Stefan Schiman, Tobias Orischnig

Coping with Potential Impacts of Ageing on Public Finances in Austria

The Demography-based Economic Long-Term Model for Austria’s Public Finances (DELTA-BUDGET) Assumption Report
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Abstract

Future demographic changes – in particular ageing populations – will have huge impacts on the situation of public finances: More people will depend on fewer people working. Demographic changes will not only weigh on public finances, but also on the growth potential of the economy via reduced labour supply. Other trends and factors are expected to influence public finances as well, like developments in the health care sector, education, support for families, unemployment, and – not least – current legislation on future policy.

On the one hand, we try to assess the potential impacts of these factors on Austria’s public finances in the long term (until 2050), on the other hand, we cater for current policy decisions which aim at coping with these challenges: We create a macro-economic model to assess possible future developments in the areas of health and long-term care, education, pensions and family support. We aggregate these projections and provide different scenarios of future developments to test the sensitivity of our projections. This assumption report gives the background information of the macroeconomic model DELTA-BUDGET, its assumptions and properties.
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<th>Abbreviation</th>
<th>Full Form</th>
<th>Description</th>
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<tr>
<td>BMASK</td>
<td>Federal Ministry of Labour, Social Affairs, and Consumer Protection; Bundesministerium für Arbeit, Soziales und Konsumentenschutz</td>
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<tr>
<td>BMF</td>
<td>Federal Ministry of Finance, Bundesministerium für Finanzen</td>
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<tr>
<td>bn</td>
<td>Billion</td>
<td></td>
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<tr>
<td>CapitalR</td>
<td>Capital stock at constant prices</td>
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<tr>
<td>Cit</td>
<td>Corporate income tax</td>
<td></td>
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<tr>
<td>cf.</td>
<td>Compare</td>
<td></td>
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<tr>
<td>ConsPrivR</td>
<td>Private consumption at constant prices</td>
<td></td>
</tr>
<tr>
<td>COFOG</td>
<td>Classification of the functions of government</td>
<td></td>
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<tr>
<td>CPI</td>
<td>Consumer price index</td>
<td></td>
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<tr>
<td>DebtPubN</td>
<td>Level of government debt at current prices</td>
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<tr>
<td>DepR</td>
<td>Depreciation</td>
<td></td>
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<tr>
<td>DepRate</td>
<td>Rate of depreciation</td>
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<tr>
<td>EC</td>
<td>European Commission</td>
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<tr>
<td>Emp</td>
<td>Employment</td>
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<tr>
<td>EmpFte</td>
<td>Employment in full-time equivalents</td>
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<tr>
<td>ESSPROSS</td>
<td>European System of integrated Social Protection Statistics</td>
<td></td>
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<td>EU</td>
<td>European Union</td>
<td></td>
</tr>
<tr>
<td>ExpR</td>
<td>Exports at constant prices</td>
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<tr>
<td>F</td>
<td>Female</td>
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<tr>
<td>FLAF</td>
<td>Familienlastenausgleichsfonds (Family Burden Equalization fund)</td>
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<tr>
<td>GDP</td>
<td>Gross domestic product</td>
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<td>GdpR</td>
<td>Gross domestic product at constant prices</td>
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<tr>
<td>HC</td>
<td>Health care</td>
<td></td>
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<td>i.e.</td>
<td>That means</td>
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<tr>
<td>IHS</td>
<td>Institut für Höhere Studien (Institute for Advanced Studies)</td>
<td></td>
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<tr>
<td>ILO</td>
<td>International Labour Organization</td>
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<tr>
<td>ImpR</td>
<td>Imports at constant prices</td>
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<tr>
<td>IncHhR</td>
<td>Net disposable income of private households at constant prices</td>
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<tr>
<td>IntN</td>
<td>Nominal long-term interest rate</td>
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<td>IntPubN</td>
<td>Interest payments at current prices</td>
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<td>IntRecPubN</td>
<td>Investment income at current prices</td>
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<tr>
<td>InvPrivR</td>
<td>Private capital formation at constant prices</td>
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<tr>
<td>InvR</td>
<td>Total capital formation at constant prices</td>
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<td>LabSup</td>
<td>Labour supply</td>
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<td>LTC</td>
<td>Long-term care</td>
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<td>M</td>
<td>Million; or: Male</td>
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<td>MarketExpR</td>
<td>Global market exposure</td>
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<td>NDD</td>
<td>Non-demographic cost drivers</td>
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<tr>
<td>OeNB</td>
<td>Österreichische Nationalbank (Austrian National Bank)</td>
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<td>OLS</td>
<td>Ordinary Least Squares</td>
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<td>ÖBFA</td>
<td>Austrian Federal Financing Agency</td>
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<tr>
<td>p.a.</td>
<td>Yearly</td>
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<td>Pit</td>
<td>Personal income tax</td>
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<td>Abbreviation</td>
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<tr>
<td>PopLab</td>
<td>Working-age population</td>
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<tr>
<td>pp</td>
<td>Percentage points</td>
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<tr>
<td>PriceConsPriv</td>
<td>Deflator for private consumption</td>
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<tr>
<td>PriceExp</td>
<td>Export prices</td>
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<tr>
<td>PriceGdpFp</td>
<td>GDP deflator at factor costs</td>
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<tr>
<td>PriceGdpMp</td>
<td>GDP deflator at market prices</td>
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<tr>
<td>PriceGdpWld</td>
<td>Index of foreign prices</td>
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<tr>
<td>PriceImp</td>
<td>Import prices</td>
<td></td>
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<tr>
<td>PriceInv</td>
<td>Deflator for investments</td>
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</tr>
<tr>
<td>Pxc</td>
<td>Prices of competitors’ export goods and services</td>
<td></td>
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<tr>
<td>R&amp;D</td>
<td>Research and development</td>
<td></td>
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<tr>
<td>RevPubN</td>
<td>Total public revenues</td>
<td></td>
</tr>
<tr>
<td>RevPubN\Int</td>
<td>Public revenues net of investment income</td>
<td></td>
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<tr>
<td>Tfp, TFP</td>
<td>Total factor productivity</td>
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<tr>
<td>Ulc</td>
<td>Domestic unit labour costs</td>
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<tr>
<td>UlcRow</td>
<td>Foreign unit labour costs</td>
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<tr>
<td>USA</td>
<td>United States of America</td>
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<tr>
<td>WageFteN</td>
<td>Wage level in full-time equivalents</td>
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<td>WagePhN</td>
<td>Wage level per person employed</td>
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<tr>
<td>WIFO</td>
<td>Wirtschaftsforschungsinstitut (Austrian Institute of Economic Research)</td>
<td></td>
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<tr>
<td>WW II</td>
<td>Second World War</td>
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1. Introduction

With the decision on the new budget laws in Austria, the long-term perspective on developments of public finances gained momentum: Paragraph 15 (2) of the new Bundeshaushaltsgesetz 2013 (Federal Budget Law 2013; cf. Schilhan 2010, p. 53) regulates that the Minister of Finance has to present an adequately explained and documented long-term budgetary projection in every third financial year to the Parliament. With this Working Paper, we will elaborate on the macroeconomic model used for these budgetary projections to make the underlying assumptions explicit and traceable. This will serve as the basis for the first report on the long-term developments of public finances in Austria, which will be published together with the medium-term expenditure framework in spring 2013.

To come up to this macroeconomic model, already in 2008 a working group was founded within the BMF composed of experts from different departments. In 2012, the authors started to present the model and its implication in different fora to discuss its outcomes and development: First, it was discussed with different departments within BMF and BMASK, then the model was also presented to other scientific and policy groups as the Nationalökonomische Gesellschaft (Austrian Economic Association), the Austrian National Bank, the Federal Financing Agency (ÖBFA), the Gesundheit Österreich GmbH (company owned by the Ministry of Health), the Chamber of Labour and the Vienna Institute of Demography. These discussions will keep on in order to improve the model and its projections. Therefore, this Working Paper can only show the current situation and level of development of the model. The projections within this Working Paper are only presented to show the behaviour of the model. They are not to be seen as previews of the legally required report on the long-term developments of public finances in Austria. The assumptions taken in this modelling exercise are not to be seen as policy statements of the BMF, but as purely technical assumptions to be taken to develop a macroeconomic model. They do not imply any future political decisions, but are only based on the scientific knowledge and expertise of the authors.

The future report on this model and its projections will deal with the main modules explained in this Working Paper: pensions, health care, long-term care, education, families, and unemployment. Furthermore, there will be additional analyses on different scenarios to show the sensitivity of the model and to develop different policy scenarios. Gender related questions will also be addressed in the different chapters. Finally, there are areas not covered yet within the model, which could also have significant effects on public finances: climate change or shortages of different resources. These aspects might be tackled within the first report only in a qualitative manner.

According to the projections by Statistics Austria (Hanika, 2011a) the demographic composition of the Austrian population is going to change significantly: While the share of elderly people (65+) among the total population is projected to increase from roughly 18% today to 28% in 2050, the share of people aged 15 to 64 years is going to decrease from 68% to about 58% over the same horizon\(^1\). Dividing both figures gives the so-called “old-age dependency ratio”, which stands at 26% today and will climb to 49% in 2050\(^2\).

The United Nations Organization (2011, p. 448-481) projects an increase of this ratio to 53% in 2050 (+27 pp) for Austria. Compared to other industrialised countries and regions, this points at a rather fast pace of demographic change: The increase of the old-age dependency ratio is projected to be 15 pp in the USA (from 20% to 35%), 16 pp in Northern Europe (from 25% to 41%) and 22 pp in Western Europe (from 28% to 50%). There are countries which might expect an even more dramatic growth: In China the ratio might soar by 31 pp (from 11% to 42%), in Southern Europe by 32 pp (from 27% to 59%), and in Japan even by 35 pp (from 35% to 70%).

The old-age dependency ratio is interesting from a public finance perspective, since it broadly delimits a group of people who is depending on (public) financial assistance (through pension provision, but also through enhanced consumption of health and care services) from a group who contributes to economic output and thereby finances these public services. Apart from the magnitude of the increase, the mere fact that this ratio is going to surge by a significant amount calls for an assessment of possible effects on public finances: On the one hand the output of the economy is affected by changes of the potential work force, on the other hand an increase of the dependent population weighs

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1 Aware of the different determinants of population projections and the multiple assumptions being made, we stick to the baseline scenario of Statistics Austria within our model. In the final part we try to evaluate changes in these assumptions and their influence on our model. Another important aspect we cannot dwell on here is the variability of Austrian population projections – see Tichy (2006) for some critical comments.

2 A related indicator is the “economic dependency ratio” (the ratio of working people to non-working (dependent) people), which is more adequate in assessing fiscal aspects (since it aims at segregating “tax payers” from “beneficiaries”), but which requires more assumptions as regards e.g. the effects of pension reforms or the development of unemployment (see Wöss/Türk, 2011)
directly on public expenditures. We, therefore, opt for an approach that integrates demographic, macroeconomic and budgetary aspects in order to assess these effects and its interactions in a theoretically and empirically coherent way.

To these ends, we construct a macroeconomic model which is driven by demographic developments and technical progress in the long run (“supply side”). The parsimonious specification links future budgetary developments to their main underlying factors - demography, productivity, inflation and labour markets. In order to deepen the understanding of future developments and to enhance the plausibility of the projections, further economic aspects are modelled too (“demand side”), while the supply side determines the evolution of the core economic variables in the long run.

The design of the core, supply-side part of the model is presented in the following chapter (chapter 2.1); the demand side is elaborated in chapter 2.2. We then proceed with revenue projections (chapter 3), followed by the modelling of public expenditures (chapter 4), which are classified according to national accounting categories. In chapter 5, we construct different scenarios (macroeconomic, labour market, demographic, health care and long-term care) to assess the sensitivity of our model. Chapter 6 draws the conclusions, also by setting the model in a broader national and international context.
2. Macroeconomic Model

The macroeconomic model is supply-side driven, centering around a Cobb-Douglas production function, which determines economic growth and other important economic factors in the long run and, hence, provides the basis for the budgetary projections. The demand side broadens the scope of the model by providing a channel from budgetary effects back to the macroeconomic level, without interfering with the supply-side determined growth path. For example, pensions are not only considered a public expenditure item, but also a part of household income, thereby affecting private consumption and - in turn - tax revenues. In modelling the various elements of the demand side we follow an "absorption approach", where domestic components are evaluated first and external trade acts as a residual that balances overall GDP expenditure with GDP determined by the supply side. The econometric methodology entails single-equation estimations of both long-term and short-term relationships (predominantly through cointegration and error-correction specifications). There are many analogies to other macroeconomic models of the Austrian economy, like those of the OeNB (Schneider/Leibrecht 2006), the WIFO (Baumgartner et al., 2004) and IHS (Hofer/Kunst, 2005).

We also investigated how other countries – mainly in the EU and OECD area – project their respective budgets or assess long-term sustainability of public finances. The models used differ widely and range from simple baseline projections (e.g. Weber et al., 2008, p. 11f) to complex micro-simulation models (e.g. the model employed by the US congressional budget office CBO, 2001; or the model of Sweden, cf. Flood et al., 2005). For our purposes, we aligned a macro-level model with specifications for a range of budgetary items, which will be explained in more detail in the next chapters.

2.1. The Supply Side

Trend output of the economy is driven by three main factors: the level of employment, its endowment with capital and technical progress. Each of these factors contributes to economic growth to a different extent. A route which is often followed in assessing the different contributions is to employ a Cobb-Douglas production model with constant returns to scale and exogenous technical progress. Trend output is estimated by means of OLS, which yields the following results:

\[
Gdp_{R_t} = 2.3 + 0.01157 \cdot Trend + 0.7 \cdot EmpFte_t + 0.3 \cdot CapitalR_t + u_t
\]

Gdp\(_R\) is gross domestic product at constant prices. Trend is a deterministic time trend; the coefficient of 1.157% is a proxy for technical progress ("total factor productivity", Tfp). EmpFte is employment at full-time equivalents according to the System of National Accounts and CapitalR is the net capital stock of the economy at constant prices. Since the time series have non-stationary patterns, we analyse the possible problem of spuriousness by applying an Augmented Dickey-Fuller test on the residuals. The test results in a t-value of -4.20, so that the unit root hypothesis for the residuals and, hence, the hypothesis of spurious regression is rejected at the 2.5% significance level (cf. Wooldridge, p. 618).

In order to fulfil the Cobb Douglas proposition of constant returns to scale, the sum of the coefficients of EmpFte and CapitalR is restricted to unity, a hypothesis which is accepted at the 10% significance level (p-value 0.16). The resulting coefficient of EmpFte is 0.7 (with a standard error of 0.07), reflecting the wage share of the economy\(^3\): it has been 72% on average over the entire estimation period (1976-2009) and stands at 70% today. This result confirms the Cobb-Douglas framework, in that it states that the coefficients should equal the respective factor income shares. As a last step, we fix the coefficients of EmpFte and CapitalR at 0.7/0.3 (which is accepted at a p-value of 0.37), thereby saving a degree of freedom in the estimation and reducing the standard error so that TFP growth eventually ranges between 1.13% and 1.18%.

The coefficients of EmpFte and CapitalR are left unchanged at 0.7/0.3 in the projections implying that the wage share remains constant throughout the projection period, which is ensured by assuming wages to develop in line with productivity growth. Uncertainty remains about the future development of TFP growth. To take a prudent assumption, we decide to project Tfp at a rate of 1.15% in the long run. In order to assess the sensitivity of the results we calculate scenarios with long-run TFP growth rates at 1.10% (lower bound) and 1.20% (upper bound) in chapter 5.

The projection of trend output is applied to growth rates by taking first differences:

\[
\Delta Gdp_{R_t} = Tfp_t + 0.7 \cdot \Delta EmpFte_t + 0.3 \cdot \Delta CapitalR_t
\]

\(^3\)The wage share is defined as the share of the total wage sum in national income; national income being the sum of factor incomes or, equivalently, GDP plus subsidies less indirect taxes and depreciation.
This equation requires assumptions about the evolution of five different factors on the right-hand-side, three of which have been elaborated in the last few paragraphs: TFP, the wage share (0.7) and the profit share (1 − 0.7 = 0.3). The assumptions about the remaining two factors (employment and the capital stock) are outlined in the remaining paragraphs of this chapter.

$\Delta \text{EmpFte}$ is projected with the growth rate of employment implied by the labour force projections of Statistics Austria (Hanika, 2011b) with the following assumptions about unemployment and part-time work: The rate of unemployment stands at 4.2% today according to the ILO definition, and is assumed to approach 4% in the long run, which translates to a rate of 6.9% on average according to the national definition of unemployment (1976-2011 average: 5.4%, 1990-2011 average: 6.6%). The increase of the share of part-time work in total employment is assumed to decelerate and to cease as of 2020.

The capital stock is raised by net investment ($\text{InvR} - \text{DepR}$),

$\text{CapitalR}_t = \text{CapitalR}_{t-1} + \text{InvR}_t - \text{DepR}_t$

where $\text{InvR}$ comprises both private and public investment. The assumptions about public investment are detailed in chapter 4.4.2, it follows GDP growth rather closely. Private investment is supposed to react to deviations of the capital coefficient, $\text{CapitalR}/\text{GdpR}$, from its long-term average. Hence, if the capital coefficient falls below its long-term average (approx. 3.6), investment will increases, and pushes the capital stock upwards again. The assumption of a constant capital coefficient is implied by the Cobb-Douglas production function. Depreciation is calculated according to the perpetual inventory method,

$\text{DepR}_t = \text{DepRate}_t \cdot \text{CapitalR}_{t-1} + \text{InvR}_t \cdot (1 - \sqrt{1 - \text{DepRate}_t})$

where the past increase of the rate of depreciation (DepRate) from about 3.5% in the early 1980s to about 4.5% in 2010 is assumed to proceed in the future, such that the depreciation rate is projected to be 5.5% in 2050.

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*Data up to 2011 shown in the figures and used for estimations are drawn from the databases of Statistics Austria and WIFO. Values as of 2012 onwards are projected by the authors.*
Putting the assumptions about all these factors (TFP, employment, capital stock and the wage/profit share) together allows for a long-term assessment of the trend growth rate of the economy:

Trend growth averaged at 2.2% in the past (1977-2011). For the remaining current decade it is projected to be 1.6% on average. In the coming decade (2021-30) it is expected to decline further to 1.4%, because the potential labour force is projected to decline. The labour market constraints are expected to loosen as of 2030 so that trend growth is expected to step up gradually, reaching an average of 1.8% from 2031 to 2050. At the same time, the capital stock is supposed to expand slightly in order to meet the additional endowment requirements. Overall, the average annual trend growth rate is projected to be 1.65% over the whole period (2012-2050). This increase is almost entirely accounted for by the increments of productivity, while labour input is stagnating. Between 1976 and 2011 productivity increases contributed 1.75 pp on average and employment growth contributed 0.45 pp.

### 2.1.1. Wages, Prices, Productivity

In order to satisfy the Cobb Douglas condition of a constant wage share, wages are supposed to develop in line with labour productivity. The inflation rate\(^5\) depends on three major factors: foreign inflation, domestic wage growth and technical progress.

\[
\Delta \text{PriceGdpFp}_t = - \Delta \text{PriceGdpWld}_t + 0.4 \cdot \Delta \text{PriceGdpWld}_t + 0.7 \cdot \Delta \text{WageFteN}_t
\]

The wage development (in full-time equivalents, \(\Delta \text{WageFteN}\)) is the major domestic cost push factor, foreign inflation (\(\Delta \text{PriceGdpWld}\)) is “imported” through raw materials that are being processed in Austria and through imported intermediate and final goods; technical progress is supposed to have a dampening effect on inflation. In the baseline scenario, imported inflation acts as a residual and is supposed to develop such that inflation averages the 2% reference level of the European Central Bank in the long run.

### 2.2. The Demand Side

#### 2.2.1. Components of GDP by Expenditure

The long run supply side development of GDP is given by the capacity of the labour force, its endowment with capital goods and technical progress. The production can either be consumed, re-invested or sold abroad. The latter option (i.e. external trade) is treated as residual between the amount produced based on the given supply side capacity and the domestic absorption brought about by consumption, investment and imports. This chapter deals with the econometric specification of consumption, investment, exports and imports.

\[
\Delta \text{ConsPrivR}_t = -0.3 \cdot (\text{ConsPrivR}_{t-1} + 0.1 - 1 \cdot \text{IncHhR}_{t-1} + 0.4 \cdot \text{IntN}_{t-1}) + 0.6 \cdot \Delta \text{IncHhR}_t
\]

In the long run, there is a one-to-one relationship between net disposable income of private households (\(\text{In-}\)

\[\text{Households}\]
cHhR) and private consumption (ConsPrivR), which, in addition to that, reacts inversely to the long-term interest rate (IntN). The short run propensity to consume is estimated at 0.6, which, according to Baumgartner et al. (2004, p. 6), has also been found by the Austrian consumer survey. Net disposable income consists of wage income, income of the self-employed, investment income and social benefits net of direct taxes and social security contributions.

\[ \Delta \text{InvPriv}_t = -0.5 \cdot (\text{InvPriv}_{t-1} - \text{InvPriv}_{t-1}) + 0.6 \cdot \Delta \text{Exp}_t \]

Private capital formation (InvPrivR) reacts to exports (ExpR) in the short run, while in the long run it adjusts such that the capital coefficient oscillates around its long-term average (Fig. 2.3).

\[ \Delta \text{Exp}_t = -0.3 \cdot (\text{Exp}_{t-1} + 8.4 - 2.8 \cdot \text{MarketExp}_{t-1} + 2.7 \cdot \left( \frac{\text{Ulc}}{\text{UlcRow}} \right)_{t-1} + 0.9 \cdot \text{PriceExp}_{t-1} - 0.4 \cdot \text{Pxc}_{t-1} + 2.2 \cdot \Delta \text{MarketExp}_t + 0.4 \cdot \Delta \text{Pxc}_t \]

MarketExpR expresses the extent to which the economy is exposed to the global markets. It is a composite indicator consisting of the four major export markets, weighted with their respective shares in total Austrian exports (Germany 30.2%, Italy 9%, USA 5.8%, and Switzerland 4.7%). In the long run, it is supposed to react to the output gap (the difference between actual and trend output) and, hence, to act as a cushion between the growth trend of the economy and domestic absorption. Beyond that, exports react inversely to the ratio of domestic-to-foreign unit labour costs (Ulc/UlcRow) and their own price (PriceExp), whereas they increase (decrease) when the prices of competitors’ export goods and services (Pxc) rise (fall).

\[ \Delta \text{Imp}_t = -0.9 \cdot (\text{Imp}_{t-1} + 1.7 - 0.3 \cdot \text{ConsPriv}_t - 0.2 \cdot \text{InvPriv}_t - 0.7 \cdot \text{Exp}_t + 0.2 \cdot \text{PriceImp}_{t-1} + 0.2 \cdot \Delta \text{ConsPriv}_t + 0.2 \cdot \Delta \text{InvPriv}_t + 0.7 \cdot \Delta \text{Exp}_t \]

The most important determinant of the development of imports (ImpR) is the development of exports, since Austria is a small open economy which processes imported raw materials and intermediate goods and, to a large extent, exports them subsequently. Domestic consumption and capital formation are minor factors for imports, as is the evolution of import prices.

Other than private consumption, investment, exports and imports, public consumption is not determined by a behavioural relationship, but is instead calculated as the sum of two items that are determined within the model: "other non-market production" (which is the sum of intermediate consumption, salary payments, public depreciation and some other minor expenditure items) and social benefits in-kind.

The current account declined from its record high of +4.9% of GDP in 2008 to 1.5% of GDP in 2011. Up to 2016 it is expected to climb to slightly more than 3% of GDP again, where it is ought to remain until the mid-2020s. Since domestic absorption is not expected to fall proportionally to trend growth, the current account declines accordingly, but is ought to remain in surplus at a range of 0.5% and 1.5% of GDP.

So far, the expenditure-side components of GDP have been analysed in real terms. In order to arrive at the “actual” level of output (as compared to trend output), those variables have to be “inflated” to nominal values. The sum of the nominal values gives nominal GDP, which, deflated again by the respective index, leads to “actual” real GDP.
2.2.2. Deflators

The long-term driving force among the various deflators is the GDP deflator at factor costs. Adding government intervention (via indirect taxes and subsidies) gives the GDP deflator at market prices (cf. footnote 5). All expenditure-side components of GDP are inflated with a particular index (deflator) to arrive at nominal values, which, added up, yield a value for nominal GDP. This, in turn, is deflated with the GDP deflator at market prices to arrive at real GDP (which, in the long term, equals trend output).

\[
\Delta^2 \text{PriceConsPriv}_t = -0.3 \cdot (\Delta \text{PriceConsPriv}_{t-1} - \Delta \text{PriceGdpMp}_{t-1}) + 0.5 \cdot \Delta^2 \text{PriceGdpFp}_t + 0.3 \cdot \Delta^1 \text{PriceImp}_t
\]

In the long run, the deflator of private consumption (\(\text{PriceConsPriv}\)), which is also used as the consumer price index in the projections, develops proportionally to the GDP deflator, with 2% on average. In the short run, import prices also play a role.

\[
\Delta^2 \text{PriceInv}_t = -0.5 \cdot (\Delta \text{PriceInv}_{t-1} - 0.8 \cdot \Delta \text{PriceGdpMp}_{t-1} - 0.4 \cdot (\Delta \text{PriceImp}/\Delta \text{PriceExp})_{t-1}) + 0.4 \cdot \Delta^2 \text{PriceGdpFp}_t + 0.3 \cdot (\Delta^1 \text{PriceImp} \cdot \Delta^1 \text{PriceExp})_t
\]

For private and public investments the same deflator is used (\(\text{PriceInv}\)). Apart from the GDP deflator, also the terms of trade (\(\Delta \text{PriceImp}/\Delta \text{PriceExp}\)) are significant: an increase in import prices relative to export prices tends to raise the price pressure on investment goods. During the past 30 years, prices of capital goods rose slightly less on average than the index of the whole economy (2.3% to 2.5% p.a.). The projected average rates are 1.7% and 2.0% p.a., respectively.

\[
\Delta \text{PriceExp}_t = 0.2 \cdot \Delta \text{PriceGdpFp}_t + 0.6 \cdot \Delta \text{PriceImp}_t + 0.03 \cdot \Delta \text{Pxc}_t
\]

Unlike the above-mentioned deflators, export prices (\(\text{PriceExp}\)) are not predominantly influenced by the domestic factor, but rather by import prices. This mirrors the important role of exports for imports, which is also captured in the volume equation of imports. Export prices of the main trading partners (\(\text{Pxc}\)), whose goods and services might partly act as substitutes of Austrian exports, have a minor effect. Export prices grew by 1 pp p.a. less than overall inflation in the past thirty years, which is projected in the future by the above specification (1.0%).

\[
\Delta \text{PriceImp}_t = 0.6 \cdot \Delta \text{PriceGdpWld}_t + 0.2 \cdot \Delta \text{Pxc}_t
\]

Import prices are substantially influenced by prices in the main trading partner countries (Germany, Italy, USA, Switzerland, etc.). Export prices of the main trading partners have a larger impact on import prices than on export prices since they enter as direct cost factors via the supply chain (while they only play a role as opportunity costs as far as domestic export prices are concerned). Import prices are projected to evolve similar to export prices, with an annual 1.1% growth on average in the long run.
3. Public Revenues

Roughly 91% of public revenues are made up of three major categories: social security contributions (about 34%), indirect taxes (about 30%) and direct taxes (about 27%). In the projections, revenues are assumed to evolve with the (weighted) growth rates of their respective assessment bases. This mechanism implies unit elasticities of revenues with respect to their assessment bases. While we are aware that it is reasonable to assume elasticities other than unity in the short run (cf. e.g. European Commission, 2005; Girouard/André, 2005), it would induce a substantial degree of arbitrariness in the long run, changing the composition of public revenues significantly. Therefore we decided that the unit elasticity assumption reflects the no-policy change requirement most properly in the long run. In the following chapters we analyse how the various assessment bases develop based on the macroeconomic model.

3.1. Social Security Contributions

Social security contributions are linked to three different assessment bases, each with different degrees of incidence (rates): the wage sum (37.85%), the income of self-employed (31.60%) and the pension income (5.10%) are subject to social security contributions (pensioners pay contributions to the health care insurance only). This means that a 100 Euro increase of the wage sum affects social security contributions by around 7.5 times more than a 100 Euro increase in pension income. The remaining paragraphs delineate how these assessment bases are affected by the macroeconomic model.

The wage sum is the product of wages per head and the number of employees. The latter is given by the exogenous projections of the labour force and the assumptions about unemployment; more details on this interaction are given in chapter 4.1.3. As already mentioned in chapter 2.2, wages are supposed to develop according to labour productivity, which ensures that the wage share in % of GDP (which is related to the wage share in % of national income, cf. footnote 3) stabilises in the long run. In turn, the wage sum has a stabilising effect on the future path of social security contributions as a share of GDP.

The income of self-employed is assumed to evolve in line with “non-wage income”, i.e. the residual of national income less the wage sum. The development of pension payments is analysed explicitly in chapter 4.1.1.

3.2. Direct Taxes

Direct taxes are separated into personal income tax (71% of direct taxes), corporate income tax (18%) and other taxes (e.g. capital gains tax, 11%).

66% of personal income tax revenues stem from wages, 13% are due to the income of self-employed and another 21% are due to pension income, all net of social security contributions. Hence, personal income tax is subject to the same assessment bases as social security contributions, with two exceptions: First, they are “net of social security contributions”, since they are deducted from the gross amounts first. Secondly, the relative incidence of the assessment bases on personal income tax revenue is different; in particular pension payments have a larger incidence on direct taxes than on social security contributions.

The assessment base of the corporate income tax is total profit net of depreciation (or, equivalently, national income less wages). Since there are no specific assessment bases for the other direct taxes (as e.g. capital gains taxes) in the model, nominal GDP is used as a proxy.

3.3. Indirect Taxes

Indirect taxes do not only comprise the value-added tax, but also the fuel tax, the tobacco tax, the municipal tax and others. Therefore, a broader assessment base than only private consumption (which would be suitable for the value-added tax only) is needed. In our model, nominal GDP seems to fit best for this purpose, since the ratio of indirect tax revenues to nominal GDP has been rather stable over the past (oscillating between 14.5% and 15.5% for most of the time).

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1 cf. BMF (2012), p. 69 for more details and annual comparisons. We stick to the baseline year 2011.
2 37.85% is the contributions rate of employed people.
3 31.60% is the average of the contribution rate of self-employed (30.45%) and farmers (32.75%).
4 5.10% is the contribution rate to the health care insurance of pensioners.
3.4. Investment and Other Income

A further 3% of total revenues stems from investment income. It is the only revenue item for which econometric estimation is used for the projection.

Theoretically, investment income is supposed to depend on the amount of investment and on the rate of return. While the latter is proxied by the long-term interest rate ($IntN_t$) in the above specification, there is no appropriate measure for public financial assets in the model. This lack of information is circumvented by including the lagged value of investment income ($IntRecPubN_{t-1}$), complemented by the amount of public revenue other than investment income of the current period ($RevPub\backslash Int_t$).

The remaining 7% of revenues which are not covered by the heretofore elaborated revenue items are projected in line with GDP growth.

\[
IntRecPubN_t = -2.7 + 0.5 \cdot IntRecPubN_{t-1} + 5.7 \cdot IntN_t + 0.5 \cdot RevPub\backslash Int_t
\]
4. Public Expenditure

According to the national accounts classification, the bulk of public budget is spent for social cash benefits (38%, chapter 4.1), followed by salary payments (19%, chapter 4.2) and social benefits in kind (11%, chapter 4.3). 9% are spent for intermediate consumption (chapter 4.4.1), 7% for capital formation and capital formation allowances (chapter 4.4.2), 7% for subsidies (chapter 4.4.3), 5% for interest payments (chapter 4.5) and 5% for other expenditure (chapter 4.4.4)

In functional terms, 21% are spent on private sector pensions, 14% on health care, 11% on education, 7% on civil servants' pensions, 4% on family benefits, 3% on long-term care, 2% on unemployment and 38% on other categories.

4.1. Social Cash Benefits

The vast majority of social cash benefits is made up of pension payments (74%), including both payments for private (chapter 4.1.1.1) and public sector pensions (chapter 4.1.1.2). 9% of social cash benefits are due to benefits by the Family Burden Equalization Fund (Familienlastenausgleichsfonds, FLAF, chapter 4.1.2), 4% are spent for unemployment benefits (chapter 4.1.3) and 4% for long-term care allowances (chapter 4.1.4). The remaining 9% (sickness allowance, scholarships, family-oriented benefits paid out by the local governments, housing benefits, etc.) are not modelled explicitly, but they are assumed to evolve in line with inflation (cf. box 1 for further details).

4.1.1. Pension Spending

In 2010, total pension spending amounted to roughly 40 bn Euro, 14% of GDP, of which around ¾ were spent for private sector pensions and ¼ for public sector pensions. There were 2.2 m pensions in the private sector, only around 315 000 in the public sector, making up a total of 2.5 m pensions. The total number of pensioners reduces to 2.2 m, since around 300 000 pensioners receive two or more pensions simultaneously; in most of the cases, these “multi-pensioners” receive a widow pension in addition to an own old-age or disability pension.

4.1.1.1. Private Sector Pensions

In the private sector the average pension amounts to around 970 Euro per month. With the average insured wage being around 2 400 Euro, this gives a benefit ratio of 40% (ratio of average pension to average insured wage). Excluding widow pensions the average entitlement raises to 1 080 Euro and the benefit ratio to 45%. The exclusion of widow pensions is particularly interesting in light of calculating the replacement rate, which is the ratio of the average first pension to the average insured wage and which, in contrast to the benefit ratio, is free from cohort effects that emerge within the overall stock of pensioners. The first pension for old-age and disability pensions amounts to approximately 1 180 Euro, which is equivalent to a replacement rate of 49%.

The projection methodology for private sector pensions is divided in two blocs, which can be termed "price" and "volume" effects. The price effect compasses the projection of the amount of individual pension payments and, hence, the benefit ratios, whereas the volume effect captures the amount of future pensions. The next paragraph analyses the assumptions with regard to the price effect.

The Federal Ministry of Labour and Social Affairs produces long-term pension projections on a regular basis; it makes assumptions about the future impact of current and past pension reforms, which are reflected in the benefit ratio excluding farmers and self-employed, being published in the tables accompanying the reports. Pension entitlements are going to decrease relative to future wage levels, reflecting the transition to a less generous pension system (Allgemeines Pensionsgesetz), but also changes within the socio-economic structure of the beneficiaries (e.g. more pensions from part-time work, more cross-national pensions due to increased migration). In the latest projections for the Austrian Pension Commission (Kommission zur langfristigen Pensionssicherung, 2010) it is assumed that the above-defined benefit ratio will fall by 9 pp (or, equivalently, 21%) from 44% today to 35% in 2050 (Table 29 in Kommission zur langfristigen Pensionssicherung, 2010). For the latest EU-wide pension projections that have been prepared for the EU Ageing Report 2012 (European Commission 2012) and which are based on EU wide concerted macroeconomic and demographic assumptions, the BMASK projects a decrease of the be-

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10 See BMF (2012), p. 69 for a detailed break-down of these numbers. We, again, stick to the numbers for the baseline year 2011.
11 See BMASK (2011) for more detailed numbers of different sorts of pensions in Austria.
12 This includes the spending on minimum pension allowances (Ausgleichszulagen) totalling approx. 1 bn Euro.
nefit ratio by 6 pp (or, equivalently, by 12%) from 44% today to 39% in 2050.

As regards the latest pension reform, we cater for the planned 2013/14 moderation of pension increases (1pp/0.8pp increase below inflation), the rise of the maximal ceiling of the contributory base and the contribution rate of farmers and self-employed. Labour market effects of the structural measures (like the extension of the number of contributory years for the corridor pension, further tightening of invalidity pension eligibility) are allowed for; however, they are expected to be weak (translating into a rise of the effective retirement age for men by 4-5 months and for women by 1 months in the long run). Until the mid-2020s no substantial decline of replacement rates is expected due to stringent caps on losses (which remain enshrined in the new regulation despite the abolition of parallel accounting). As for existing pensions, we stick to the assumption of inflation adjustment.

Having analysed the potential future impact of the "price" effect, we will now turn to the "volume" effect of private sector pensions. From a public finance point of view, this effect is going to work in the opposite direction than the price effect, since the dampening effect of the declining benefit ratio is outweighed by the contrasting evolution of the number of pensions.

Today, there are around 1.7m old-age and disability pensions (and pensioners, since there is hardly anyone who earns two or more old-age and/or disability pensions simultaneously; survivors’ pensions are not modelled explicitly). In each year over the entire projection period the number of pension inflows is expected to be higher than the number of pension "outflows" (which occur through the decease of the pensioners).

The age-specific number of new pensions is calculated as the population of the respective age multiplied with the probability to retire at the respective age. To arrive at the age-specific probability to retire, we use a methodology that exploits the link to age-specific labour market participation rates, which is explained in Annex 2.2 of the so-called Assumptions Report accompanying the 2009 Ageing Report (European Commission, 2008, p. 98). Based on Statistics Austria’s projections of the labour force (cf. Fig. 4.1) the probability of not retiring before a specific age shifts to older cohorts (Fig. 4.2). The probability to retire decreases for the age groups below 62 and it increases for older age groups (Fig. 4.3).
Fig. 4.3 Age-specific retiring probabilities

Due to the steady increase of elderly people, the pension inflow increases from around 90,000 annually today to 115,000 at the end of the 2020s and the start of the 2030s. By then, the tide of "baby-boomers" entering retirement is expected to abate, such that the annual pension inflow is expected to stabilise at approximately 108,000 thereafter.

The pension "outflow" depends on the probability of death and on the share of pensioners among the decedents. According to Statistics Austria’s projections the annual number of deaths increases steadily until 2050, departing from around 77,000 today, to 84,000 in 2030 and 100,000 in 2050. Since the labour market attachment of men has been historically strong, almost all of the decedents will carry pension entitlements, although this share declines slightly (as male participation rates are expected to fall accordingly), but will remain above 97%. The share of female pensioners among elderly women is significantly lower, but will increase over time — in line with labour market developments — ranging within a band of 75% and 85%. Total annual pension outflows will, hence, increase from today’s 68,000 to 74,000 in 2030 and 91,000 in 2050.

Overall, the total number of old-age and disability pensioners is expected to rise steadily from today’s 1.7m to around 2.5m in 2030 and 3.0m in 2050 (left axis and red line in Fig. 4.4).

Fig. 4.4 Direct pensions – total number, inflow and outflow

Up to now, only old age and disability pensions have been considered, since there is an explicit link to the labour market assumptions. In addition to 1.7m private sector old-age and disability pensions/pensioners there are approximately half a million widow pensions, resulting in the above-mentioned total of 2.2 million private sector pensions. In the projections of the BMASK for the Pension Commission as well as for the EU Ageing Report, spending for widow pensions is projected to decrease slightly from 1.5% of GDP today to around 1.3% of GDP in 2050, which results from changes in family structures, converging life expectancies of men and women and the fading out of pensions for WW II
4.1.1.2. Public Sector Pensions

Public sector pensions include all retired civil servants on the federal, local and municipal level as well as in (former) state-owned corporations like the Austrian Post, the Austrian Federal Railways and the social security system. The average public pension amounts to around 2 270 Euro per month. With the average insured wage being around 3 400 Euro this results in a benefit ratio of 67%. Excluding widow pensions the average entitlement goes up to 2 550 Euro. The first pension amounts to approximately 2 700 Euro, giving a replacement rate of about 79%. Hence, while only ⅛ of the all pensions go to the public sector, they account for ¼ of total pension expenditure due to significantly higher average pension entitlements.

The benefit ratio stands at 67%, while it is only 40% in the private sector. However, due to the pension reform of 2004 all pensions will be harmonised in the long run, implying a stronger relative benefit reduction for civil service pensions than for private sector pensions. Indeed, according to public sector pension projections carried out by Statistics Austria in cooperation with the Statistical Department of the Upper Austrian Government the benefit ratio is expected to fall from today’s 67% to 50% in 2050 (cf. BMF, 2011a). The bulk of this decrease takes place in the second half of the projection period, since the transition regime is designed rather generously for civil servants born before 1974, and is tightened only thereafter.

The number of public sector pensions is going to increase slightly within the next 20 years. Subsequently, it is expected to plummet substantially, to around 70% of the current level in 2050, for two reasons: Part of it can be explained by the on-going reduction of the public workforce, which currently stands at approximately 630 000 employees and is expected to stabilise at around 615 000 in the midst of the current decade and to remain at this level subsequently. More importantly, the fall of public sector pensions in the distant future is due to the substitution of civil servants by public sector employees with private sector contracts (they are part of the private sector pension scheme); this has been practiced in public administrations since the late 1990s. Currently, around 56% of the public work force has such contracts; this share being expected to increase further to 67% until 2030 and to 69% in 2050.

4.1.2. Family Burden Equalization Fund (Familienlastenausgleichsfonds, FLAF)\(^{13}\)

Family-oriented cash benefits include the family allowance (Familienbeihilfe), child care allowance (Kinderbetreuungsgeld), maternity allowance (Wochengeld) and other expenditure. FLAF includes also benefits that are not social cash benefits, but which are mentioned in this chapter for the sake of completeness; these are: subsidies for school transport (Schülerfreifahrt), subsidies for school books and pension insurance contributions during parental leave (the latter being classified as transfers between public authorities, the schooling benefits as subsidies).

4.1.2.1. Family Allowance

Varying amounts of family allowances are paid for children up to the age of 24: From birth to the age of 2, children are subsidised with 105.40 Euro per month; children up to the age of 9 are subsidised with 112.70 Euro, juveniles up to the age of 18 with 130.90 Euro and young adults not yet in the workforce up to 24 with 152.70 Euro. Each of these amounts is assumed to evolve in line with the population in the respective age bracket; furthermore, inflation-adjustment is assumed (cf. box 1 for further details on this).

4.1.2.2. Child Care Allowances

The child care allowance is either paid out as lump-sum over various periods, or dependent on the income of the beneficiary. Currently, approximately 15% of new beneficiaries choose the income-dependent variant (8 800 out of 58 000). On average, claims of the income-dependent category (28 105 Euro) are double that of the lump-sum categories (14 000-16 000 Euro), which gives an approximate total of 30% of spending on child care allowances being linked to income. This share is also projected into the future by assuming 30% of child care allowance spending to develop in line with the wage sum; the remaining 70% are kept constant in real terms (as is spending for family allowances). As concerns demographics, both variants are linked to the future development of the number of births.

4.1.2.3. Maternity Allowances

Maternity allowances are paid in order to cater for a proper income of a mother at the time around birth. Hence, it depends on the woman’s previous income, so that it is assumed to evolve in line with the wage sum and in line with the projected number of births.

\(^{13}\)For more information on the FLAF see for instance Mayrbäurl (2010), who also looks into future opportunities for the FLAF.
4.1.2.4. Subsidies for School Transport & Subsidies for School Books
School books and transport to schools are assumed to develop in line with the number of the respective pupils, being proxied with the population aged 6 to 18. The prices of those goods and services are assumed to evolve in line with other consumer prices, hence they are indexed to inflation.

4.1.2.5. Pension Insurance Contributions during Parental Leave
As mentioned before, this expenditure item is a transfer between public authorities, paid by the federal budget and earned by the social security. It is designed to smooth the income of social security and to make it independent of the society’s birth patterns; however, this financial risk is externalized to the federal budget, and therefore it is appropriate to model its expenditure effect on public finances. It is projected to evolve according to the number of births and according to inflation.\(^{14}\)

4.1.2.6. Projected Composition of the FLAF
Due to the different assumptions about the future development of the various items of the FLAF – in particular with regard to inflation and wage adjustment – its composition will change accordingly. While FLAF expenditures are modelled bottom-up (the respective items enter overall public expenditure), FLAF revenues are drawn from the overall revenue projections in a top-down manner; they are shown in order to visualize the growing surplus of the FLAF that is envisaged for the future; currently, more than 80% of the revenues stem from employers’ social security contributions, the rest from personal income and corporate taxes. Due to the existence of a nominal fixed amount in the personal income share and different developments in the future, this share is ought to change to approximately 90/10%.

Box 1: No policy change: Plausibility vs. "Legality"
The notion of "no policy change" oscillates between the conflicting poles of plausibility and "legality". In this context, "legality" means adherence to existing laws. For example, the methodology for pension projections satisfies this condition, since the effects of enacted reforms of the pension legislation on the future amount of pensions are explicitly taken into account.

On the other hand, plausibility has to be taken into consideration as well. A weak form of this concept is implemented with budgetary items, where there are no explicit legal rules. This concerns almost all revenue and expenditure items, since some assumptions about inflation/wage adjustment, about the assessment bases or whether to link its development to nominal GDP for the sake of simplicity have to be made.

A strong form of plausibility prevails where certain assumptions are in conflict with existing rules. The strong form of plausibility overrules the notion of legality, if it is necessary in order to adhere to the notion of "no policy change". In particular, this holds for the assumed inflation adjustment of family allowances (cf. chapter 4.1.2.1), lump-sum child care allowances (cf. chapter 4.1.2.2), nursing allowances (cf. chapter 4.1.4) and other social cash benefits (cf. chapter 4.1). On the one hand there is no legal basis for assuming inflation valorisation; some interest groups are even urging to implement an automatic inflation adjustment. The assumption of inflation adjustment for the projection purpose, however, does not pre-empt such political claims, since it need not to be interpreted as strict automatic valorisation, but rather as a mechanism in order to maintain the real value of these benefits; something that can also be accomplished through discretionary interventions from time to time in practice. Counterfactually, refraining from inflation adjustment would reduce the real values of the benefits substantially over time, mimicking a "long-run fading out" – something not intended by the legislature and therefore contradicting the notion of "no policy change".

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\(^{14}\) The assessment base for pension insurance contributions during parental leave is not the wage of the respective beneficiary, but a statutory amount that is linked to inflation.
4.1.3. Expenditures due to Unemployment

Unemployment expenditure is separated into two categories, one of them being social cash benefits (unemployment benefits and transitional assistance), amounting to approx. 1% of GDP. As with private sector pensions, we again split the projection into a “price” effect and a “volume” effect. The latter is dealt with in the next paragraph.

In 2011, the unemployment rate according to the international definition stood at 4.2% and is projected to climb to 4.8% in 2013. It is assumed that this rate declines convexly approaching 4.0% in the long run. Subtracting unemployment from the (exogenously given) labour supply gives the path for long-term employment. Some autoregression is built into the short-run behaviour of employment. Increments of labour supply are modelled more explicitly and are found to react positively to increases of employment, increases of real per capita wages and increases of the population aged between 15 and 65 (for men) and 60 years (for women).

\[ \Delta \text{LabSup}_t = -(\text{LabSup}_{t-1} - \text{LabSup}_{t-2}) + 0.6 \cdot \Delta \text{Emp}_t + 0.1 \cdot (\Delta \text{WagePN}/\Delta \text{PriceConsPriv})_t + 0.9 \cdot \Delta \text{PopLab}_t \]

The overall labour supply in the economy amounted to around 4.1m in 2011 according to the ILO definition, while it was only 3.6m according to the national definition. These discrepancies, which occur due to different definitions, directly translate into differences in employment and unemployment figures. While in the short run “national definition” employment and labour supply are supposed to behave in the above mentioned fashion, they are supposed to develop in line with their “international” counterparts in the long run (which, econometrically speaking, act as exogenous long-run driving forces). Eventually, unemployment by national definition is calculated as the difference between labour supply and employment. As a result, the long-term unemployment rate according to the national definition, which stood at 6.7% in 2011, is projected to increase to 7.5% in 2013 and to oscillate around 6.9% thereafter (ranging from 6.6% in the 2020s to 7.0% in the early 2040s).

Hence, some deductions are necessary in order to arrive at the assumed amounts of future unemployment (the “volume” effect), while spending per unemployed (the “price” effect) follows a simple rule: it is assumed to grow at the rate of per capita wages. This assumption is justified for the unemployment cash benefit, since it is a fraction of the beneficiary’s last income.

4.1.4. Long-Term Care Allowances

In 2009, 2.3 bn Euro were spent for long-term nursing allowances (BMASK 2011a, p. 12). Matching expenditure data with data about recipients and population allows to construct “age profiles”, i.e. average amounts spent at different ages. For example, the profiles rise for very old people, because they receive higher payments per head.

Fig. 4.5 2009 age profiles for nursing allowances (male and female)

In the projections, the age profiles are aligned with future demographic developments under the baseline assumption that 50% of additional life expectancy is spent without care dependency and 50% is spent in long-term care (cf. chapter 4.3.2.1. for the discussion of morbidity hypotheses). This assumption shifts age profiles to the right as shown in Fig. 4.6.

Fig. 4.6 Future age profiles for nursing allowances (male only)

\[ \text{in}^{15} \text{The other category comprises spending for active labour market measures, which essentially embodies subsidies for firms in order to hire (long-term) unemployed (therefore, they are part of spending for “subsidies”) and which amounts to around 0.75% of GDP. This item is assumed to develop in line with inflation.} \]
Another assumption concerns the take-up effect. This factor is also considered in Mühlberger et al. (2008) and states that information about eligibility will rise until it reaches 100% in 2020. In line with Mühlberger et al. (2008), it is assumed that the number of recipients will increase by 1% p.a. until 2015 and by 0.5% p.a. from 2016 to 2020 due to this effect.

While the change in demography and the take-up effect are cost-push factors, the assumptions about inflation adjustment dampen expenditures in relation to GDP.

4.2. Salary Payments

Per capita wages in the public sector are assumed to evolve in line with per capita wages in the private sector in the future. Currently, the public sector employs around 633,000 people, the majority being employees with private sector contracts (Vertragsbedienstete); only less than 300,000 are civil servants. Due to the current practice of employment we assume that the share of civil servants will decrease further to less than one third of total public employment.

The same projection methodologies are applied for both groups. By the same token, employees are separated into those employed in the education sector (approximately one third of total public employment) and those that are not engaged in education. Non-educational personnel is assumed to decrease slightly (by about 9,000) until 2015 and to stay constant from then on. Teaching staff is assumed to depend on the number of pupils, which is elaborated in the following chapter.

4.2.1. Education

Children and juveniles are classified into four different school types: kindergartens/preschools, primary education (elementary school, special needs school), secondary education (secondary school, grammar school, vocational school, special needs school) and tertiary education (university, college).

Classifying all children aged from 3 years to 6.5 years to be enrolled in kindergartens or preschools gives a total of approximately 305,000 children in 2010. In the same year about 35,000 pedagogues were employed (full time equivalents). Letting the number of children adjust to projected demographic changes leads to a fluctuation in the range of 325,000 (by 2025) and 310,000 (by 2040). We choose to keep the effective ratio of children to pedagogues (8.7) constant throughout 2050, which leads to a proportional fluctuation in the number of pedagogues, with the fluctuation band being proportionally smaller (not more than 2,000).

For primary schools, the assumption that children from the age of 6.5 to 10.5 are enrolled ensures a 100% enrolment rate, since according to the figures of Statistics Austria (2011a, p. 93) approximately 330,000 pupils were taught by about 27,500 teachers (full time equivalents, Statistics Austria, 2011a, p. 242) in the school year 2009/10. The future pattern of the number of pupils is naturally similar to that of the children in the preceding age group, though some years “delayed”. So, there is a peak around 2030 (at about 347,000) and a trough around 2045 (going below 335,000). Holding the effective ratio between pupils and teachers (12) constant again lets the number of teachers oscillate between 28,000 and slightly above 29,000.

Since not only grammar but also all types of vocational schools are included, an age band of 10.5 to 19.5 years is appropriate for the secondary education category, which covers all 815,000 pupils (Statistics Austria, 2011a, p. 93) in this category. The demographic projection foresees a sharp decline throughout this decade, which is counteracted (but not fully outweighed) by trend effects as elaborated in Hanika et al. (2012), so that the number falls to less than 770,000. Subsequently, secondary school attendance rises to below 790,000 by 2035 and declines to 770,000 again until 2050. The projected constancy of the pupils-to-teacher ratio (10.5) lets the number of teacher fall from the current 77,000 (Statistics Austria, 2011a, p. 242) and oscillate between 73,000 and 75,000 further on.

The tertiary education sector differs from the others in some aspects. First, there is no 100% enrolment rate. Secondly, this leaves space for gender-specific differences in enrolment. Thirdly, there is a substantial share of foreign students and, perhaps most importantly, there is a significant interaction with the labour market, making assumptions about tertiary education dependent on what is assumed about the labour market and vice-versa.

The reference population are those aged 19 to 25 years for men (currently, 33% of them are students) and 18 to 24 years for women (39%). This differentiation is made due to the military or alternative service men are obliged to do at the age of 18. How these shares evolve depends on the assumptions about the labour market. We proxy the share of “non-working students” by the number of those juveniles that are currently not working, but who will enter the labour market when they are adults (subtracting the mean participation rate of 26/25 to 45 years old in 14 years’ time from the mean participation rate of the 19/18 to 25/24 years old today). This gives a share of approximately 68%/64% of “non-working students”\(^\star\). These shares are adjusted in or-
der to meet the number of domestic students projected by Statistics Austria (2011c), giving a 53%/55% share of “non-working students” in 2030 and an overall students share of 43%/47% in the above-mentioned age brackets (+10 pp of male students, +8 pp of female students). From 2030 on, these shares are held constant. The share of foreign students (currently 25%) evolves also in line with the assumptions of Statistics Austria (2011c), so that it will reach 30% in 2030, from where on it is held constant. The student-to-staff ratio (11.6) is kept constant throughout the projection period. This lets the number of university and college staff (currently around 28 500) rise steadily to almost 35 000 at the end of the projection horizon. The overall number of students is expected to rise from currently about 331 000 to around 385 000 in 2030 and to more than 400 000 in 2050.

Apart from labour costs (2/3 of total costs) there are also material and other costs, which are mentioned here for the sake of covering all education expenditures. These costs are simply assumed to evolve in line with public consumption.

Although educational staff is modelled explicitly and, thus, its trajectory does not show such a smooth path like that of non-educational staff, it stays within a rather narrow band, ranging from not less than today’s 235 000 employees to not more than 250 000 employees (around 2035). Hence, to whom it might seem a too strong assumption that the number of teachers varies with the number of students, the alternative (keeping teachers constant and letting the students-to-teacher ratio vary) does not differ much in terms of (financial) outcome.

4.3. Social Benefits in Kind

In-kind social benefits comprise three main items: Spending for long-term care (chapter 4.3.1), spending for health care (chapter 4.3.2) and spending for schooling (FLAF expenditures for school transport and subsidies for school books are already dealt with in chapter 4.1.2.4).

4.3.1. Long-Term Care Benefits in Kind

This category mainly comprises expenditure for institutional care. Data about the volume of in-kind spending for long-term care varies: According to the System of Health Accounts (Statistics Austria, 2011b), the difference between total public spending for health care (23.5 bn Euro) and total public spending for health care excluding long-term care (20.1 bn Euro) amounted to 3.4 bn Euro in 2009; subtracting the expenditure for long-term care cash benefits (2.3 bn Euro) leaves 1.1 bn Euro for spending in kind. In contrast, Mühlberger et al. (2008) estimated in-kind spending at 1.3 bn Euro for the year 2006, containing also disability care. Drawing on the ESSPROS classification (Eurostat, 2011), 1.3 bn Euro in the old age function can be assigned to long-term care in-kind benefits (accommodation and home help), and a further 0.7 bn Euro is spent for long-term care purposes in the disability function (for accommodation and for assistance in carrying out daily tasks). Since there is no age related information for in-kind spending, we resort to the age profiles for cash spending as an approximation. Since cash benefits are paid out not only to old people but also to disabled people, we include spending for the care of disabled people, which gives a total of approx. 2.0 bn Euro for long-term care in kind benefits in 2009 according to the above-mentioned ESSPROS data.

In the case of cash benefits, a take-up effect is considered apart from the demographic factor embodied in the age profiles. The take-up effect does not apply to in-kind benefits, but there are other cost drivers: First, a differentiation has to be made with respect to unit costs. While cash benefits can be set directly by government action and are assumed to evolve with inflation, the costs for in-kind benefits are much more determined by market mechanisms and are therefore expected to evolve with productivity/wages at least. On top of that, an elasticity of unit costs with respect to productivity/wages of 1.1 is assumed in order to cater for the potential future excess demand for formal care (since Austria lags behind in formal care supply compared to other countries) and a Baumol effect in this sector (due to high service levels, where productivity evolves at a slower pace than in more capital-intensive sectors of the economy). These assumptions boil down to an average real unit cost growth of 1.65% p.a., which is well within the range of 1% to 2% assumed in Mühlberger et al. (2008, p. 19). Another important, “semi-demographic” cost factor is the enhanced demand for formal care as women increase their labour market participation and thus decrease their propensity to provide informal care. Currently, about 80% of older people in Austria receive help from their family or their social network (Schneider/Buchinger 2009, p. 4 – although this assumption might be questionable, as the data is from the mid-1990’s according to Schimmerl 2011, p.96). Mühlberger et al. (2008, p.18) assume that an increase of women’s participation rate by 5 pp bet-
ween 1995 and 2006 is accompanied by an increase of the share of formal care in total care by also 5 pp (from 20% to 25%). We apply this assumption by projecting that the share of formal care in total care increases by the same percentage points as the labour market participation rate of women aged 40 to 65 years. This boils down to an average annual increase of about 0.2 pp from 2009 to 2030, which is significantly lower than the 0.5 – 1.0 pp assumed in Mühlberger et al. (2008, p. 18). By that, a total of 13.5 pp will shift from informal to formal care (0.3 pp p.a.) between 2009 and 2050.

Depending on the assumptions, Mühlberger et al. (2008, p. 29) expect a surge of total in-kind spending by 109.1% to 420.7% between 2006 and 2030. Schneider/Buchinger (2009) project an increase of long-term care costs of 122.9% between 2008 and 2030 in their baseline scenario. Other studies on Austrian long-term care reveal similar results (e.g. Streissler, 2004). In order to cater for the diverging assumptions about the switch between formal and informal care, we calculate a variant with a threefold expansion of formal care compared to the increase of women’s labour market participation (0.9 pp p.a. until 2050).

4.3.2. Health Care

Health-care specific age profiles (cf. Czypionka et al., 2011, p. 23; Fig. 4.7) are employed in a similar fashion as long-term care profiles. A noteworthy finding is the downward slope of age profiles for health care expenditures for very old people (cf. Fig. 4.7 or Riedel/Hofmarcher, 2003, p. 198f), which can be explained by three factors: First, utilitarian or professional reasons, where limited resources might be devoted to younger cohorts or knowledge about elderly people’s treatment is just limited. Second, older people might restrain themselves voluntarily from receiving health care. And third, there might be a generation effect, that older people have different perceived needs and habits.

Fig. 4.7 Age profiles for health care expenditures

Similar to in-kind long-term care benefits, health care unit costs are assumed to evolve with productivity/wages. Apart from that, there are non-demographic factors that affect spending, too. In the following chapters they are classified as demand side (chapter 4.3.2.1) and supply side factors (chapter 4.3.2.2). This discussion is followed by giving some econometric results of the effects of non-demographic cost drivers and their inclusion in the projections.

4.3.2.1. Demand side factors

Generally, the cost drivers of health expenditure can be clustered into demand-side and supply-side factors (cf. European Commission, 2011a, p. 5ff). The main demand-side factors are changes in the population and age structure. Even though ageing might not be the main driver of expenditure growth, it is an important one. Some studies and international comparisons find that there is doubt about the magnitude of the ageing factor; others – as for instance Colombier/Weber (2010) for Switzerland – attribute most of excess costs on ageing. However, this might be a “red-herring” debate, as argued by the OECD (2011, p. 23), because, while health care expenditures increased steadily in the past, the age structure of the society did not change substantially. The share of people aged above 65 has augmented by only 2.4 pp in the past 30 years (1981: 15.2%, 2010: 17.6%), while it will surge by a whopping 9.7 pp in the next 30 years, and even by 10.7 pp until 2050. Nonetheless, (public) expenditure for health care increased from 5.4% of GDP in 1990 to 7.3% of GDP in 2009 (Fig. 4.8); this picture changes only slightly if adjusted for business cycles: Although the shift from 2008 to 2009 (from 6.9% to 7.3%) is mainly due to the drop in GDP, health care expenditure has already reached a similar level during the preceding boom, if adjusted for the cycle.

Fig. 4.8 Public expenditure for health care
Another demand-side factor is the development of health status – **morbidity** (cf. European Commission, 2011a, p. 9f). Different competing hypotheses can be found in the literature: On the one hand, the “expansion of morbidity” hypothesis states that falling mortality (longer life) is accompanied by an increase in morbidity (sickness) and disability (Gruenberg, 1977). Hence, the longer people live, the longer they are sick. On the other hand, we find the “compression of morbidity” hypothesis, which claims that morbidity is declining in an even more rapid way than mortality and therefore, disability and ill-health are compressed towards the end of life. For Austria, some authors suggest this latter thesis to be true (cf. Riedel et al., 2002, p. 69). Furthermore, there is also a debate, whether or not health related costs are a function of time since birth or a function of time to death. Most of the literature finds evidence for the “death-related costs” argument, but mainly if long-term care is included into the observation. Death related costs increase at the end of life not because morbidity increases, but because larger shares of these people die within a relatively short period of time (i.e. higher mortality; see Przywara, 2010, p. 21f). Since it is not possible to draw a final conclusion on the development of health status as life-expectancy keeps increasing, we model a compromise between the morbidity compression theory (less time in bad health with increasing longevity) and the morbidity expansion theory (more time in bad health with increasing longevity) by assuming that the time spent in bad health remains constant as longevity increases in absolute terms. Statistics Austria (2009) reveal that, in fact, time spent in (subjectively) bad health has decreased since 1978 (from 4.2 years to 4.0 in 2006 for men and from 6.1 to 4.8 years for women) while life expectancy has increased substantially at the same time (by 8.6/6.9 years, respectively). On the other hand, years spent in chronic illness seem to have increased during the last few years.

**Fig. 4.9 Future age profiles for health care expenditure**

The third important demand-side factor for health expenditure increases is **income**. Again, the effect of income on health expenditures is not clear cut (cf. European Commission, 2011a, p. 11): There is no scientific consensus about the income elasticity of health expenditures. Some researchers find evidence for health services being a luxury good with an income elasticity above unity. Others find variations of income elasticities depending on years, countries, methodology, level of aggregation, level of income (cf. DiMatteo, 2003) and health system model. Most studies lead to the conclusion that “health is an individual necessity and a national luxury” (Getzen, 2000). Getzen (2000) finds in a meta-analysis that on a country level income elasticities vary between 1.2 and 1.6. However, more recent and more sophisticated econometric panel studies find evidence for lower elasticities (cf. Acemoglu et al., 2009, Baltagi/Moscone, 2010, Costa-Font et al., 2011, or Sen, 2005) and therefore supporting the hypothesis, that health care expenditure is a necessity rather than a luxury good.

We adopt these latest findings to our model by employing an income elasticity of 0.9. The public health care system in Austria is already universal, implying that higher income will not automatically increase demand and expenditures in the future. In our view this national saturation is also in line with international comparisons, which state that richer countries tend to have income elasticities below unity while poorer countries tend to have income elasticities above unity, implying an international catch-up effect (cf. DiMatteo, 2003, p. 28).

### 4.3.2.2. Supply side factors

Turning to the supply-side determinants of health expenditure growth, an issue which is very important is the **institutional setting**. Even though it is very hard...
to quantify such effects, some authors try to proxy institutional variables like the share of publicly financed health services, the gatekeeper function of general practitioners, and the remuneration of physicians or the consumption of alcohol/tobacco (cf. European Commission, 2011a, p. 13f). The organizational and institutional structure of the health care system and its implications on expenditures are of great importance during discussions on health care reforms as currently undertaken.

Another important supply side effect stems from health technology and its progress. The impact of technology was already discussed very early in the literature on health care costs (cf. Newhouse, 1992). Different studies suggest that between a quarter and half of all expenditure growth might be attributed to technology (cf. European Commission, 2011a, p. 12). The transmission channels are mainly substitution and expansion/extension effects: Old treatments are substituted by newer ones (substitution effect), which might be cheaper or more expensive. If newer treatments are cheaper, more people can avail of them and the total volume effect might outweigh the decreasing price effect. But with new technologies it might also be possible to treat new illnesses and, therefore, expand the scope of health care (expansion or extension effect). Overall, these technology effects on the supply side tend to be positive and lead to further increases of the quality of health care.

These non-demographic cost drivers - technology and institutions - have been quantified in various regression analyses, among others by Czypionka et al. (2011) for Austria and by the European Commission (2011b). In these projections this factor is merely added as a top-up on the basic per-capita health care expenditure growth. The estimates of the EC range between 1.2 pp and 1.6 pp for Austria, the estimate of the IHS amounts to approx. 1.7 pp (multiplying the estimated mean impact of technical progress on spending (Czypionka et al., 2011, p. 8) with the projected increase of spending on this, p. 12, ibidem).

Our approach with regard to non-demographic cost drivers is more in the vein of the EC, who sets the coefficient of the age-related factor at unity, which is perfectly mimicked by using age profiles. Czypionka et al. (2011), however, estimated a coefficient that is well above 2 for the age-related factor, which is perhaps blurred by the low variation of this variable compared to the health care expenditure. The inclusion of a period dummy as of 1995 onwards in the calculations of the EC shows that non-demographic costs have increased significantly less since then (by around 1.2 pp p.a. compared to 1.5-1.6 pp without a period dummy). We, in our projections follow a dual approach: In the first years until 2020, we consider the newly established and approved health expenditure dampening path of the federal government to be in place. This health care reform program will decrease health care expenditure by different measures to be taken by all levels of government (organization of hospitals, cap on pharmaceutical costs, electronic health care filing system, etc.). We incorporate this policy by adjusting non-demographic costs in order to meet the expenditure target. As a result, non-demographic costs are ought to decrease as of 2013 and to approach zero in 2016. Between 2017 and 2020, they are allowed to increase again and to reach 0.5 pp in 2020. This value for non-demographic cost increases (0.5 pp p.a.) is held constant then for the projection beyond 2020. On the one hand this value is clearly below past trends that saw non-demographic costs increase above 1 pp p.a. (see the discussion of the literature above), implying that the institutional reforms currently underway have permanent effects and that they are not reversed after 2020. On the other hand, as non-demographic costs are still permanently growing (and do not converge to zero, as e.g. assumed by the European Commission, 2012), we cater for further potential cost pressures, that will arise also in the future, e.g. above-average pharmaceutical costs.

Furthermore, this assumption does not mean that technological progress has to be cost neutral as we are only projecting total non-demographic costs, which include all different components (for instance the organizational structure, pharmaceutical costs, or investments into health infrastructure). Any of these components can be positive or negative in the future – but we look at the sum of total NDCs, not at individual components and their developments.

To show different scenarios in our projections, we will also assume NDCs to stick to their historical level of 1.25%, which will increase health care expenditures significantly (cf. Chapter 5). By permanently applying the health care expenditure dampening path after 2020, health care expenditures would be lower.

Another critical assumption concerns the morbidity in later ages. As a reference we take the morbidity scenarios elaborated by Comas Herrera et al. (2003). As already mentioned at the beginning of this chapter, the baseline scenario for long term care assumes that 50% of additional life-time through increased longevity is spent in care dependency, whereas another 50% is spent without further need for care (cf. chapter 4.1.4). This scenario lies in between the dependency expansion scenario (which assumes that the time spent in dependency increases in line with longevity) and a pure right shift of the time spent in dependency when life expectancy increases (cf. Comas-Herrera et al., 2003, figure 1, p. 168). For health care, we assume 100% of additional life-time to be spent in good health (“right shift”), which is a compromise between the morbidity expansion and morbidity compression scenario. For the Health Care Morbidity compression scenario, we
assume a compression of 150%, meaning that every year of additional life expectancy is accompanied by 1.5 years less in bad health (which means technically to shift projected future age profiles more to the right).

4.4. Intermediate Consumption, Capital Formation, Subsidies and Other Expenditures

4.4.1. Intermediate Consumption

Approximately ¼ of intermediate consumption is due to age-related spending, of which 20% are due to education expenditure, the rest due to health care spending. However, the majority of intermediate consumption, which comprises maintenance of buildings and automobiles, licence fees, fuel, office equipment, but also military machinery, is not related to demographic developments. The biggest expenditure areas (following the COFOG classification) in this regard are for economic affairs (around 24%), general public services (20%), but also environmental protection (4%) and cultural services (4%). We choose to project this part of intermediate consumption in line with GDP growth such that its share with respect to GDP stays constant in the long run. In the medium term spending for intermediate consumption is projected to decrease from today’s 4.3% of GDP to 4.0% in 2016 (in accordance with medium-term forecasts carried out by the Ministry of Finance, as e.g. outlined in the Federal Medium Term Budgetary Framework, cf. BMF, 2011). In the long run, intermediate consumption is projected to increase very slightly due to the above-mentioned content of age-related spending.

4.4.2. Capital Formation and Subsidies for Capital Formation

We treat investments of state-owned companies and investments of companies that are outsourced but still under government control within one category, since there are no differences from a public sustainability point of view. Slightly less than 1/5 of these expenditures can be accounted for by age-related spending. The remaining expenditure, which is not related to demographic developments, comprises, among others, capital injections for the railway, for the subway and – more recently – for banks. The transport sector accounts for about 32% of total expenditure in this area. Another spending item is water supply and waste water management (together about 10% of total).

Overall, public investment has been declining throughout the past, which is partly due to downsizing of investment, but partly also due to privatizing public entities. In a no-policy change scheme we do not consider potential further privatizations unless they are legally enacted. We therefore project this part of public capital formation to evolve in line with GDP in the future.

4.4.3. Subsidies

Almost half of the subsidies go to the health care and long-term care sector; a further 10% is spent for active labour market policies (cf. footnote 15). The remaining share (which, again, is projected to grow in line with GDP) is spent for subsidising railway tickets, for co-financing farmers’ subsidies from the EU, and for R&D allowances.

4.4.4. Other Expenditure

Other expenditure comprise, among others, transfers to the EU and transfers in the context of international development, but also the above-mentioned pension insurance contributions during parental leave, which are part of the FLAF budget. The large part of items not related to demography (which, again, is projected with GDP growth) lets the expenditure-to-GDP ratio almost unchanged at its medium-term level.

4.5. Interest payments

Interest payments (IntPubN) are estimated according to the following distributed lag parametrisation:

\[
\text{IntPub}_t = -3.5 + 4.4 \cdot \text{Int}_t + 2.6 \cdot \text{Int}_{t-1} + 2.0 \cdot \text{Int}_{t-3} + 4.5 \cdot \text{Int}_{t-5} + 0.2 \cdot \text{DebtPub}_{t-1} + 0.3 \cdot \text{DebtPub}_{t-3} + 0.5 \cdot \text{DebtPub}_{t-5}
\]

The lagged value(s) of the regressand do not enter significantly in this specification, obviating potential problems of spuriousness. Interest payments are assumed to depend on the past average interest rates on government bonds (IntN) and on the level of the government debt (DebtPubN). This is not to say that the higher the public debt, the higher the interest rate to be paid, but merely the higher the amount of interest to be paid. Hence, we refrain from assuming any kind of non-linearity between debt and interest which might be due to decreasing investor confidence when debt increases.
We start out with a specification that includes interest rates and debt levels over the past 5 years. In such a specification, every second year is insignificant. This might stem from non-stationarity of the data, by which the value of one year encompasses the information of the preceding year. Therefore, insignificant time lags (2 and 4) are dropped. While the coefficients on the rates are left unrestricted, a unity-restriction is imposed (and accepted by the t-test) on the sum of the coefficients of debt due to the linear relationship between the volume of debt and the volume of interest payments.

For projection purposes, the assumptions about the long-term interest rate are important. It is expected to evolve in line with nominal GDP growth with a range of surcharges and discounts. In the past 30 years, the surcharge of long-term interest rates on nominal GDP growth was 1.5 pp on average. In the past 20 years it reduced to 0.5 pp, while during the boom years in the last decade there was even a discount of almost 1 pp. In the projections, a surcharge of 0.75 pp is assumed in the baseline, and further scenarios with a surcharge of 1.5 pp and a discount of 0.5 pp are calculated (cf. Fig. 4.10).

**Fig. 4.10 Assumptions about the long-term interest rate**

![Graph showing assumptions about the long-term interest rate](image-url)
5. Different scenarios and sensitivity tests

This chapter gives a brief overview of the different scenarios to be developed to show the outcomes of different assumptions.

5.1. Baseline scenario

The baseline scenario is the reference scenario in our projections. It shows the most probable development according to our assumptions and will be contrasted with the long-run effect of the debt brake rule.

5.2. Macroeconomic scenarios

In order to investigate the sensitivity of the results with respect to macroeconomic assumptions, two scenarios are constructed which vary the baseline assumptions about TFP growth and interest rates:

- "good econ": TFP growth converges to 1.20% in the long run; long-term interest rates are 0.5 pp lower than nominal GDP growth.
- "bad econ": TFP growth converges to 1.10% in the long run; long term interest rates are 1.5 pp higher than nominal GDP growth.

While the economic probability of such a coincidence ("higher TFP + lower interest rate" vs. "lower TFP + higher interest rate") might be debatable, the only focus here is on the effects on public finances. In this regard, the TFP and interest rate variations of either combination work in the same directions – though, differing in size – and, hence, span a wide range for the budgetary baseline projection to oscillate with regard to macroeconomic uncertainties.

5.3. Labour market scenarios

Apart from its baseline projection, Statistics Austria calculates a "status quo" and an "activation" scenario for the labour market (Hanika, 2011b). The former assumes constancy of today’s age- and gender-specific participation rates, the latter a strong increase of participation rates, facilitated by favourable social and political circumstances. To avoid confusion, we will further on call the "status quo" scenario of Statistics Austria "constant participation" scenario.

The "constant participation" scenario is more radical than the "activation" scenario, in that it entails a 6 pp drop of participation rates compared to the baseline, while in the "activation" scenario the overall participation rate increases by only 3 pp. The labour market scenarios have a stronger impact on the economic variables in the model than the macroeconomic scenarios due to more pronounced denominator effects in expenditure-to-GDP ratios. Some social cash benefits, which are projected in line with inflation (e.g. nursing allowances) stay rather stable in absolute terms relieving/weighing on the respective expenditure-to-GDP ratios. The same holds for expenditures on health care and education, since they are predominantly dependent on overall demographic conditions, not on the labour market participation. Although the "activation"/"constant participation" scenario brings along a decrease/increase of the number of pensioners, this is counteracted by an increase/decrease of individual pension entitlements due to higher/lower average career lengths. An exception is spending for long-term care, which increases/decreases even more than GDP because higher/lower participation rates leave less/more women in the informal care sector.

While we did not touch upon the unemployment rate assumption so far, this lever is at least as interesting to scrutinize, since it offers potential for budgetary improvements by exploiting idle parts of the current workforce. In this "low UR" scenario, we assume a decrease of the unemployment rate by 1.5 pp compared to the baseline (this decrease being distributed uniformly among all age groups and gender). The impact on the economy would be large. This scenario shows the positive effects that arise from labour market improvements for both, public revenues (at least in absolute terms) and expenditures (in absolute and in relative terms compared to GDP).

5.4. Demographic scenarios

Hanika (2011a) calculates nine variants to the baseline demographic projection; we pick six of them – including our baseline scenario - in order to visualize the impacts of different aspects of demography:

For people aged older than 65 it is assumed that participation rates decrease linearly to zero at 75. For example, this assumption translates into a participation rate of 16% of the 70-years old in 2035 and 28% in 2050.
5. Different scenarios and sensitivity tests

- **High fertility**: While in the baseline scenario a cautious increase of the current level of 1.44 to 1.5 until 2030 is assumed, the "high fertility" variant assumes an upturn to 1.9, mimicking the current situation in Nordic countries and France.

- **High/Low life-expectancy**: According to the baseline scenario life-expectance would increase from 77.7 years to 85.9 years for men and from 83.2 years to 89.5 years for women. In the "high life-expectancy" variant the figures would grow to 88.7 and 91.6 years, respectively. In the "low life-expectancy" variant they would decline to 82.5 and 86.8 years, respectively.

- **High/Low migration**: In 2010, 114,398 people immigrated to Austria from abroad. In the baseline scenario it is assumed that there is a decline to 103,000 in 2022, from then on a modest increase to 110,000 until 2050 is projected. The "high (low) migration" scenario starts out with an 8% higher (lower) immigration and ends up with a volume that is 14% above (below) the baseline in 2050.

5.5. **Health care and LTC scenarios**

As regards LTC, we compute a high formal care variant, assuming a threefold increase of formal care compared to the increase of women’s participation rates, as outlined in chapter 4.3.1.

As regards health care, we investigate the effects of assuming an enhanced onset of cost saving developments in the health care sector, i.e. what happens if the health care expenditure dampening path is applied beyond 2020 (cf. chapter 4.3.2.2.). Third, we also model a scenario, where health care reforms will not materialize and “nothing happens”, so that past cost trends in health care persist in the future.
6. Conclusion

In this paper, we first developed a macro-economic model to assess the potential impact of demographic ageing (and other factors) on public finances in Austria over the long run. The bases for our analysis are demographic projections of Statistics Austria (Hanika, 2011a) and assumptions on future employment rates (Hanika, 2011b). We use different ways of projecting various important expenditure areas and revenue items of Austrian public budgets and conclude by grouping different scenarios to analyse the sensitivity of our model.

The main interest of this research is to develop a general and comprehensive method of analysing the impacts of ageing and other factors on Austria’s public finances in the long run. This is the first time that such an analysis is undertaken in a comprehensive and quantitative manner: So far, either partial analyses on specific sectors have been conducted, or the analyses were not based on a comprehensive model to assess different channels of impacts and, hence, were merely focused on qualitative investigations (cf. Kramer, 2009). Furthermore, the timeframe of this work is in line with other international organisations and prolongates public medium-term analysis, which is already in place in the budgetary processes today (cf. BMF, 2011), into the long run.

This is in line with an international trend to strengthen the long-term view on public finances: Nowadays, most industrialised countries aim at deepening the understanding of the long-term behaviour of their public finances. The EC analyses the potential effects of demographic changes on the sustainability of EU member countries’ budgets (cf. the Sustainability Report; EC, 2009 and 2012; and Haberfellner/Part, 2009). The OECD started an initiative on “Fiscal Futures” in 2009 in order to undertake detailed research in this area (cf. Anderson/Sheppard, 2009). More recently, the Austrian Court of Audit presented a report on the principles of fiscal policies (Rechnungshof, 2011), which also stresses the importance of long-term views on public finances.

With the recent reforms of the Austrian budget law (cf. Schilhan, 2010) there will be an increasing focus on long-term objectives. We hope that this paper can contribute to direct additional interest on long-term views of public finances in Austria - an attempt, which was already taken up by others (cf. Katterl, 2010). The model presented here could be used and further developed for the sake of these analyses.

Apart from that, there is further supplementary research to be made in this regard: Long-term impacts other than demography might get more important in the future. In this context, the question arises on how climate change or resources restraints will affect public finances in Austria and how this could be integrated in future analyses. Addressing these and further issues will be crucial in order to cope with future challenges public finances are going to face.
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7. About the authors

Stefan Schiman:

Current position:
• Economist, Austrian Institute of Economic Research (WIFO)
• Lecturer, Joint Vienna Institute

Former positions:
• Economist, Economic Policy Department, Austrian Federal Ministry of Finance
• Risk Management Department, Deniz Bank
• Scholar, Institute for Advanced Studies (IHS)
• Visiting Researcher, Wegener Center for Climate Change

Education:
• Master degree in Financial Economics from Maastricht University (2008); thesis title: "Measuring Monetary Policy Shocks in Austria - A Structural Co-integrating VAR Approach"
• Bachelor degree in Economics from Graz University (2007)

Tobias Orischnig:

Current position:
• Economist, Department for Planning, Controlling, Administrative Reforms; DG Budget and Fiscal Policy, Austrian Federal Ministry of Finance

Former positions:
• Advisor to the Executive Director of the Asian Development Bank, Manila, Philippines
• Internships in the European Parliament and the German Federation of Trade Unions

Education:
• Master degree in International Economic and Business Studies, University of Innsbruck (2004); thesis: "NEPAD - The New Partnership for Africa’s Development and regional public goods"
• International Program at the Institut d’Etudes Politiques de Paris

Research interests:
• Development Economics: Relationship China-Africa; Austria’s ODA; Water users associations;
• Budget and Fiscal Economics: Long-term projections; Impacts of climate change on public budgets; Sustainability indicators
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