Chapter 3. The fiscal impact of population ageing in Germany: An unequal challenge for different levels of government

by Fanny Kluge, Research Scientist, Laboratory of Digital and Computational Demography, Max Planck Institute for Demographic Research
Tobias Vogt, Assistant Professor, Population Research Centre, University of Groningen

Population ageing is a global phenomenon, and Western European welfare states, in particular, are ageing at a rapid pace. Still, not all states or even regions within a given country are ageing in the same way, and we find significant differences among them. While some metropolitan areas are attracting younger inhabitants and are even growing, peripheral areas are suffering from out-migration and rapid ageing. In federal countries, these demographic differences create challenges across levels of government, and the variation in the cost and revenue structures of these levels should be taken into account. There are also considerable differences among states or municipalities due to diverging demographic developments. In this chapter, we present age profiles of government revenues and expenditures per capita for the federal, state, and local governments, and use the population projections for the different German Länder *to examine how demographic changes affect budget gaps at each level of government. The results show the long-term fiscal implications caused by different ageing patterns. As out-migration reinforces economic fortunes, a compensatory factor in the fiscal equalisation scheme among the* Länder *is discussed.*

Introduction

Population ageing challenges the current and future fiscal arrangements of developed countries. Previous research has shown that demographic changes are having a significant impact on public spending, and on pensions and health care in particular. The changes in the population age structure call for a range of political adjustments. In a federal country like Germany, the different levels of government are unequally affected due to differences in their cost and revenue structures. While the federal government in Germany is mainly responsible for paying for national defence and general public services that are not age-varying, it also has to cover supplementary payments for social security, including retirement benefits, which are projected to increase sharply as the population ages.

In contrast, the *Länder* (federal states) and local governments are primarily responsible for paying for education and child care, which are expenditures that are likely to decrease as the population ages. Still, all levels of government in Germany will face budget shortfalls, as tax revenues are mainly generated by a shrinking number of working-age individuals. Prosperous federal states and municipalities will be able to meet these challenges by attracting workers from less successful regions, which will, in turn, reinforce the fiscal challenges of the regions that lag behind.

The focus on specific levels of government is often neglected in research on demographic effects on public finance. Earlier work for the United States predicted the effect of this structure on government expenditures in areas such as social security and education (Lee and Edwards, 2002[1]; Lee and Tuljapurkar, 1998[2]). Edwards (2010[3]) used age-specific expenditures from National Transfer Accounts for the United States to analyse the impact of population ageing on the different levels of government. For Germany, comparable studies were carried out by Seitz, Freigang, and Kempkes (2005[4]); Seitz and Kempkes (2007[5]); and Seitz (2008[6]). Their research focused on sustainability estimations for sub-budgets of the government. Bach et al. (2002[7]) examined in detail how tax revenues are changing due to shifts in the age structure of the German population. Drawing on earlier data, Kluge (2013[8]) showed the challenges that the different levels of government face. This chapter uses the latest available data sources and acknowledges the impact of migration on state and local government expenditures.

In Germany, low fertility and increasing life expectancy have resulted in a rapidly ageing population. Currently, the median age of the German population is 46 years, which is almost four years higher than the median age of the population of the neighbouring country of France, and makes Germany one of the oldest countries worldwide (UN Population Prospects, 2019[9]). Moreover, the median age in Germany is expected to rise from 45.7 years in 2020 to 49.2 years by 2045. Thus, while Germany is already a rather old country, its population is ageing at a fast pace. However, this overall trend masks profound regional differences in the rate of ageing between rural areas that are growing older and losing population and metropolitan areas that have a younger age structure and are gaining population. This urban-rural divide is especially interesting given that, in addition to population ageing, migration reinforces the economic fortunes of different geographic areas. Younger, more skilled individuals will continue to migrate to economically strong regions with a younger age structure, and to leave regions that are already suffering from out-migration (Goldstein and Kluge, 2016[10]; Kluge, Goldstein and Vogt, 2019[11]). While population ageing is an important driver that alters the relative composition of the population, the shrinking of the population due to mortality or migration is also an important issue. Using a detailed approach to study government revenues and expenditures that acknowledges the importance of spatial variation is vital.

The German system redistributes resources not only among individuals of different income levels, socio-economic status, and age, but across regions. Demographic developments in Germany are proceeding in regional clusters. While it is true that Germany is among the oldest countries in the world, we find pronounced variation in the age structure by region. Figure 3.1 displays the median ages of German municipalities in 2013. It shows that there are areas in southern and western Germany, primarily around larger metropolitan areas, in which the median age is between 36 and 44 years; as well as regions in western and southern Germany, mainly in rural areas, in which the median age clusters around the national median age of 46 years. The figure also indicates, however, that in many municipalities in eastern Germany (except larger cities and university towns such as Berlin, Leipzig, Dresden and Jena), Saarland, and Lower Saxony, the median age ranges from 48 to 53 years. These enormous differences in the population age structure have profound implications for the budgets of the different municipalities. Older municipalities tend to have higher expenditures and lower revenues and are more likely to suffer from out-migration. These trends can, in turn, further aggravate the financial situations of these municipalities, and restrict their room to manoeuvre.

Figure 3.1. Median age by German district, 2013
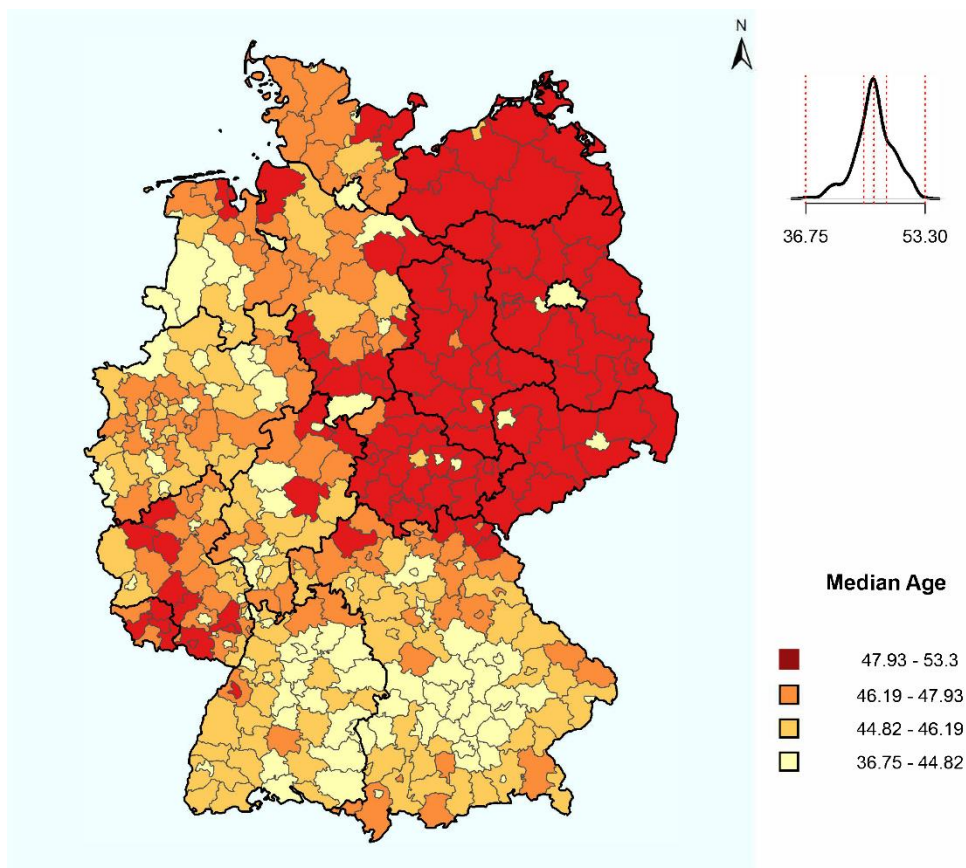
Source: Authors' calculations and presentation based on Regionaldatenbank (2016) accessible via www.regionalstatistik.de (accessed on 10 October 2018).

In this chapter, the latest demographic trends for the German municipalities and the age cost profiles for the different levels of government are presented. The National Transfer Accounts data for Germany is drawn upon to provide detailed estimates for all relevant public revenues and expenditures by single years of age. In addition, it will be shown how expenditures and revenues are expected to differ across the German states in the future. This approach is not intended to serve as an economic forecast, as a representative state profile for each of the 16 German *Länder* is used. Instead, the aim is to shed light on the differences in revenues and expenditures likely to result from the demographic differences among the states. The implications of migration and the steps policy makers can take to address these gaps are also addressed.

Methods and data

The National Transfer Accounts (NTA)[1] are used as a data source for the estimations of revenues and expenditures by level of government and age. The theoretical roots for the NTA project have been provided by Samuelson (1958[12]), Diamond (1965[13]) and Lee (1994[14]). The project was established to introduce the variable age into the National Accounts. It aims to produce detailed estimates of the age dependency of income, consumption, and savings, as well as of government revenues and expenditures. Thus, the project seeks to provide answers to the question of how population ageing is affecting economic indicators. In this chapter, only the NTA results for the age dependency of government revenues and expenditures for the different levels of government are shown.

Government expenditures

In the following discussion, total government expenditures include all public in-kind and cash transfers that are provided for individuals living in Germany (Equation 1). Total government expenditures E_t are given by:

$$E_t = \sum_{j=1}^{J} TG_{j,t}^{in-kind} + TG_{j,t}^{cash} \tag{1}$$

where $TG_{j,t}^{in-kind}$ denotes all public in-kind transfers to which public monetary transfers, $TG_{j,t}^{cash}$, is added, in time t for function j. Public in-kind transfers $TG_{j,t}^{in-kind}$ consist of transfers for education, health, or other summed over all ages from 0 to 90+ in time t. The outcomes reflect public consumption. Public monetary transfers, $TG_{j,t}^{cash}$, are then added, which include pensions, disability payments, family and housing allowances, and other forms of social, financial assistance.

The approach used is comparable for all items. Suitable survey data or administrative records that provide information on the relative utilisation of a particular type of government expenditure by age are identified. For expenditures on education by age, information on the number of children by age and school type is used, as well as the corresponding costs for each individual by school type. The age profile is estimated by calculating the number of students of this age and school type, which is then used to obtain the per capita values. The relative age shares of health expenditures are estimated using the costs of diseases (Statistisches Bundesamt, 2016[15]). In the next step, the profiles are smoothed and macro-adjusted to fit the National Accounts.

Government revenues

Total government revenues are given by:

$$TGO_{j,t} = \sum_{j=1}^{J} TGO_{j,t}^{L} + TGO_{j,t}^{A} + TGO_{j,t}^{C} + TGO_{j,t}^{O} \tag{2}$$

where $TGO_{j,t}^{L}$ are the outflows on labour, $TGO_{j,t}^{A}$ denote the outflows on asset holding, $TGO_{j,t}^{C}$ include all taxes related to consumption, and $TGO_{j,t}^{O}$ denote all other revenues.

Table 3.1 shows the revenues of the levels by type and the micro profile used to allocate the tax by age. Some revenues, such as market selling, other current transfers, and second home taxes, are not easy to classify. For these revenues, the general tax profile for allocation is used.

Table 3.1. Taxes by the level of government and the micro profile used to allocate the respective tax

Joint taxes (federal/state/local)	Age profile for allocation
Income tax (42.5/42.5/15)	Compensation of employees
Accessed income tax (42.5/42.5/15)	Self-employment income
Corporate income tax (50/50/0)	Income and profits
VAT and import turnover tax (51.5/46.3/2.2)	Consumption
Federal taxes	
Insurance tax, energy tax, electricity tax, motor vehicle and air transport tax	Consumption
Tobacco taxes	Consumption of tobacco
Alcopop taxes, spirits tax, sparkling wine tax	Consumption of alcohol
Länder taxes	
Property tax, inheritance tax, real estate transfer tax	Capital
Betting and lottery tax	Alcohol and tobacco
Fire brigade tax	Consumption
Beer tax	Alcohol consumption
Municipal taxes	
Land tax A (Forestry) and B (Other)	Capital
Excise tax	Self-employed income
Other	General tax profile

Note: For the joint taxes, the redistribution key between the levels is shown in brackets.
Source: Authors' considerations.

All age profiles are smoothed before the numbers are adjusted to the macroeconomic control variable. The transfer components (except expenditures for education) are smoothed with the Friedman SuperSmoother in R (supsmu package). The population of the respective year is used as a weight.

Adjustment factor

A crucial adjustment in the National Transfer Accounts is made to ensure that the estimates are nationally representative and fit the National Accounts. Therefore, all of the revenue and expenditure items are scaled to fit their corresponding macroeconomic controls. Depending on how many levels share the expenditures for an expense item, one to three macro controls (federal, state, local government) are used. The adjustment factor is given by:

$$\theta_j = \sum_{a=1}^{90+} \frac{x(a)N(a)}{X_j}, \tag{3}$$

where the age-specific expenditure share, *x(a)*, is multiplied by the population at that age, *N(a),* and is divided by the corresponding macro control by level of government, Xj.

Table 3.2. Public total transfers by level of government (COFOG classification), Germany, 2016

EUR billions

	Government (consolidated)	Federal	State	Local
General public services	182.8	114.1	102.0	39.2
Defense	30.6	31.3	0	0
Public order and safety	44.4	4.8	32.8	7.3
Economic affairs	94.1	35.1	39.7	30.6
Environmental protection	17.4	5.3	3.3	9.6
Housing and community amenities	11.7	2.2	4.1	7.8
Health	199.0	5.9	9.1	5.0
Recreation, culture, and religion	28.9	1.9	14.9	13.1
Education	120.9	5.5	93.0	33.8
Social protection	533.9	171.7	71.5	72.5
Total	1 263.7	377.8	370.3	218.9

Note: The row sums are missing the social security estimates that are disregarded in this analysis.
Source: Federal Statistical Office (2016[16]), *National Accounts 2016,* Federal Statistical Office, Wiesbaden.

For the estimation of the National Transfer Accounts or their underlying parts, such as government revenues and expenditures by level of government, an extensive amount of data is required. These data are described in the following section.

Data

To construct the accounts, a micro survey is needed to estimate age utilisation profiles, corresponding population estimates, and macro controls that allow for the adjustment of the micro profiles to fit the UN System of National Accounts. The macro controls are provided by the federal and the *Länder* statistical offices for the respective years that show detailed results in the National Accounts. Population estimates in one-year age groups are provided by the German Federal Statistical Office. The microeconomic age profiles of government monetary transfers to individuals are estimated using the Income and Expenditure Survey (EVS) 2013.[2] The EVS is conducted every five years by the Federal Statistical Office, and includes data on income, consumption, assets and transfers for 60 000 households. The survey data are representative of households with a monthly net income of less than EUR 18 000. For three months, participating households keep a detailed book of household accounts that covers all forms of income and expenditure. Per capita profiles for the different levels over time are also available. These estimates are relatively stable for the different years.

Results

Because they have different financial obligations and revenue sources, federal, state, and local governments face different challenges. From a demographic point of view, it is especially interesting to note the differences in the age dependency of transfer variables. Both government revenues and government expenditures vary over the life cycle, with expenditures increasing more than revenues.

In Figure 3.2, the total public benefits per capita by age are provided by the different levels of government. The estimates include not only cash transfers made to individuals but in-kind transfers for health or education. The pronounced increase in transfers at older ages at the federal level is solely due to supplementary payments to the German social security

system, which are mainly in the form of public pensions, health and long-term care expenditures. If we disregard these supplementary payments, the federal profile becomes almost flat and hardly varies by age. As national population numbers decline, expenditures at the federal level are likely to be lower in the future. The federal-level expenditures on younger individuals are mainly related to national defence and public order and safety. These expenditures are evenly distributed across the population, and add up to about EUR 2 000 per capita per year. The *Länder* provide pensions for civil servants and financial support for students, which together make up a significant share of state expenditures. The municipalities provide housing allowances and certain forms of social assistance to the middle-aged population. Both state and local governments pay significant shares of the educational costs of young people. The municipalities and the *Länder* provide support for their youngest residents through expenditures on kindergartens and schools. These public transfers vary considerably by age, with most resources flowing to the young and the old. The per capita cost of supporting residents in their teens is, on average, around EUR 8 000 per year at the state level and EUR 3 000 at the municipal level. These figures are slightly higher for children attending kindergarten (up to around age six).

Figure 3.2. Public benefits by level of government and age in Germany, 2013

Per capita values in EUR
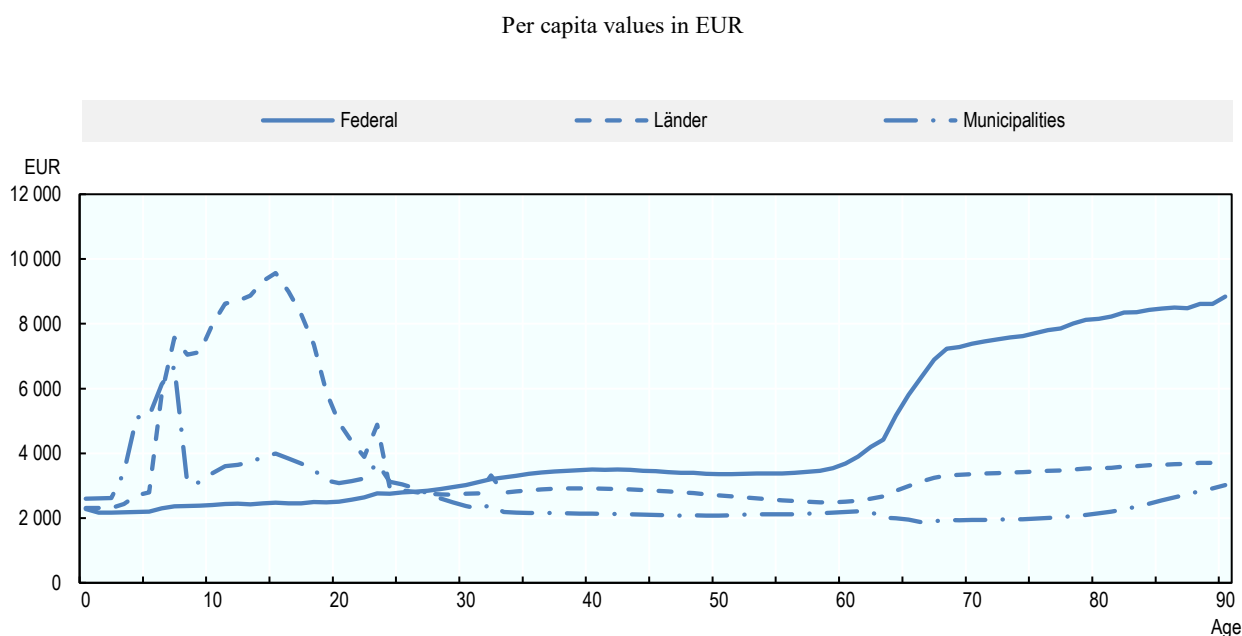
Note: These profiles include age-varying cash transfers like pensions and housing allowances and in-kind transfers like education or health care.
Source: Authors' calculations based on Federal Statistical Office (2013[17]), *National Transfer Accounts 2013,* Federal Statistical Office, Wiesbaden; Federal Statistical Office (2013[18]), *National Accounts 2013,* Federal Statistical Office, Wiesbaden. Subcategories are available upon request.

Public revenues also vary by age and by government level. Figure 3.3 shows the per capita public revenue values at each level of government in detail. The total profile includes combined taxes shared between the different levels, such as value-added tax (VAT) as well as taxes that are collected at one level only.[3] The federal government receives all of the revenues from the solidarity surcharge and from tobacco or electricity taxes. State governments receive revenues from property and inheritance taxes and taxes on beer. Major inflows for the municipalities are generated by real estate and excise taxes. For all levels,

revenues are generated by working-age individuals. The federal government receives per capita inflows of around EUR 1 000 per year from children (due to VAT on children's estimated consumption), of around EUR 3 000 euros per year from retirees, and of more than EUR 6 000 euros per year from prime-age adults. While the *Länder* have comparable inflows, municipalities receive lower tax revenues per capita, and the age structure is slightly more skewed toward older working ages due to the underlying revenue profile of self-employed individuals used to allocate excise taxes.

Figure 3.3. Public revenues by level of government and age in Germany, 2013

Per capita values in EUR
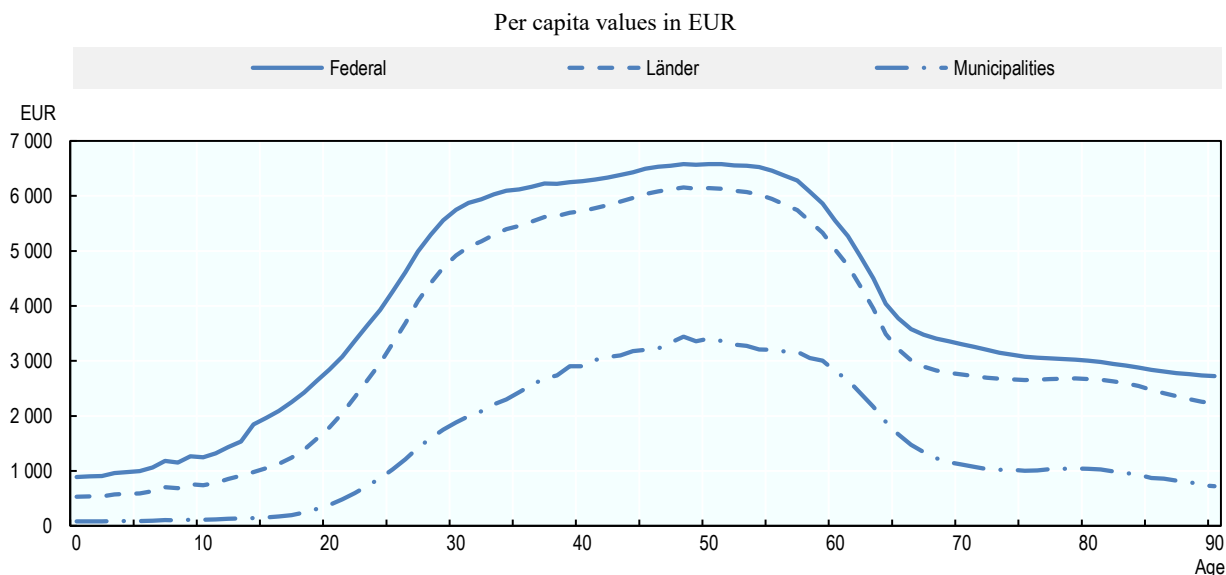
Source: Authors' calculations based on Federal Statistical Office (2013[17]; 2013[18]), *National Transfer Accounts and National Accounts 2013,* Federal Statistical Office, Wiesbaden.

The German **Länder** *in 2050*

The estimated profiles of state revenues and expenditures are used to show future imbalances arising from different demographic dynamics. The same age profiles are applied to all of the German *Länder*. The results are not intended to provide an economic forecast. Instead, the aim is to uncover the differences in expenditure and revenue levels that result solely from demographic changes in age structure and migration.[4] The overall revenue and expenditure levels are expressed as percentages relative to the values in 2013. Changes are further documented in the expenditure levels for the young (under age 27) and the old (over age 57). The age brackets denote the turning points of the life-cycle deficit in Germany. This means that an individual in Germany is not earning sufficient labour income to finance his or her public and private consumption until after he or she reaches age 27. Then, after the individual reaches age 57, the life-cycle deficit again turns negative, and the person's labour income is not sufficient to finance his or her consumption. While younger individuals typically depend exclusively on transfers from other members of society, older individuals might rely on a mixture of transfers and savings.

Table 3.3 shows the expenditure and revenue levels of the 16 German states in 2050. Except for Hamburg, all states can expect lower expenditures and revenues. In some states, the decrease in revenues is moderate, such as in Bavaria or Baden-Württemberg, with revenue levels reaching over 90% of today's values. Others face revenue decreases in the magnitude

of around 20%, as for example, Brandenburg or Mecklenburg-Vorpommern. At the same time, expenditures also drop to considerably lower levels in these states. The most significant discrepancy between revenues and expenditures is in Brandenburg, with a 10 percentage point difference. For all other states, the imbalances are around 7 percentage points in 2050. As stated earlier, these results do not include political adjustments or behavioural adaptations that may alter this picture in the future.

Table 3.3. Germany's expenditure and revenue levels in 2050

Percentage of expenditures and revenues in 2013, changes in the expenditure shares of the population below age 27 and above age 60 as a percentage of total expenditures in 2013 and 2050

State	Level 2050		Expenditures <27		Expenditures 57+	
	Revenues	**Expenditures**	**2019**	**2050**	**2019**	**2050**
Brandenburg	80%	90%	36%	35%	34%	42%
Berlin	99%	107%	40%	40%	26%	33%
Baden-Württemberg	93%	98%	43%	39%	27%	35%
Bavaria	92%	98%	42%	38%	28%	36%
Bremen	91%	96%	42%	40%	28%	33%
Hesse	91%	97%	42%	39%	28%	35%
Hamburg	100%	109%	42%	42%	24%	31%
Mecklenburg-Vorpommern	77%	86%	36%	35%	34%	40%
Lower Saxony	88%	93%	42%	39%	29%	36%
North Rhine-Westphalia	88%	93%	42%	39%	28%	35%
Rhineland-Palatinate	87%	93%	41%	38%	30%	37%
Schleswig-Holstein	87%	92%	41%	37%	30%	38%
Saarland	78%	85%	38%	37%	33%	38%
Saxony	83%	90%	37%	39%	34%	37%
Saxony-Anhalt	71%	79%	35%	37%	36%	40%
Thuringia	73%	81%	36%	37%	35%	40%
Germany	**89%**	**95%**	**41%**	**39%**	**29%**	**36%**

Source: National Transfer Accounts for the levels of government 2013; Federal Statistical Office (2019[19]), *Fourteenth Coordinated Population Projection*; authors' calculations.

The differences for expenditures on the young that are depicted in Table 3.3 are minor. For most states, expenditures on the young decrease slightly or remain stable. For eastern German states like Saxony or Saxony-Anhalt, there are even slightly higher shares for 2050. Here, in recent years, the fertility rates were among the highest in Germany.

The expenditures for individuals above age 57 are increasing in all states as a share of total expenditures. In almost all states, these shares increase by 7 to 8 percentage points. Interestingly, the increases for eastern German states such as Saxony or Saxony-Anhalt are much lower (only 3 to 4 percentage points). This does not show that these states are younger, but rather that they are already old today, due to out-migration, and that ageing continues in these regions.

Discussion and outlook

The results show the different cost and revenue structures of the three levels of government in detail. The federal government's financial obligations are mainly age-independent expenditures related to national defence or economic affairs, and are not increasing as the population ages. However, because it provides additional funds for social security, the expenditures of the federal government will likely increase in the long run. By contrast, as

the population ages, the expenditures of state and local governments are expected to decrease in the long run. The biggest challenge facing all levels of government is generating sufficient revenue while the population is ageing. All levels of government rely heavily on revenues that come from the working-age population. Given that the fraction of the population who are of working ages is expected to decline in the coming decades, it is likely that revenues will decrease significantly. A broader age base for tax revenues would be desirable.

The differences among the levels of government are also affected by differences between states or municipalities. Large discrepancies in the demographic developments of different places will mean that the challenges they face will vary. We estimated long-run differences in the revenues and expenditures of the 16 German *Länder* that are solely due to demographic differences. In some states, benefits and revenues will decrease moderately, by around 6-8 percentage points; while in other states, benefits and revenues may decline by as much as 20-30 percentage points. The latter states are mainly in eastern Germany and peripheral western German regions that have an older age structure and high levels of out-migration. The budget gaps of the different German states range between 4 and 10 percentage points. The time horizon of 2050 seems to leave sufficient time for adjustments to be made.

These different demographic realities seem to suggest that regions that are already ageing and are economically disadvantaged will continue to lose inhabitants through out-migration. Studying the implications of these population losses is vital given that migration tends to be highly selective. Levels of out-migration from eastern Germany to the prosperous regions in the west have been particularly high. This east-west migration occurred in two bigger waves in 1990 and 1997 and continued in the decades that followed (Heiland, 2004[20]). Today, internal migration in Germany occurs mainly from economically weak districts and *Länder* to prosperous urban areas (Sander, 2014[21]). Younger individuals, and especially young women, are especially likely to emigrate. These patterns worsen the situations of the out-migration regions. When young adults leave, these regions face a heavy double burden, i.e. they do not fully benefit from their educational investments, and they lose future tax revenues.

The problem of migration reinforcing economic inequality could be addressed in several ways. One solution could be to transfer age-variable expenditures to the federal government. In the current situation, states and municipalities that suffer from out-migration finance kindergartens and schools for all young inhabitants. A large share of these skilled individuals will likely migrate as young adults to metropolitan areas or more prosperous rural areas in southern or western Germany. The receiving states and municipalities gain skilled workers without having to make the corresponding investments in human capital. A second potential solution is to implement a demographic factor in the fiscal equalisation scheme of the German *Länder*. The state that educated a migrating individual could receive financial compensation from the state that collects the individual's taxes. This could be a fraction of the tax revenue based on, for example, FIFA-type (Fédération Internationale de Football Association) compensation rules. Under these rules, when a soccer player is sold to another club, the club that trained the player receives a fraction of the transfer fees.

In addition, more general solutions are needed to deal with the impact that demographic changes are expected to have on the fiscal relationships among the federal, state, and local levels of government. The economic life-cycle needs of individuals will have to be adjusted as people live longer. One of the most prominent proposals for dealing with this issue is to

promote longer working lives (Vaupel and Hofäcker, 2009[22]), as even a slight increase in the number of years each individual works would have an enormous impact at the population level. If the comparatively long period of time Germans spend in education is shortened or the period of time Germans spend working is extended by just one year, all of the individuals in this age group would immediately convert from being beneficiaries to being contributors. These reforms are expected to save money, as governments would be receiving positive net flows from individuals who, in prior years, would have been receiving benefits. This approach may prove particularly attractive given that in addition to living longer, individuals are spending more years in good health than they were in the past (Christensen et al., 2009[23]). Calculations from the National Transfer Accounts life cycle for Germany show that in 1970, an employee who retired at age 64 had a mean life expectancy of 70 years. This means that around 9% of a person's lifetime was spent in retirement. Later, and especially in the 1990s, early retirement programmes expanded even as life expectancy rose. While the average retirement age is again at around 64 years after decades in which early retirement was the norm, individuals currently have a mean life expectancy of 80 years. Thus, Germans now spend around 21% of their lifetime in retirement. These positive outcomes of demographic change should be communicated.

Another proposal is to redesign the individual life cycle so that people work roughly the same number of years as they did in the past, but that the time spent working is distributed differently. The idea is that people could reduce their working hours while young in order to pursue alternative life goals like raising a family, and make up for these reductions by working additional hours after reaching retirement age (Vaupel and Loichinger, 2006[24]). However, the retirement age could be linked to remaining life expectancy (Fenge and Peglow, 2014[25]). It has, for example, been suggested that if we use modified government revenue and expenditure profiles that shift the retirement age by five years, all of the German *Länder* could finance their expenditures through their revenues. In this scenario, revenues would increase to 105% of the original level, while expenditures would be reduced to about 98% in even the most disadvantaged German states. How these developments play out in the future depends on how expenditures for the oldest old change. Studies have shown that the highest expenditures for health and long-term care are focused on the two years before death (Breyer and Felder, 2006[26]). If this continues to be the case, expenditures will not increase dramatically, as the largest financial obligations are also shifted to older ages, even as the number of oldest-old people living in Germany is expected to quadruple by 2050.

A shortcoming of this study is that a representative state profile for all German *Länder* has been used. This is suitable for estimating the demographically induced differences described in the chapter — still, this approach masks differences among the states in individual economic life cycles. Therefore, in future work, it would be interesting to estimate real state profiles for two representative states. The analysis could be adapted to estimate government revenues and expenditures for an economically sound and an economically weak German state, and their differences and similarities could be studied with a focus on their human capital investments and old age expenditures. In addition, it would be interesting to update the estimates when the latest Income and Expenditure Survey is released in late 2020. Already having state and municipality profiles for 2003 and 2013 that provide rather stable per capita estimates, these findings could be investigated to see if they hold for the most recent years. Such an outcome would strengthen the argument that the per capita values of revenues and expenditures can indeed contribute to efforts to predict future budgets.

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Notes

1. For a more detailed overview, see www.ntaccounts.org.

2. The 2013 survey data are the latest available estimates from the Income and Expenditure Survey. The consumption questionnaire and the corresponding scientific use file for the Income and Expenditure Survey 2018 will not be available until late 2020.

3. A detailed overview of the different taxes collected by level of government can be found in the "Methods and data" section.

4. For future research, it would also be interesting to estimate and compare the age profiles for two representative states in order to show what details the overall *Länder* profile masks. In addition, political or behavioural adjustments could be evaluated.
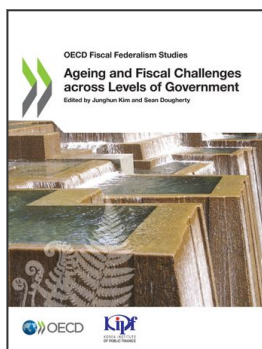
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