% of their last gross income. MEA-SOCSIM assumes one year of unemployment benefit I receipt. Accordingly, the contribution base for unemployment benefit I recipients is calculated by multiplying their number by 0.8 and the previous year's employment income subject to GKV.

[7] During the Corona pandemic, the federal subsidy was significantly expanded to cover the costs of the pandemic. This particularly affected the years 2020 to 2022.

For recipients of the new “Bürgergeld” (former unemployment benefits II), the federal government pays contributions based on 0.2155 times the so-called "Bezugsgröße" (reference amount).[8] Furthermore, a reduced contribution rate of 14.0% applies to recipients of Bürgergeld.[9]

Calculation of the average (additional) contribution rate.

In the calculation of the contribution rate, several “liquidity” reserves must be considered. The first one is the reserve of the “health fund”, which must amount to at least 20% of the monthly expenditure of the health insurance. Then there are all reserves of the health insurance providers. Since MEA-SOCSIM does not consider all providers separately, all those reserves are combined in a common one for the simulation. The reserves of the health insurance providers must be equal to at least 20% of the monthly expenditure of the provider, but may not exceed 50% of their monthly expenditure.

Taking both reserves into account, MEA-SOCSIM first determine the revenues based on the general contribution rate of 14.6%. Based on these, and taking into account the minimum reserve of the “health fund”, the volume of contributions to the health insurers are determined and therefore their average deficit/surplus under the current additional contribution rate. Considering the minimum and maximum reserve demand the necessary average additional contribution rate can then be computed.

2.4 THE SOCIAL LONG-TERM CARE INSURANCE (SPV) IN MEA-SOCSIM

The social long-term care insurance is the youngest branch of the German social insurance system. As already mentioned, German social long-term care insurance follows the statutory health insurance to a large extent in its organization. This applies in particular to the group of insured and contributing members. The structure via several providers is also identical, whereby each health insurance provider also serves as a long-term care insurance provider. As a rule, but not necessarily, almost every citizen is therefore insured with the same provider for both health and long-term care.

However, there are also differences. For example, the providers cannot levy an additional contribution rate. Instead, the general long-term care insurance contribution rate is set in such a way that the expenditures of all long-term care insurance providers are covered. This difference is due the fact that the benefits in long-term care insurance are more strictly regulated and, in particular, do not differ between the providers. The nursing care insurance providers are therefore not in competition with each other. Compared to the GKV, however, the contribution burden differs depending on the number of children. Insured persons without children have to pay a 0.6 percentage point (PP) higher contribution rate. For parents with more than one child, the contribution rate is reduced by 0.25 pp from the second child onwards.

Probably the most decisive difference between the two systems is that the GKV follows the needs principle, while the SPV is designed as a partial cover insurance. For this purpose, those in need

[8] The "Bezugsgröße" corresponds approximately to the average income of the statutory pension insurance (see § 18 SGB VI and Anlage1 SGB VI).
[9] Any deficit in contributions calculated for the base year is summarized in a residual value and projected in line with the development of the calculated contribution basis.

of care are initially divided into five care levels (care grade 1: slight impairment of independence or abilities to care grade 5: severe impairment of independence or abilities with special requirements for nursing care). The more severe the need for care, the higher the benefits. The benefits themselves are regulated by various lump sums. Among other things, there are flat rates for stationary care, home care by ambulant care services or cash payments for private care.[10] In some cases, lump sums can be combined or drawn in parallel.

However, particularly in stationary care, the flat rates have been far from enough to cover the costs, which led to high co-payment demands on the part of the nursing homes. The law stipulates that these co-payments must be levied uniformly in a facility, regardless of the degree of need for care (care level). Differences may occur, however, between nursing homes. The facility's uniform own contribution is refereed as “Einrichtungseinheitlicher Eigenanteil” (EEE). As the average EEE exceeds the financial means of many, especially pensioners, the social care insurance has started to cover a part of those co-payments. The amount covered depends on the length a person is already in stationary care but not on the care level as long as it is at least level 2.[11] The maximal covering rate is payed after three year in stationary care and amounts to 70% (75% starting in 2024) of the EEE.

Simulation of the Social Long-Term Care Insurance

Despite those differences, MEA-SOCSIM still relies on some parts of the procedure used for the GKV simulation in its modeling of the SPV. This applies in particular to the group of insured and contributing members. Also, the contribution base can be taken from the GKV by treating the additional contributions for childless like subsidies and the reduced contributions for parents with more than one kid as additional expenditures.[12] This is possible as long as we assume that the increase/reduction in the contribution rate remains the same over the simulation period.

For the calculation and projection of the expenditures, on the other hand, MEA-SOCSIM has to follow a different approach as for the GKV-projection. This is mainly due to the fact that there are no average per capita care expenditure profiles available like for the health insurance.

In the following we first present the computation of the SPV-expenditures. Afterwards we will show how MEA-SOCSIM deals with the extra contribution of childless and reduction of the contribution rate for parents with more than one child. At last we shortly discuss the contribution rate calculation.

Calculation of expenditures:

There are in total the following five expenditure items MEA-SOCSIM considers in the calculation of the SPV:

1. Expenses via flat-rate payments separately for stationary and ambulant care,

[10] In the following, we refer to home care, regardless of whether it is provided privately or by an ambulant care services, generally as ambulant care.
[11] There is actually no reimbursement for people in stationary care who are only in care level 1.
[12] There is a minor difference in the contribution basis, which is a higher contribution by the Federal Employment Agency for recipients of Bürgergeld. Specifically, the agency pays contributions on the basis of 0.2266 times the "Bezugsgröße" (reference amount).

2. Participation in costs for EEE,
3. Pension insurance contribution for caregivers,
4. Payments into the “Pflegevorsorgefond” (long-term care fund), and
5. Other expenses (e.g. administrative costs).

Point three to five where not mentioned yet. We will do this together with the presentation of their calculation.

For the first two expenditure items MEA-SOCSIM considers:

- the number of people in need of care separately by stationary and ambulant care,
- the average flat-rate benefits per person in need of care separately by stationary and ambulant care,
- the average EEE, and
- the average duration in stationary care.

The current **number of people in need of care** are provided through the BMG (2023b) separately by stationary and ambulant care, the care level, gender and age. Using that information, we compute **age- and gender-specific probabilities to be in need of care** by putting the number of care cases in relation to the total population. These profiles are naturally initially relatively low, almost zero, but then increase more and more rapidly with increasing age.

For the future, these care probabilities can be adjusted based on external rates separately for ambulatory and stationary care as well as the care level, but regardless of age and gender. However, in addition, the care probabilities can be adjustable according to the assumptions on the effects of population ageing on morbidity (see Section 2.2. and Pu, 2011). This essentially concerns adjustments to the care probabilities according to the **compression hypothesis** or **expansion hypothesis** and therefore to changes along the age dimension**.**

The **average flat-rate benefits per person in need of care** can be estimated by a statistic of the BMG regarding the number of beneficiaries by type of service and level of care. Ultimately, these simply have to be multiplied by the flat rate amounts of the respective type of service and divided by the total number of care cases in stationary and ambulant care, separately according to the care levels. For future, they are extrapolated using exogenously specified growth rates.

The average **facility's uniform own contribution (EEE)** are provided by the "Association of Statutory Health Insurance Providers" (Verband der Ersatzkassen) (see. VDEK, 2023) and are update through external rates.

At last, the **average duration in stationary care** is taken from Rothgang (2021) and is assumed to remain constant over the whole simulation horizon. This may be a rather optimistic assumption, considering the rising life expectancy. In fact, this assumption is probably most plausible under the compression hypothesis. However, assumptions about changes in length of stay in stationary care are speculative, which is why constant rates represent an acceptable compromise.

The expenses via flat-rate payments are then given through the multiplication of the number of people in need of care and the average flat-rate benefits per person. The participation of the social

care insurance on the EEE by the multiplication of the people in stationary care (with care level 2 or higher) with the average EEE and the duration in stationary care and the participation amount.

In addition to the expenditures for the care service, the social care insurance must cover two further expenditures. First there are the **pension insurance contributions for not employed caregiver** who are not yet retired themselves. The contributions paid are flat-rates which depend on the care level of the person being in care. The care service must cover at least ten hours spread over at least two days and the care giver must not be employed for more than 30 hours per week otherwise. Payments are again made only for care levels 2 or higher. MEA-SCOSIM takes these expenditures from the BMG statistics for the base year and updates them annually based on the development of gross wages, the pension insurance contribution rate and the number of ambulatory care cases as we lack sufficient information for a more detailed simulation.

Another relevant expenditure item of the SPV are annual payments into the so-called "**Pflegevorsorgefond**" (long-term care fund). This fond was introduced 2015 with the intention to stabilize the contribution rate after 2035, when the first cohorts of baby boomers reach an age with an increased probability to be in need of care. The annual payments amount to 0.1% of the contributions to the long-term care insurance. The last payment is scheduled for 2033. Starting in 2035 the fond can be used to stabilize the contribution rate. Therefore, an annual amount equal to 1/20 of the savings volume in 2034 can be withdrawn. Unused funds can be transferred to the next year.[13]

Calculation of additional revenues from childless, revenues shortfall for the second to fifth child and other revenues:

As already explained, the contribution base is almost identical to the GKV and can therefore be taken directly from the GKV with only minor adjustments. However, this does not apply to the special regulations depending on the number of children, which do not exist in the health insurance. Those special treatments were primary introduced with the argumentation that children are potential future contributors and may relieve the finances of the long-term care insurance in the future by providing personal care for their parents. In general, childless members must, therefore, pay a by 0.6 PP higher contribution rate as long as they do not receive Bürgergeld or are younger than 24 years old or were born before 1939.[14]

In addition to the supplement for childless, since 2023 parents with at least two children receive a discount on the general contribution rate. For each child under the age of 25 (calculated from the second child), this amounts to 0.25 contribution rate points. This applies from the second to the fifth child. Accordingly, the maximum discount is 1.00 PP. Children who have reached the age of 25 are not considered. Hence, in the case of two children the deduction ceases to apply as soon as the older child reaches the age of 25.

[13] Administrative costs and other smaller expenses are summarized in a residual and are updated with the inflation rate.
[14] The additional contribution was 0.25% when it was introduced in 2005. In 2022 it was raised to 0.35%. 0.6% applies since 2023.

Both amounts are roughly estimated in MEA-SOCSIM under the assumption that the increase/reduction of the contribution rate remain the same, hence 0.6 PP for childless and 0.25 PP per additional child. This is crucial insofar as, under this assumption, the resulting increase or decrease in revenue can be calculated independently of the contribution rate.

For the **additional revenue from childless members**, the number of the childless population is required. Thereby, the number of childless women (by age group) can be taken from a special survey on motherhood, which is surveyed every four years in the course of the German Microcensus (see StaBA, 2019a). Unfortunately, there is no corresponding survey on fatherhood. Due to this data gap, we take the age distribution of childless women also for men, but assume a 20% higher childless rate. The distribution of childless women is then projected under consideration of the future assumptions regarding the fertility rates. In addition, we consider the results of Bönke et al. (2020), who find a 40% smaller income among mothers compared to childless women. The study finds no similar difference between fathers and childless men. The amount of the additional revenue is than given by the multiplication of the corrected income of childless, the number of childless and the additional contribution rate of 0.6%.

The estimation of the **revenue shortfall for the second to fifth child** relies on two rates. The first one is the rate of mothers (and fathers) with at least two children under 25 on the whole population (by age); the second one is the rate of individuals (younger than 25) with at least one sibling under 25 on the whole population (also by age). Both rates can be estimated from the Microcensus of 2019 and data from the German Pension Insurance. For fathers, the distribution of women is relied on, as before. The first rate is used to estimate the age-specific average income of mothers and fathers who benefit from the reduction of the contribution rate. The second rate is used to determine the fraction of the under-25-year-old population for which there is a contribution rate reduction based on their number of siblings. Together with the per-child deduction of 0.25%, the product of these values then yields an estimate of the revenue shortfall for the second to fifth child. The used rates are kept constant over the entire simulation horizon.

In addition to the contribution income, a **federal subsidy** of one billion Euro was introduced in 2022. So far, there are no rules for a dynamization of this subsidy in place. On the contrary, according to current plans, the payments are to be suspended for the years 2024 to 2027 in order to reduce government spending and comply with the debt brake. At the same time, allocations to the nursing care fund should be reduced by around one billion Euro for the same years. In MEA-SOCSIM, for the time being, we consider the official rules without dynamization of payments, but also without the temporary abolition.

Calculation of the contribution rate:

For the calculation of contribution income and, in particular, the contribution rate, we assume that the childless supplement will not be increased further, i.e. will remain at 0.6 contribution rate points in the future. Similarly, no increase in the deductions for the second to fifth child is assumed. Accordingly, they are included in the calculation of the general contribution rate as additional revenues (similar to subsidies) or additional expenditures.

Furthermore, a minimum reserve of 0.5 months' expenditure must be maintained across all long-term care insurance providers. However, the federal government may adjust the contribution rate by law if the total reserve is expected to fall short of one month's expenditure (see § 55 SGB XI). In MEA-SOCNIM, we therefore take one month's expenditure as the minimum reserve for the social long-term care insurance and adjust the contribution rate accordingly.

Own contribution for care

As already explained, the social long-term care insurance is designed as a partial coverage insurance. Accordingly, care costs that must be borne by those in need of care themselves remain. If those costs exceed the financial means of a person, until 2020 their children had to contribute to the costs. After 2020, however, this is only the case if their annual income exceeds €100,000. If the personal contribution cannot be borne (even with the support of the children), "Hilfe zur Pflege" ("assistance for care") can be applied for from the German social welfare.

For stationary care, the total costs for the base year can be calculated relatively precisely due to the legal regulation of facility's uniform own contribution (EEE). For the future development, the ratio of those personal contribution to total expenditure depends on whether the flat-rate amounts that social care insurance pays per person in need of care grow in line with the costs of the care facilities. If their growth lags behind the general increase in spending, the difference must be offset by larger increases in EEE. Although long-term care insurance covers up to 70% (75%) of those costs since 2022 (starting in 2024), the remaining portion must continue to be borne by those in need of care themselves, regardless of their level of care.

Based on VDEK (2023) and Rothgang (2021) we estimated for 2022 a nationwide average EEE of €1,014.5 per month. The number of people in stationary care was around 850,000 people. The total amount of EEE therefore amounted to 10.5 billion Euro. The lump sums paid by the social care insurance corresponded to a further 15.12 billion Euro and the total expenditure for stationary care to 18.41 billion Euro. Therefore, on average, the long-term care insurance covered around 72% of stationary care costs.[15] However, the coverage rate is actually lower for care level 1 and higher for the other care level as there is no reimbursement of EEE for care level 1. Moreover, the coverage rate differs in respect to the length a person is already in stationary care as the reimbursement of EEE depends on this.

For ambulant care, the total costs are more difficult to determine. As already mentioned, this is mainly because there are no official numbers on this topic. In addition to the actual costs for ambulant care services, which go beyond the care insurance flat rates, there may also be informal social costs due to privately provided care. For example, own employment may have to be reduced in order to take care for a relative. Moreover, the care can come at the expense of your own free time and, in the worst case, health. These costs are naturally difficult or impossible to quantify.

Rothgang and Domhoff (2019) estimate the non-covered ambulant expenditures at 150 Euro per month based on Schneekloth et al. (2017) and Rothgang and Kalwitzki (2017). However, they explicitly point out a great deal of uncertainty regarding this amount. Using nevertheless this number and taking the development of the EEE since 2019 into account, we estimate an average personal contribution of 216 Euro in 2022. Multiplied by the number of people in ambulant care, this results in uncovered costs of 10.5 billion euros (8.5 billion euros without care level 1). Together

[15] This does not include the costs of accommodation and investments. Adding these expenses would reduce the coverage rate to 47%.

with the nursing care insurance expenses for ambulant care, the total expenses for ambulant care amount to 39.2 billion Euro (37.2). The coverage rate of social care insurance corresponds therefore to 73% (77%) and is slightly higher than for the stationary care.

3. ASSUMPTIONS

The simulations presented in this paper are based on the moderate variant (G2-L2-W2) of the 15th coordinated population projection (see StaBA, 2022a). This extrapolates the German population until 2070 under the assumptions of:

- an increase in life expectancy at birth to 84.6 years for men and 88.2 years for women by 2070,
- an increase in the fertility rate to 1.55 by 2032,[16] and
- a linear decrease in annual net immigration from 1.3 million persons in 2022 to 250,000 in 2033.

From 2033 onward, constant rates are assumed for both the fertility rate and net migration.

The assumptions regarding the labor market are based on the employment assumptions of the middle variant of the Pension Insurance Report 2022 (BMAS, 2022), the Joint Economic Forecast of the German Economic Institutes of 2023 (Gemeinschaftsdiagnose, 2023), and the spring forecast of the German government of 2023 (BMWK ,2023). These include assumptions regarding the development of the total number of employed persons, self-employed, employees (separated into compulsorily insured and marginally employed persons), and unemployed. However, it does not provide the developments separate by gender, old and new federal states, or age, although different growth rates are to be expected here. In addition, no explicit information is provided on the development of the number of pensioners or the assumed reaction of the population to the increase in the statutory retirement age. The Pension Insurance Report at least reports the short-term development of the equivalence pensioner.[17] Consequently, we cannot guarantee an exact replication of the administrative assumptions. The labor market rates of the administrative data are obtained by means of age-independent adjustments to the base-year rates. Retirement patterns are adjusted such that the future number of retirees roughly corresponds to the trend in the equivalence pensioner. For this purpose, we assume that the compulsorily insured labor force postpones its retirement by nine months for each year the statutory retirement age is raised.

Wage and salary developments are also taken from the Pension Insurance Report 2022. In its medium assumption, the report assumes gross wage growth rates of between 4.5% and 5% for the years 2022 to 2024 due to the high inflation. From 2025 onward, inflation is assumed to normalize. Wage growth is then expected to be 3% p.a., which we assume to be made up of 1.8 PP inflation and 1.2 PP productivity growth.

The simulations are based on the legal situation in September 2023, which means that they do not include any cost-cutting measures due to the current severe household situation. In particular,

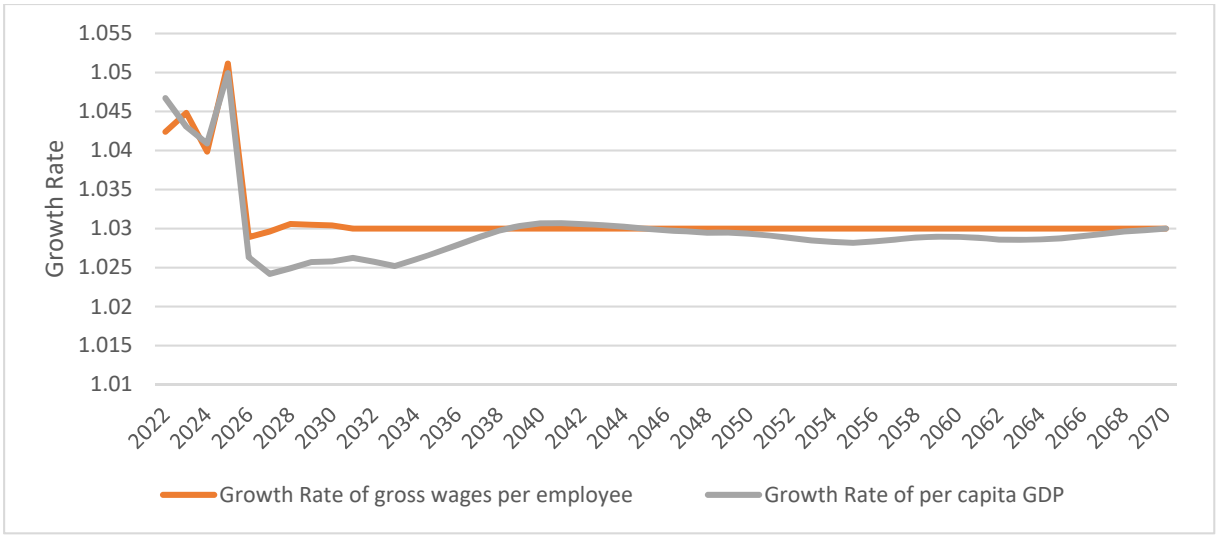
[16] At the same time, the average age of women at birth is expected to increase from 31.5 years to 32.6 years.
[17] The equivalence pensioner is the ratio of pension expenditure to the standard pension. The standard pension is the pension that a pensioner with 45 earning points receives without deductions. The development of the equivalent pensioner therefore matches the development of the number of pensioners, as long as the average number of pension entitlements does not change.

temporary suspensions or reductions in federal subsidies to the social security systems were already discussed before the worsening of the household situation.

With regard to the development of healthcare and nursing care spending, we follow the assumptions of Werding et al. (2020). He assumes that the per capita health expenditure profiles grow in line with the development of GDP, which we estimate through the development of the sum of gross wages. For nursing expenditures, on the other hand, costs are likely to be more dependent on personal costs. Werding et al. (2020), therefore, use gross wage growth per employee for the adjustment of the flat rates per case, which we follow. Moreover, we assume the same growth rate for EEE. Compared with GDP growth, this turns out to be higher growth rates under our assumptions, since the growth of the sum of gross wages is dampened by the decline in the number of employed persons due to the retirement of the baby boomer generation. This is particularly the case until 2038 (see Figure 3). After 2038, the growth rates of GDP and wages per employee then barely differ.

In contrast to all other benefit adjustments the flat rates per care case are updated only each third year. This follows an old legal regulation, which is currently suspended. The current legal situation only includes a 4.5% increase in 2025 and an increase in 2028 by the accumulated core inflation between 2025 and 2028, but not by more than the accumulated increase in the sum of gross wages per employee over the same period (see §30 SGB XI). Accordingly, the assumed gross wage per employee adjustments starts in 2031. Regarding the adjustment of EEE we, moreover, take over the development from 2022 to 2023 from publications of the VDEK (2023). For the adjustments in 2024 and 2025 we consider, moreover, larger growth rates accordingly to Rothgang (2021). Rothgang estimates, thereby, the growth of the EEE in view of the "third Care Strengthening Act" (dritte Pflegestärkungsgesetz), which established a collective bargaining (Tarifbindung) in the nursing sector on the one hand and an expansion of the number of nursing staff through new staffing assessment procedures on the other hand. Both will lead to higher costs and a corresponding increase in EEE. We adopt his assumptions, but adjust them for the stronger wage development due to the higher inflation rate as assumed at the publication of his work. The adjustment accordingly to the gross wage growth per employee starts in 2026.

Figure 3: Growth Rate of gross wages per employee and per capita GDP



Source: Own calculation

At last, we make assumptions regarding the development of the rates implying the need for care. With regard to stationary care probabilities, we do not assume any changes, i.e., we keep the probabilities constant for the baseline scenario. On the other hand, we can observe a significant increase in the proportion of persons in ambulatory care in the most recent years. This increase is particularly intensive for care level 1. Hardly any change can be observed for the highest care level 5. We estimate the further development of ambulatory care probabilities based on the past trend using a logarithmic extrapolation until 2030, separately for each care level (1 to 4). We then keep the rates constant. Overall, this leads to growth rates of 143% (care level 1), 19% (care level 2), 27% (care level 3) and 9% (care level 4). The increase for care level 1 is likely to be overestimated and should be considered a worst case. However, since persons in care level 1 do not receive any relevant benefits for ambulatory care from the social long-term care insurance system, this assumption is not decisive for our simulation calculations.

In addition to this baseline scenario, we consider the following alternative scenarios:

- Com: Here, the per capita health expenditure profiles as well as the probabilities of care are shifted to the right according to the compression hypothesis. By 2070, the profiles are shifted by half of the assumed increase in life expectancy, i.e. 2.86 years for men and 2.37 years for women.[18]
- Exp: Here, the profiles of per capita health care expenditures as well as the probabilities of care are raised more steeply with increasing age in line with the expansion hypothesis. By 2050, the profiles/rates are assumed to have increased by 20% more from age 90 onward. Between ages 60 and 90, the additional growth rate increases linearly.[19]
- MedTec: Here, the financial challenges of a cost-driving medical-technological progress shall be shown. For this purpose, 0.5 PP higher growth rates are assumed for the expenditure profiles, the per-case flat rates of the long-term care insurance and the EEE.
- WageG: This scenario only varies the assumptions on the health insurance. In contrast to the baseline scenario, the expenditure profiles are adjusted with gross wage development per employee.
- Inf: This scenario only varies the assumptions on long-term care insurance. In contrast to the baseline scenario, the per-case flat rates are only updated with inflation, although we continue to assume the real care cost per care case to develop in line with the gross wage development per employee. Accordingly, the personal contributions have to increase more strongly to cover the total costs of care. In the case of stationary care, the EEE has to increase, therefore, by additional 0.8 PP p.a. on average.

[18] The consideration of only half of the increase in life expectancy follows again the assumptions of Werding et al. (2020).

[19] It should be noted that the assumptions for the expansion hypothesis are essentially freely chosen, while the assumptions for the compression hypothesis are independent assumptions in Werding et al. (2020) fundamentally depend on the assumptions about the development of life expectancy.

4. RESULTS

In the following we present our results. We start with the social long-term care insurance, followed by the statutory health insurance. At last we briefly discuss our calculations for the statutory pension insurance and compare them with the results of the Pension Insurance Report of 2022. This is also intended to classify our calculations in relation to official projections.

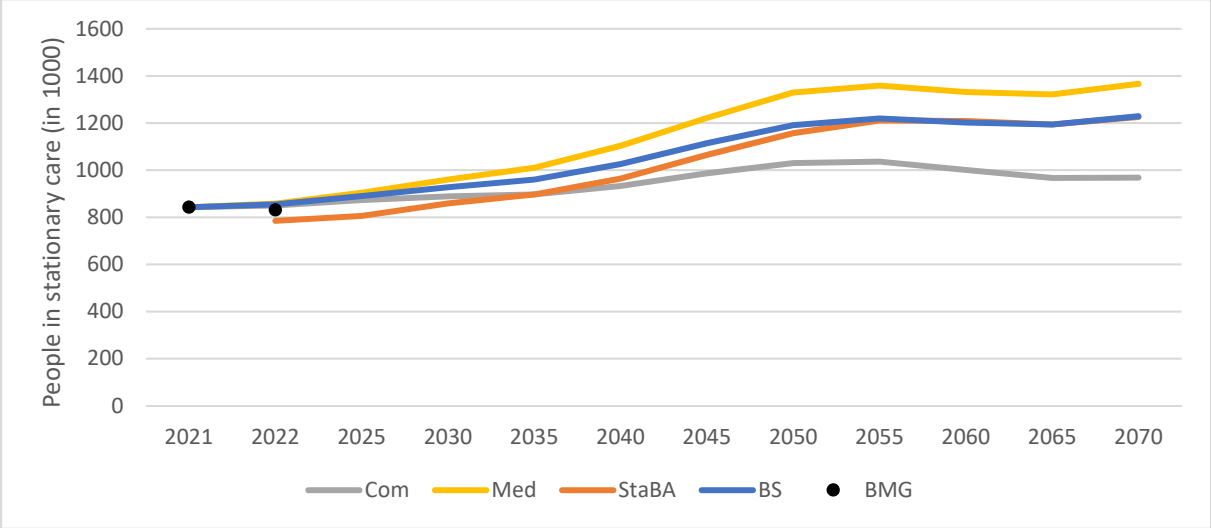
2.5 SOCIAL LONG-TERM CARE INSURANCE

Before we discuss the cost development (contribution rate) of the social long-term care insurance, we first compare our forecast of the long-term care cases with the corresponding forecast of the Federal Statistical Office (see StaBA, 2023b). We compare our results with the variant "V2 - Model of the further effects of the introduction of the concept of the need for long-term care" of the StaBA, which, like us, takes into account the most recently observed trend in ambulatory care with regard to care probabilities.

Figure 4 shows the development of service recipients in stationary care. It depicts the official numbers from 2021 and 2022 according to the German Federal Ministry of Health (BMG) (black dots), the projections of the German Federal Statistical Office (orange line), and our calculations according to the baseline scenario (BS), Com, and Exp scenarios. In 2022, the number of persons in stationary care stood at 830,000, according to the BMG. This number increases to about 1,230,000 persons by 2070 under both our baseline scenario and the StaBA projection. The main increase occurs, thereby, between 2035 and 2055, hence in the years the baby boomer generation reach the ages above 75 and, therefore, ages with a high possibility to become in need of care. However, there is a noteworthy difference between the number of people in stationary care between the StaBa forecast and our forecast on the beginning of the simulation timeline. We are starting from a higher level while the StaBA predicts at first smaller numbers. In fact, the StaBA underestimates for 2022 the official numbers of the BMG by 45,000 while we overestimate the number in 2022 by almost 25,000 persons.[20] Hence, in the end both estimations are not accurate for 2022. However, we cannot explain why the StaBA assumes a smaller number of people in stationary care for 2022 than in 2021.

[20] The deviation in 2022 is due to the fact that 2021 is the basis year in both simulations. In future versions we will update the basis year of the simulations.

Figure 4: Number of people in stationary care (in 1000)



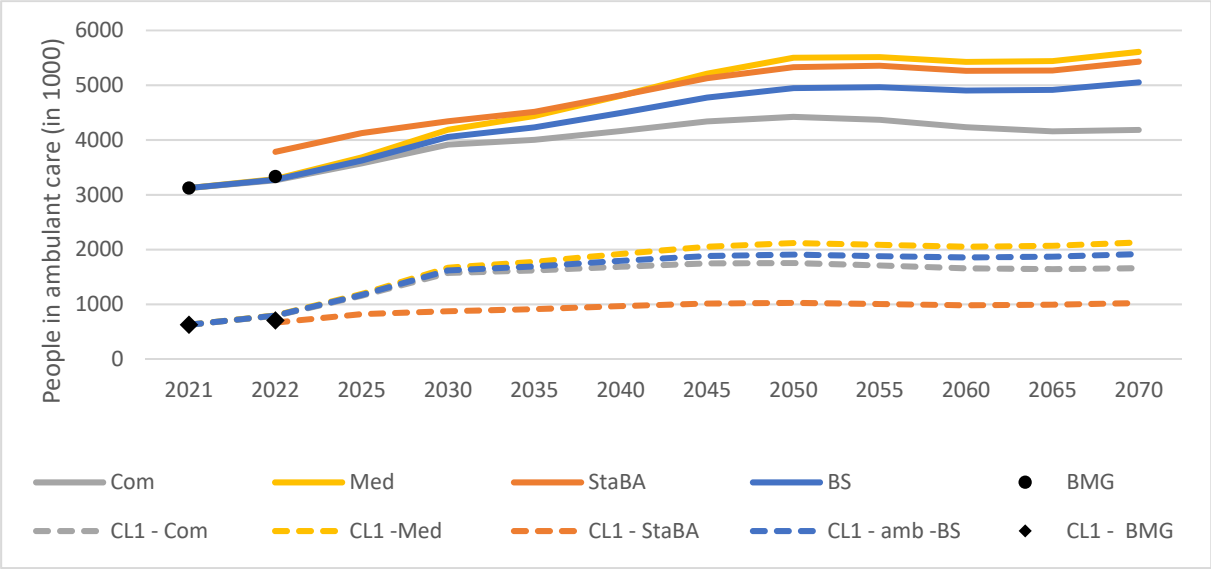
Source: Own calculation

Under the compression hypothesis it is assumed that the probability of needing long-term care depends on the distance to death. Therefore, the number of long-term care cases rises less sharply here. This is mainly due to the fact that the time during which a person is in need of care is shorter or rather increases less strongly as under the baseline scenario. Moreover, an intermediate peak in care cases occurs in 2050s. This is due to the fact that the baby boomers are reaching an age with high mortality rates and are therefore increasingly in need of care, which lead to a higher number of care cases. Afterwards, the number falls as the strong baby boomer generation passes away. Thus, about 1,030,000 stationary nursing cases are forecast for the 2050s while the number then declines slightly to 970,000 until 2070.

On the other hand, the number increases more under the expansion hypothesis. This is because it is assumed that the additional years of life will be spent in poorer health and thus the probability of needing care will increase. Overall, under our assumptions, the number of people in stationary care increases to 1,370,000, which translates into a 35% higher increase than under the baseline scenario.

Figure 5 shows the development of ambulatory care cases for the same projections and scenarios. However, since the StaBA treats the group in care level 1 without benefits separately in their projections, we show the group of care level 1 also separately (dashed line). Accordingly, the solid line contains only the individuals in care level 2 to 5.

Figure 5: Number of people in ambulant care (in 1000)



Note: Solid line care level 2 to 5, dotted line care level 1

Source: Own calculation

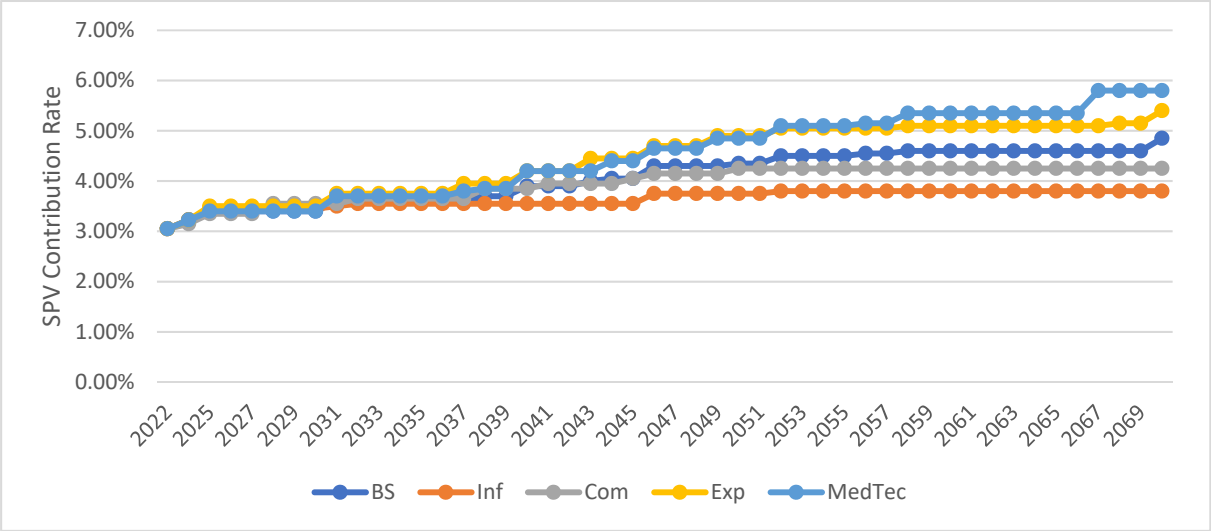
For 2022, a similar underestimation as for stationary care can be observed with regard to the number of ambulatory care cases in care level 1 in the StaBA forecast. However, this discrepancy may have its origin in the stricter definition of "without benefit". Hence, the number of the StaBA does not include the ambulant care cases of level 1 who receive some benefits from the SPV. On the other hand, the number is overestimated in our calculation. In the long term, there is a more serious difference between our projections and those of the StABA. Based on our assumptions, the number of level 1 ambulatory care cases more than doubles by 2030, while the StaBA forecasts show only a slight increase. By 2070, the number of people with level 1 care under our baseline scenario will be even 1.4 times higher than in 2022, while the StaBA predicts only an increase of 50%. As already noted in section 3, our assumptions represent the worst case and, since care level 1 is not entitled to relevant benefits in ambulatory care, this assumption is irrelevant for the projection of the SPV.

For the remaining ambulatory care cases (care level 2 to 5) the StaBA projection overestimates the official BMG numbers by 450,000 persons in 2022. By contrast, we underestimate the actual numbers by 55,000 people. Over the simulation period, the discrepancy between our baseline scenario and the StaBA projection then decreases slightly to 380,000 persons in 2070. The general trend is therefore similar under both simulations. The number of ambulatory care cases rises in line with stationary care until 2050 and then remains relatively stable. The German Federal Statistical Office estimates that there will be 5,330,000 nursing cases in 2050, while we estimate 4,950,000.

Similarly, to stationary care, we observe a smaller increase in ambulatory care cases under the compression hypothesis, including a peak in 2050, while the number of ambulatory care cases increases more strongly under the expansion hypothesis. In 2070, the difference to the baseline scenario amounts to 870,000 persons under the compression hypothesis and 560,000 persons under the expansion hypothesis.

The increase in the number of people in need of long-term care inevitably affects the finances of the social long-term care insurance system and thus its contribution rate. The latter is shown in Figure 6, where the general SPV contribution rate without the supplement for childless persons is shown. In the base year, the contribution rate is 3.05% and then rises to 3.4% by 2024. In the baseline scenario, the contribution rate then rises to 4.85% by 2070. Between 2031 and 2040, it can be kept relatively constant between 3.6% and 3.7%. This is, on the one hand, due to the small increase in the number of people requiring stationary care until 2035 and, on the other hand, due to the "Pflegevorsorgefond" which can be used to stabilize the contribution rate as of 2035. The resources of the "Pflegevorsorgefond" will, thereby, not be completely exhausted before 2055 accordingly to our calculations. That there are nevertheless increases in the contribution rates is due to the fact that only a certain proportion of the fund can be used each year (see Section 2.4).

Figure 6: SPV Contribution Rate



Source: Own calculation

The scenarios based on the compression/expansion hypotheses show a weaker/stronger increase in the contribution rate, depending on the meaning for the future number of people in need of care. By 2070, the contribution rate under the scenario Com rises to 4.25% and under the scenario Exp to 5.4%.

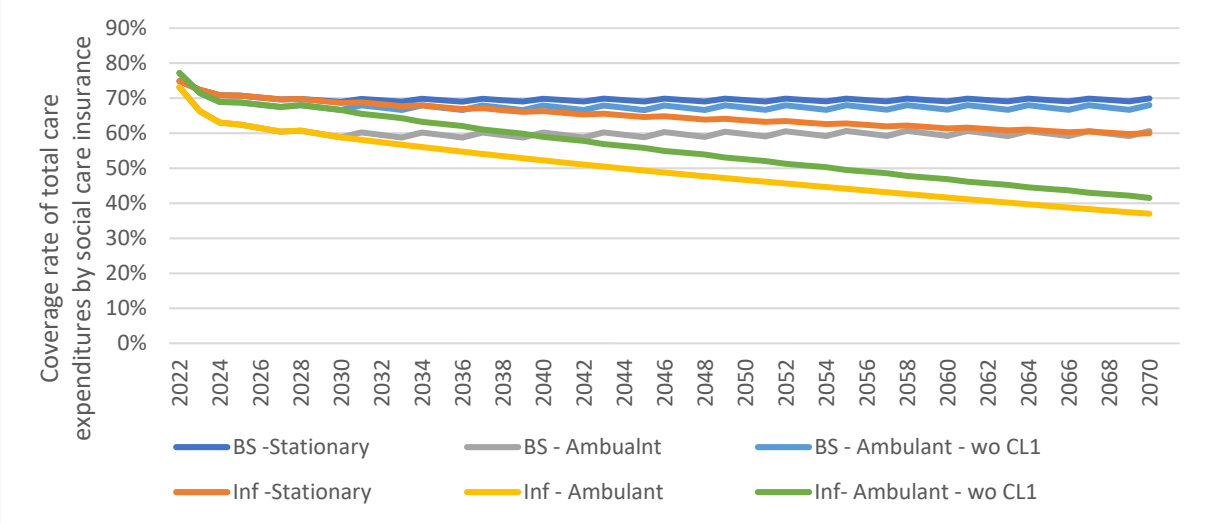
Under the assumption of a cost-driving medical-technological progress, the contribution rate rises more sharply, as expected. The trend up to 2057 is, thereby, very similar to the Exp scenario. Under the MedTec scenario, costs rise due to higher flat-rate payments per case, while the number of people in need of care rises in the Exp scenario more strongly. Until 2057, in both scenarios therefore increase total expenditure to a similar extent compared to the base scenario, albeit via a different sub-determinant. After 2056 the contribution rate of the MedTec scenario then exceed the contribution rate of the Exp scenario. One reason for this could be that as of 2050 no further additional increase in the number of people in need of care is assumed under the scenario. The contribution rate of the long-term care insurance went up to 5.8% under the scenario MedTec until 2070.

The smallest increase in the contribution rate can be observed under the scenario Inf which assumes that the flat rates per case are updated only with inflation. Overall, the contribution rate rises to 3.8% by 2070. However, since we still assume that the real per capita care costs increase in line with gross wage growth per employee, the lower flat rates per case have to be financed by

larger personal contributions, which led directly to the question, how the cost of care not covered by the social care insurance may develop.

In the end, this question depends on how the flat rates develop in respect to the per capita cost of care. If both increase in the same way, as assumed for most of our scenarios, then the own contribution remains constant in relation to total care expenditure. In fact, we observe only a slight decline in the coverage rate in most of our calculations (see Figure 7). These took place until 2028 due to the suspended/reduced adjustment of flat rates until then as well as the assumed stronger growth in own contributions due to the recent care reforms, which among other things included an improvement in remuneration for caregivers. However, it must be pointed out that the same care reforms initially reduced own contributions (especially in stationary care) considerably before 2023. The coverage rate decreases by about 5 PP in stationary care and by 9 to 13 PP in ambulatory care. The lower decrease in stationary care is due to the fact that the social care insurance takes over part of the own contribution in stationary care (EEE).

Figure 7: Coverage rate of total care expenditures by social care insurance



Note: wo CL1 shows the coverage rates without considering the care level 1

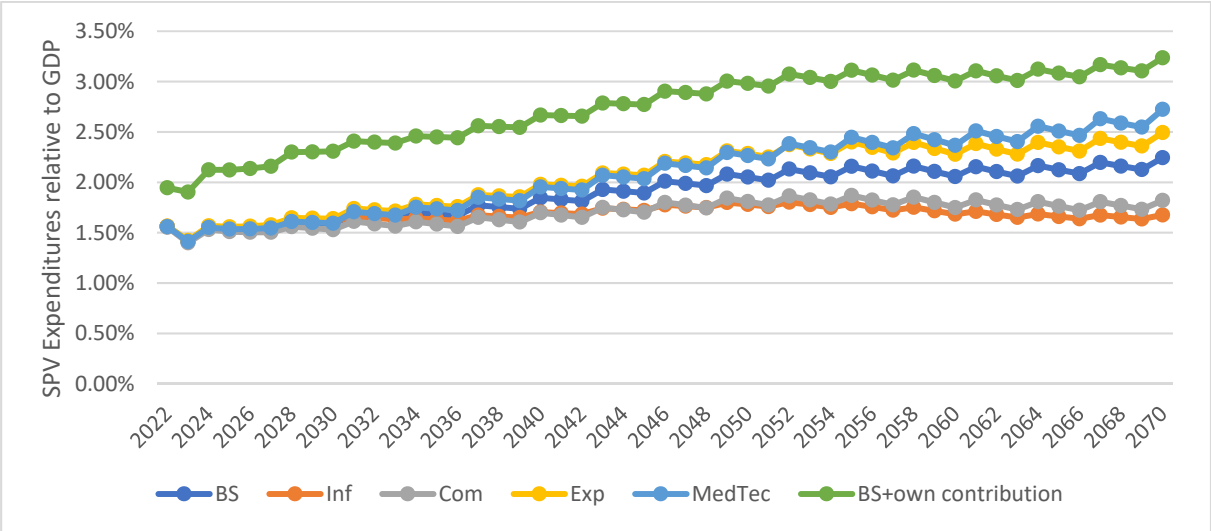
Source: Own calculation

However, if the per-case flat rates are only updated in line with inflation, as is currently envisaged for 2025 and 2028, and the actual costs depend on the development of gross wages, then the own contribution will inevitably increase. Under our assumptions, the own contribution to total care expenditure will increase by 15 PP in stationary care and 36 PP in ambulant care by 2070.

Finally, as in the case of health insurance, we look at the ratio of long-term care insurance expenditure to GDP (see Figure 8). In 2022, the social care insurance expenditure accounts to around 1.5% of GDP. Afterwards they rise for our baseline scenario to around 2.25% until 2070. The development is, thereby, similar to the development of the contribution rate. Differences in the trends are mainly due to the stabilizing effect of the payout phase of the "Pflegevorsorgefond", which are not deducted from the total expenditure. Moreover, we observe in 2023 a decrease in the expenditures which has its origin in the end of the Corona pandemic. Under the alternative scenarios, the expenditure of the social care insurance rises correspondingly less or more strongly in relation to GDP. In the worst-case scenario MedTex it rises to 2.7%.

If the personal contributions are taken into account, the share of total care costs in GDP is around 0.4 PP higher in 2022 and rises to around 3.3% under the baseline scenario.

Figure 8: Care expenditures relative to GDP

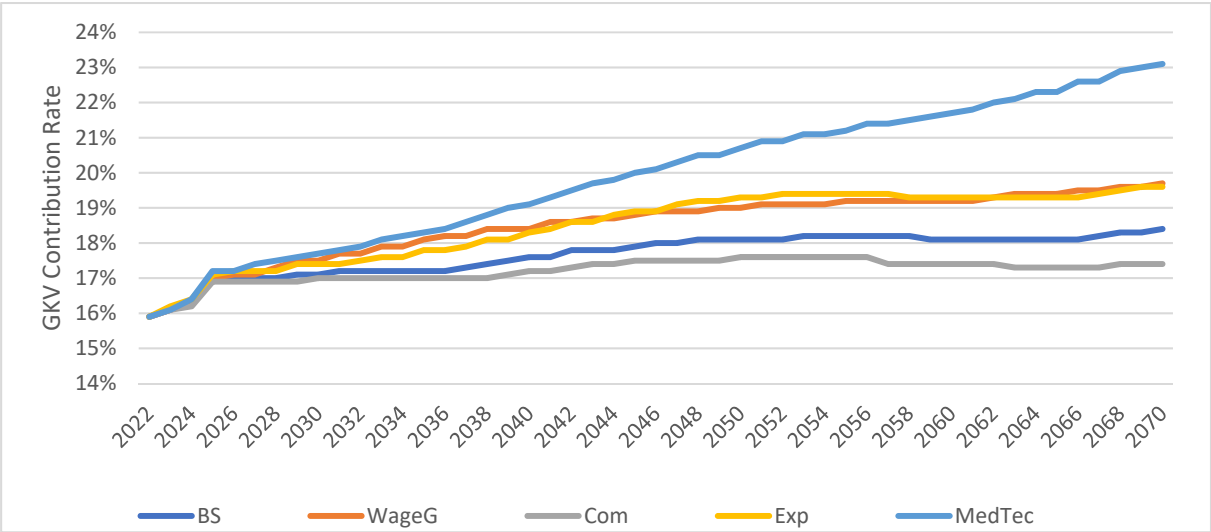


Source: Own calculation

2.6 Statutory Health Insurance

The development of the statutory health insurance system under the five scenarios is discussed below. First, we look at the development of the GKV contribution rate and the average additional contribution rate. Specifically, we discuss the sum of the general contribution rate of 14.6% and the additional contribution rate. Figure 9 shows their development until 2070 for all five scenarios. In 2023, the statutory average additional contribution rate is 1.6%. The total contribution rate is thus 16.2%. We initially predict a further increase in the GKV contribution rate for all scenarios until 2025. Under the baseline scenario, the total contribution rate will then be 17.0%. Subsequently, the increase in the contribution rate slows down under the baseline scenario and reaches 18.4% by 2070.

Figure 9: GKV Contribution Rate



Source: Own calculation

Under the compression scenario, the increase in the contribution rate is lower, as expected. Until 2038, it can even be kept constant at 17.0%. Between 2038 and 2055, the contribution rate then first increases and decreases afterwards slightly until 2061. This can be explained by the fact that the baby boomer generation reaches the age with high mortality rates, which, according to the compression hypothesis, leads to higher health care spending. At the end of the simulation period the contribution rate rises again slightly and reaches 17.4% in 2070, which is 1.0 PP lower than in the baseline scenario.

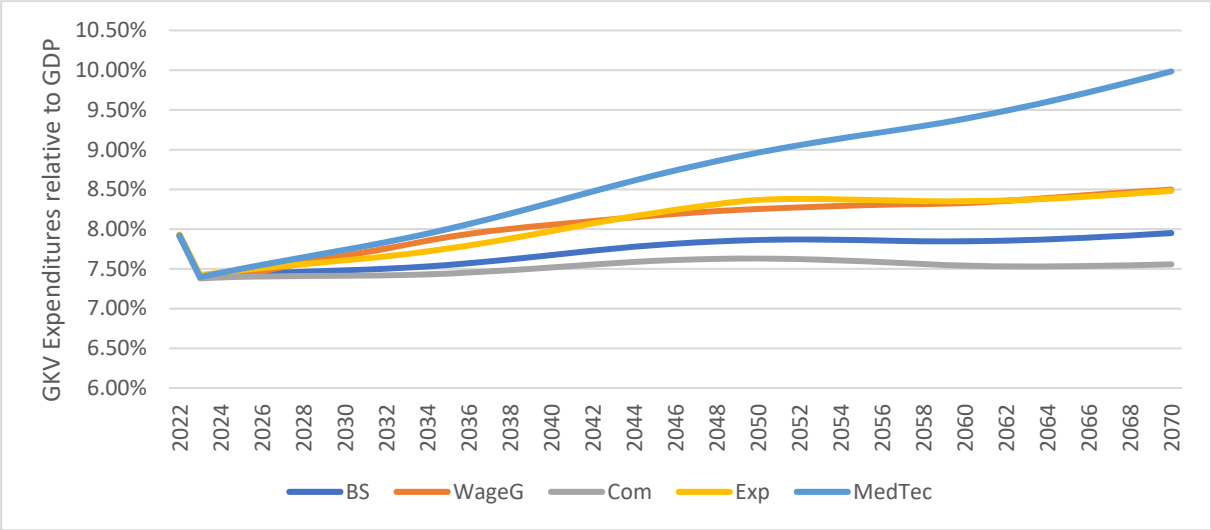
Under the Exp and WageG scenarios, the contribution rate developments are relatively similar. In both cases, we observe a steeper increase in the contribution rate until 2070, whereby it is 1.3 PP (WageG) and 1.2 PP (Med) above the contribution rate of the baseline scenario in 2070. In both cases, this was to be expected, as per capita health care spending increases more strongly without any change in the contribution base.

The strongest increase in contribution rates can be observed under the assumption of a cost-driving medical technical progress. Here, the GKV contribution rate rises steadily to 23.1% by 2070. This is 4.7 PP higher than in the baseline scenario and illustrates the large uncertainties inherent in the projections of the statutory health insurance system. Compared with statutory pension insurance, where cost development is essentially dependent on statutory requirements, the development of the expenditures in the healthcare system depends on many factors. Some of them cannot be predicted in advance. In addition, there is uncertainty as to which costs will be covered (in full) by health insurers in the future. For example, cost-intensive new treatment procedures may not be included in the benefits portfolio of the statutory health insurance companies, or the co-payment for certain treatments may be raised in a similar way to social long-term care insurance. If those steps were chosen, the contribution rate could be kept low despite cost-driving medical technical progress. However, for the best medical care, people would then either have to pay high co-payments or purchase supplementary insurance. This would consequently lead to a greater disparity in healthcare between the rich and the poor.

Figure 10 additionally shows the expenditure of the statutory health insurance system in relation to GDP. By design, the development of this ratio is very similar to the development of the contribution rate. What is striking, however, is that the share of GDP accounted for by health care expenditure falls significantly by 0.5 percentage points from 2022 to 2023. This is due to the increased spending in the health sector due to the Corona pandemic. There is no corresponding decline in the contribution rate between 2022 and 2023, as the pandemic costs were financed by the reserves of the health insurance providers and through a higher federal subsidy.

In the baseline scenario, spending in relation to GDP then gradually rises after 2023. Until the end of our simulation they reach the level that was required during the pandemic. Under our assumptions regarding the compression hypothesis, however, spending remains largely constant at the 2023 level. Under our worst-case scenario (MedTec), on the other hand, costs rise from 7.5% to 10% of GDP.

Figure 10: GKV expenditure relative to GDP



Source: Own calculation

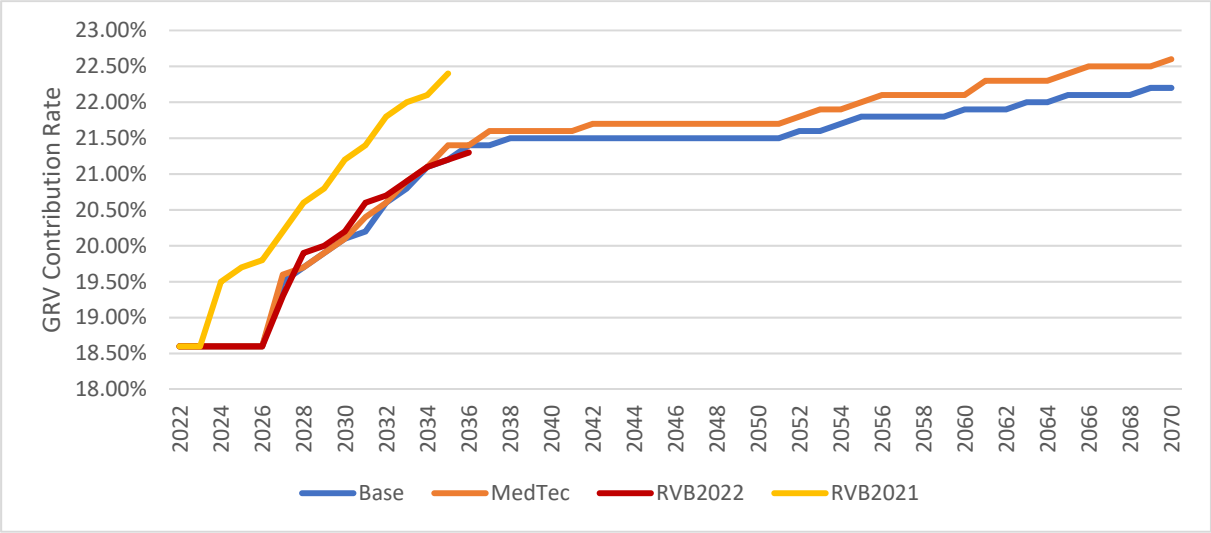
2.7 Statutory Pension Insurance

Figure 11 shows the development of the pension insurance contribution rate for our baseline scenario and according to the Pension Insurance Report of 2021 and 2022 (BMAS, 2021 and BMAS, 2022). In addition, it shows the GRV contribution rate under the MedTec scenario, which has the largest deviation from the baseline scenario.

First of all, it can be stated that the contribution rate development of the baseline scenario and the Pension Insurance Report of 2022 are largely the same. Under both simulations, the contribution rate remains stable at 18.6% until 2027 and then starts to rise. At the end of the simulation of the Pension Insurance Report in 2036, the contribution rate of both simulations is 21.3%. Under our calculation, the contribution rate subsequently rises to 21.5% in 2038 and then remains at this level until 2052, when it rises again. In 2070, it finally reaches 22.2%.[21]

[21] A new pension insurance report was published at the end of November 2023 (BMAS, 2023). This assumes an even later increase in the contribution rate, but is similar to the results of the RVB2022 in the long term. It was no longer possible to incorporate the new assumptions by the submission deadline.

Figure 11: GRV Contribution Rate



Source: Own calculation

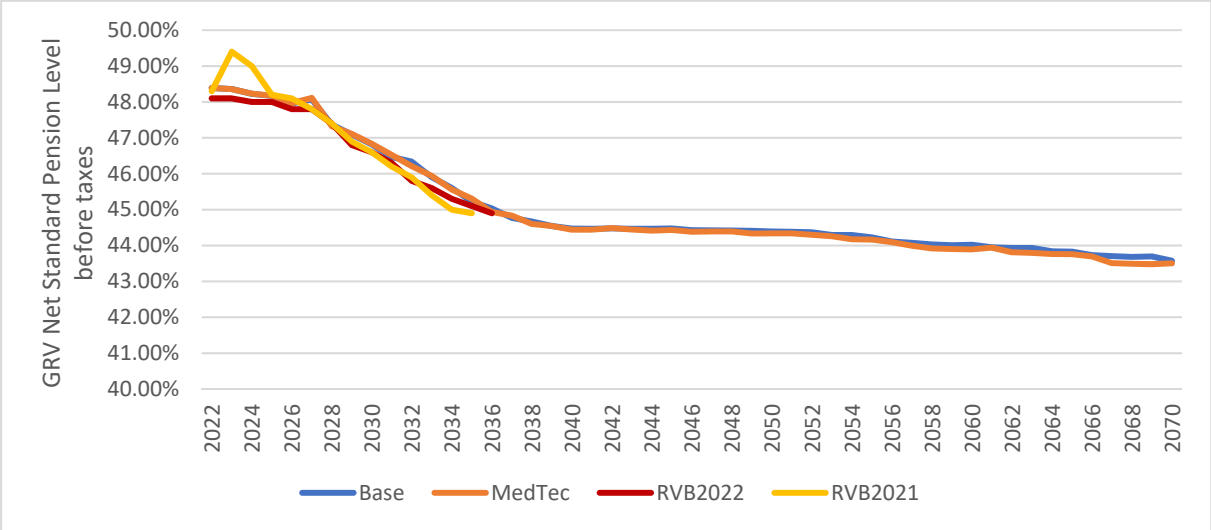
Compared with previous calculations, the overall increase in the GRV contribution rate is considerably lower. For instance, the Pension Insurance Report 2021 estimated a 1.1 PP higher contribution rate for 2035.[22] The differences in the simulations result mainly from the new population projection, which differs from the last official population projection, the 14th Coordinated Population Projection (StaBA, 2019b), in particular with regard to the assumptions on life expectancy and net immigration.[23] The assumed life expectancy of the 15th Coordinated Population Projection in 2060, for example, is 0.9 years (men) and 0.8 years (women) below the assumed life expectancy of the 14th Coordinated Population Projection of the same year. At the same time, it is not only assumed that immigration will be higher in the short term, e.g. due to the war in Ukraine, but also that immigration will be 54,000 people higher p.a. in the long term. The lower increase in life expectancy is initially due to a continuing slowdown in the increase in life expectancy since 2008 (see StaBA, 2023a), which inevitably has a dampening effect on the assumed long-term trend. In addition, the decline in life expectancy during the corona period is partially taken into account in the trend calculation (see for more detailed explanation of the assumptions see StaBA, 2022b). Moreover, the mortality tables of 2021 (i.e. of the coronavirus period) are chosen as the starting point for the extrapolation. It is therefore not assumed that the further increase in life expectancy originally expected during the coronavirus period will be made up for in time. The extent to which this is an overly pessimistic assumption will only become clear in the coming years. The higher long-term immigration rates, on the other side, are initially justified by Germany's high demand for labor. In addition, it is argued that there have recently been increased waves of immigration due to the war in Syria and Ukraine and that similar situations are likely to also occur in the future again. Both the lower life expectancy and high immigration lead to a lower financial burden on the German social system (see Thiede, 2023). The number of pensioners is lower due to lower life expectancy, while higher net immigration dampens the decline in the labor force.

[22] Rausch (2023) predicted for 2060 at least a 2.8 PP higher contribution rate.
[23] Of course, there are also other reasons for the differences. For example, in the meantime, the so-called "Nachholfaktor" has been reintroduced, which compensates for omitted pension cuts due to the wage decline during the Corona pandemic in the long term.

Assuming a cost-driving medical-technological progress of 0.5 PP, the GRV contribution rate increases by about 0.4 PP more until 2070. This is due to the higher contribution rate in the statutory health insurance, which is necessary to cover the higher health care expenditure (see Section 3.2) and the circumstance that the GRV scheme takes over the employer's share of pensioners' health insurance contributions. Hence, the expenditure of the pension insurance scheme rises with a higher statutory health insurance contribution rate. The course of the GRV contribution rate therefore differs also slightly under the other alternative scenarios. However, due to the smaller changes in the health care contribution rate the changes to the pension contribution rate are rather small.

At last, Figure 12 shows the net standard pension level before taxes[24] for the same four forecasts. First, it can again be noted that our baseline projection is largely in line with the forecast of the Pension Insurance Report of 2022. Furthermore, we observe a decline in the pension level from 48% to around 44.5% by 2040 and then a rather slow further decline to 43.6% until 2070. Under the cost-driving medical-technical progress, the pension level falls slightly more strongly. However, the difference amount only to 0.2 PP in 2070.

Figure 12: GRV Net standard pension level before taxes



Source: Own calculation

Compared to the Pension Insurance Report 2021, the more favorable demographic assumptions hardly result in a higher protection level until 2035. This is primarily due to the fact that, under the old forecasts, the GRV contribution rate was expected to rise by 0.9 PP already in 2024. Under current law, the increase in the contribution rate would actually lead to a dampening of the pension adjustment in the following year. However, as the pension level must not fall below 48% before 2026, this dampening effect would have been suspended. Under the new demographic assumptions, the increase in contribution rate does not happen before 2026, allowing the damping effect of the pension adjustment to take full effect.[25] As a result, in 2035 the pension level of the

[24] The net standard pension level before taxes represents the standard pensioner in relation to the average salary of the population covered by pension insurance. Net before taxes refers to the fact that social security contributions are deducted from both values, but not the income tax. The standard pensioner is a pensioner with 45 years of contributions in which he has earned the average salary.

[25] In fact, this also explains the huge difference in the contribution rates. Under the old simulations, a smaller share of the demographic burden was redistributed to pensioners and had to be financed accordingly by higher contributions from the contributors.

RVB 2021 of 44.9% is very similar to the pension level of RVB 2022 of 45.1%, despite the different assumptions.

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