DRAFT

Demographic developments in Germany – avoiding a false sense of security in times of vigorous growth

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Abstract

While strong immigration flows have stabilized the German population in recent years, in the long-run Germany is set to display a substantial population decline and, even more importantly, severe population aging. This will endanger average prosperity growth and the stability of the systems providing old-age security, health care and long-term care. The current economic mood is quite joyful, though, preventing a pensive look at these long-term challenges. It would be preferable to place more emphasis on promoting economic growth and to implement structural reforms to prepare the social security system for future demographic change. Among these measures are interventions aiming at increasing the participation rate of women, enhancing productivity by more investments into human capital, and the coupling of the statutory retirement age to increases in old-age life expectancy.

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I. Introduction

In Germany, the current demographic and economic situation is quite favorable. A strong immigration after the enlargement of the European Union and refugees from Africa and the Middle East has stabilized the German population, which otherwise would have started to decline in 2010. Moreover, the stable economic environment during the European debt crisis led to strong capital inflows that lowered the yields on government bonds and reduced the debt payments for public debt substantially. At the same time, the last years witnessed strong employment growth, associated with higher tax revenues and revenues of the social security system, and even surpluses in the federal budget. It is likely that this favorable situation will continue to exist in the short-run.

However, this favorable development hides that the demographic change in Germany is by and large an inevitable development in the long-run. While it might be possible to alter the degree of ageing and of population decline, it will hardly be possible to turn the trend around. From this long-run perspective, economic policy has to address the principal question of how to adapt to this development to mitigate any negative consequences effectively. However, given the favorable current situation the political will to address these challenges remains insufficient. On the contrary, recent changes in the pension system even reduced the sustainability of the German social security system.

The long-run challenges for the public finances and in particular the social security system will start to become visible after 2021 when the baby boom generation starts to retire. Due to the fact that the demographic change is a slow process, the various aspects of this transitions are quite certain (Bloom and Luca 2016). It is therefore instructive to explore the likely quantitative effects on economic growth and public finances, based on projections of the demographic transition. These simulations need to carefully consider the possible linkages between demographic and economic developments. While the effects of aging on the size of the labor force or the public expenditures for social security are obvious, there might be other channels that should not be neglected.

This paper provides a comprehensive discussion of the current state of the debate on the economic consequences of demographic change in Germany, and suggests measures to alleviate the ensuing economic burden. We start by presenting the current state of the demographic transition in Germany and its long-term outlook, followed by a discussion of the consequences of these changes for the growth of economic prosperity. In particular, we use recent empirical findings to challenge some of the assumptions typically invoked to study the effects of demographic change on economic growth. The assessments by the German Federal Ministry of Finance and the European Commission regarding the sustainability of public finances provide the basis for our discussion of possible reforms of the systems of old-age security, health care and long-term care.

The results of these projections show that age-dependent expenditures increase substantially after 2021. This implies that the current structure of public finances is not sustainable. This sustainability gap is so wide that it will not be sufficient to concentrate efforts exclusively on promoting economic growth. What is needed is a more comprehensive package of measures, where not only participation rates are lifted by providing a better environment for the combination of work and family life, and productivity growth is promoted by enhancing investments in human capital, but reforms are also addressing the social security system directly. Specifically, it is highly advisable to couple further increases to the statutory retirement age with the increasing old-age life expectancy. Not implementing the necessary reforms today, which could alleviate the imbalances causing the sustainability gap, will lead to increasing problems tomorrow.

II. Demographic transition in Germany

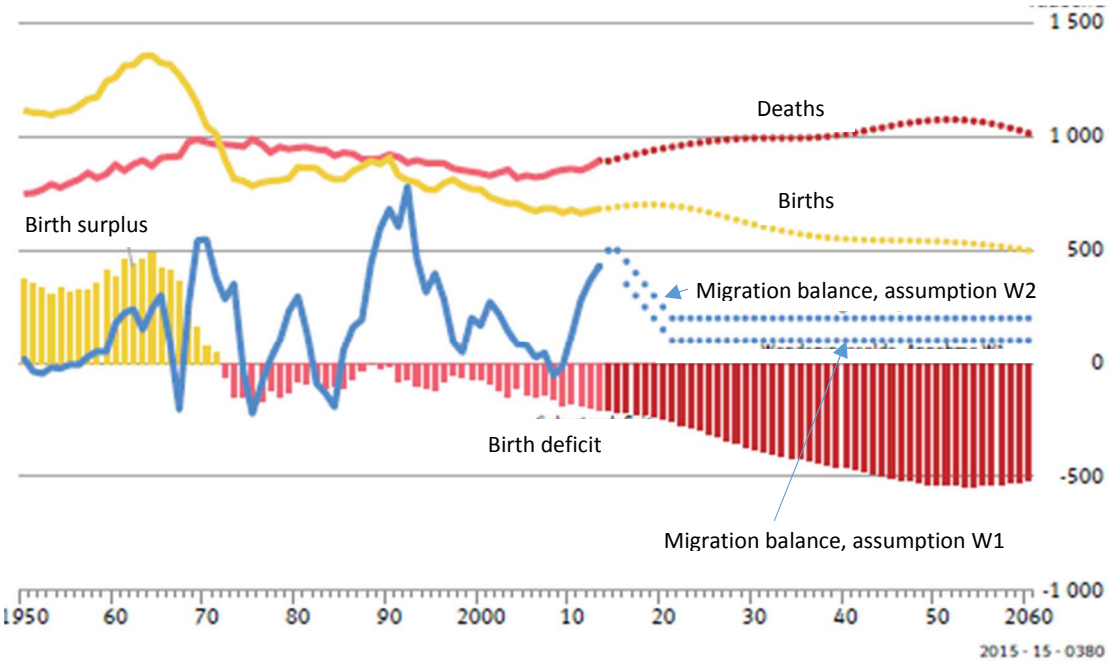
We start the discussion by illustrating the current state of the demographic transition in Germany and its long-term outlook. There are at least two important demographic trends with considerable effects on economic growth and public finances – alterations to the size of the population, and changes in its age structure. In many respects, it is the ageing of the population which implies the more remarkable economic consequences.

The first important element of demographic transition is the decline in birth rates. This has two important implications. The first is that the population declines because every new cohort of newborns will be smaller than the last one. The second implication is that the population becomes older on average as calendar time passes by. As can be seen in Figure 1 this trend started in the late sixties. In the early seventies, the number of births fell below the number of deaths. However, the birth deficit was balanced by a positive net migration until 2008. Afterwards the population in Germany started to decline. The eastward enlargement of the European Union and some years later the European debt crisis lead to a noticeable increase of the number of immigrants to Germany. This strong net migration again stabilized the population size.

However, as the projection suggests this development is not likely to continue in the future. It is already visible that migration from Spain has eased since the economic recovery. In contrast, immigration from Eastern Europe will continue for some time because the income differences between Germany and Eastern Europe are still large. Nevertheless, it is likely that the number of immigrants will decline compared to 2010. However, caused by the increasing number of refugees from Africa and the Middle East we expect more than 200 000 immigrants over the medium-run.

Figure 1

Fertility, mortality, migration

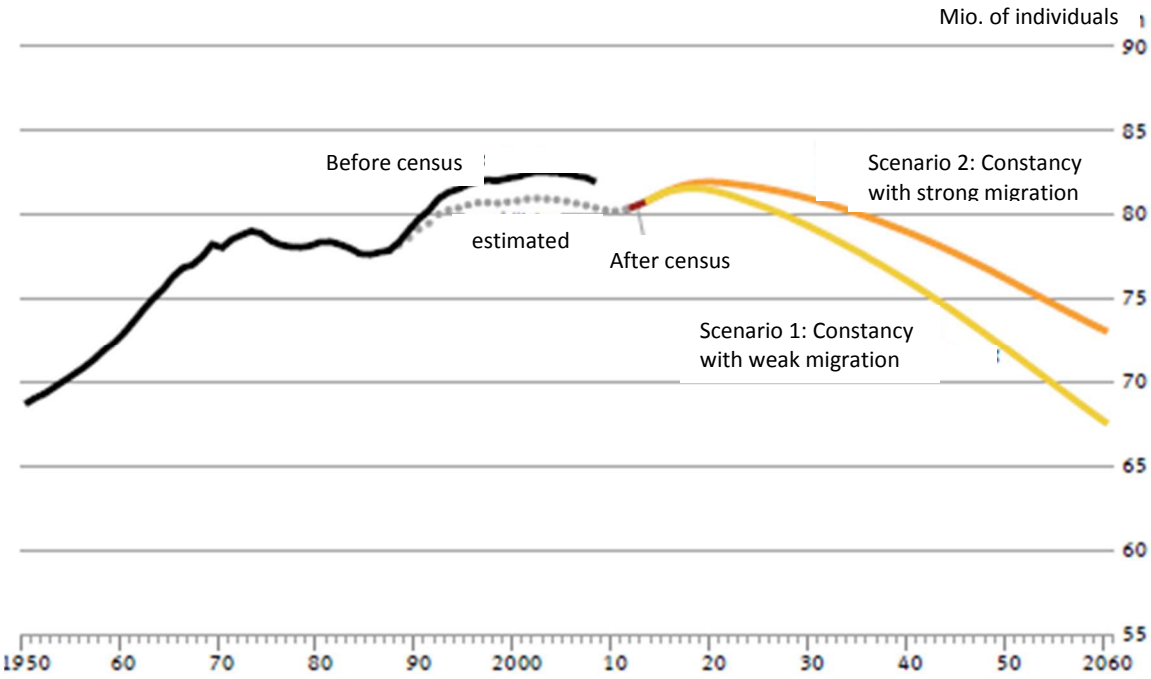


Source: Destatis (2015).

It is also evident from Figure 1 that the birth deficit will increase considerably after 2020. If one assumes that the immigration will decline over a longer time horizon the most likely scenario is that the population in Germany will start to decline around the year 2020 (Figure 2). However, immigration is difficult to predict. The Federal Statistical Office uses therefore two main scenarios (T- and T+ in the following) which differ among others in their assumptions about future immigration. Further differences of the two scenarios lie in the assumptions about the birth rates, life expectancy and the participation rate (Table 1). These two scenarios are also the basis for the sustainability report of the Federal Ministry of Finance (2016).

Figure 2

Population in Germany



Source: Destatis (2015).

Scenario 1 (T-): The birth rate stays at its long-term average of 1.4 children per woman. Life expectancy of women increases from 82.8 to 90.4 and for men from 77.7 to 86.7 years. Net migration is assumed to be 100 000 person per year.

Scenario 1 (T+): The birth rate increases to 1.6 in 2028. Life expectancy of women increases to 88.8 and for men from 84.8 years. Net migration is assumed to be 200 000 person per year after 2020.

Table 1

Assumptions for the baseline scenarios of the sustainability report from the Ministry of Finance

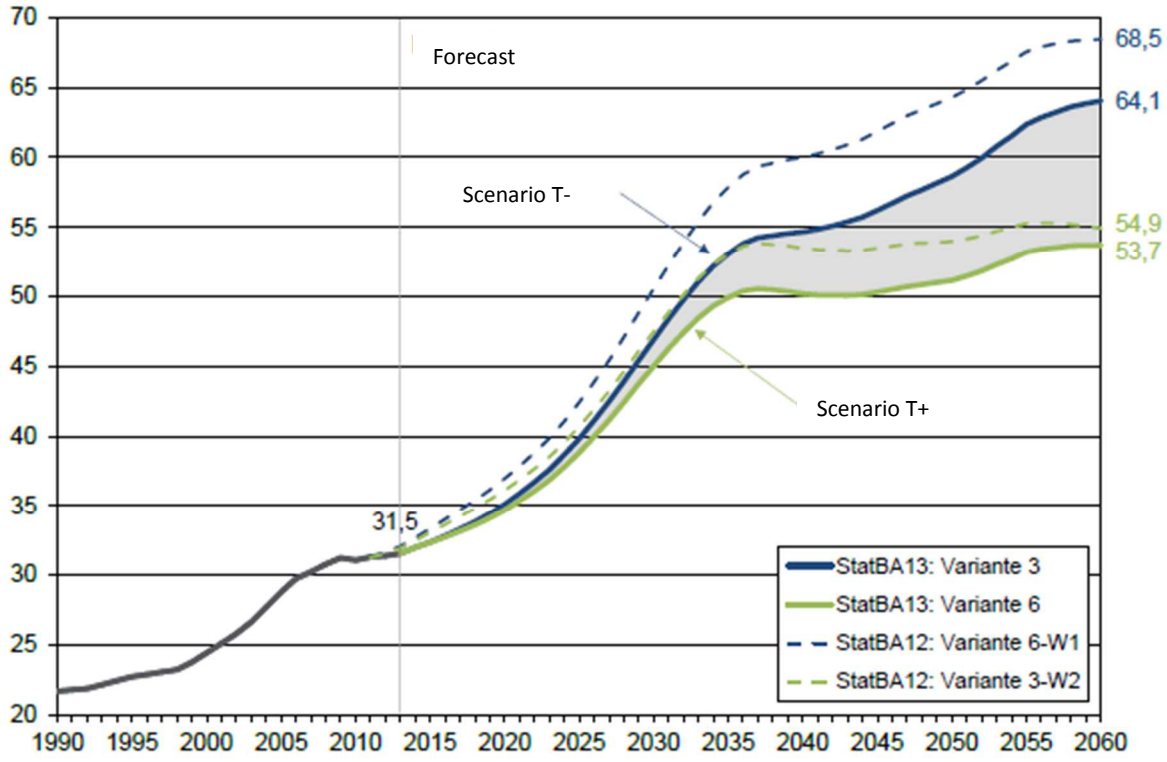
	2010	2020	2030	2040	2050	2060
			Scenario T–			
Demography:						
Population (mill.)	81.7	81.5	79.6	76.8	73.2	69.2
Old-age dependency a)	31.1	35.1	46.9	54.7	58.6	64.1
Labour market:						
Participation rates (%)						
– females (15–64)	74.6	79.6	82.2	82.5	83.0	83.5
– males (15–64)	84.5	85.4	86.0	85.9	85.9	86.1
Labour force (mill.)	43.8	44.6	42.2	38.8	36.4	33.4
Employment (mill.)	41.0	43.0	39.9	36.7	34.4	31.6
Unemployment rate b) (%)	6.4	3.8	5.5	5.5	5.5	5.5
Economic growth:						
Labour productivity c) (%)	0.6	1.0	1.9	1.8	1.6	1.6
GDP c) (%)	0.9	1.4	1.1	0.9	0.9	0.7
GDP per capita c) (%)	0.9	1.4	1.4	1.3	1.4	1.3
			Scenario T+			
Demography:						
Population (mill.)	81.7	82.2	81.9	80.6	78.8	76.9
Old-age dependency a)	31.0	34.7	45.0	50.2	51.2	53.7
Labour market:						
Participation rates (%)						
– females (15–64)	74.6	78.5	82.6	82.8	83.3	84.0
– males (15–64)	84.5	85.0	86.5	86.4	86.4	86.7
Labour force (mill.)	43.8	44.8	43.9	41.8	40.9	39.4
Employment (mill.)	41.0	43.2	42.6	40.6	39.8	38.3
Unemployment rate b) (%)	6.4	3.6	3.0	3.0	3.0	3.0
Economic growth:						
Labour productivity c) (%)	0.6	0.9	1.9	2.0	1.8	1.9
GDP c) (%)	0.9	1.4	1.8	1.5	1.6	1.5
GDP per capita c) (%)	0.9	1.4	1.8	1.7	1.9	1.7

Annotations:
a) Population aged 65+ per population aged 15–64.
b) % of total labour force (internationally standardised definition).
c) Real growth rates (annualised averages over the last 10 years).
Sources: Figures for 2010 are based on actual data provided in official data sources; all other figures are based on simulations using the SIM.13 model („Social Insurance Model, 2013 version“).

Source: Werding (2016).

Figure 3

Development of the age dependency ratio



Source: Werding (2016). Dotted lines are projections based on data from the old census. Solid lines are based on data of the new census.

The relentless increase of life expectancy is the second important element of the demographic transition. This tendency intensifies the aging of the population and has a strong effect on the German pay-as-you-go pension system because it increases the size of the 65+ cohort. A common indicator for this development is the increasing age-dependency-ratio (Figure 3). This indicator is often used to assess the burden of younger generations caused by the current structure of the pension insurance. The age-dependency-ratio is the relation between the number of retirees and size of the working age population.

In a pay-as-you-go pension system, this ratio indicates how many members of the labor force have to finance the pension of one retiree. For example, an increase from 32 to 55 means that currently 3 workers have to pay the pension of one retiree. In 2060 only two workers have to finance the pension of one retiree.

This measure is therefore already illustrative for the challenges of the ongoing demographic change. However, there are many other aspects to consider.

III. Economic consequences

To assess the scope of the needed reforms in the social security system it is necessary to quantify the effects of the demographic transition on economic growth. Due to the long time horizon, it is common to estimate the effects of aging on long-run or potential output. Most sustainability assessments, as the one used by the Federal Ministry, use a production function approach. In this approach, potential GDP is explained by labor, capital and total factor productivity.[2]

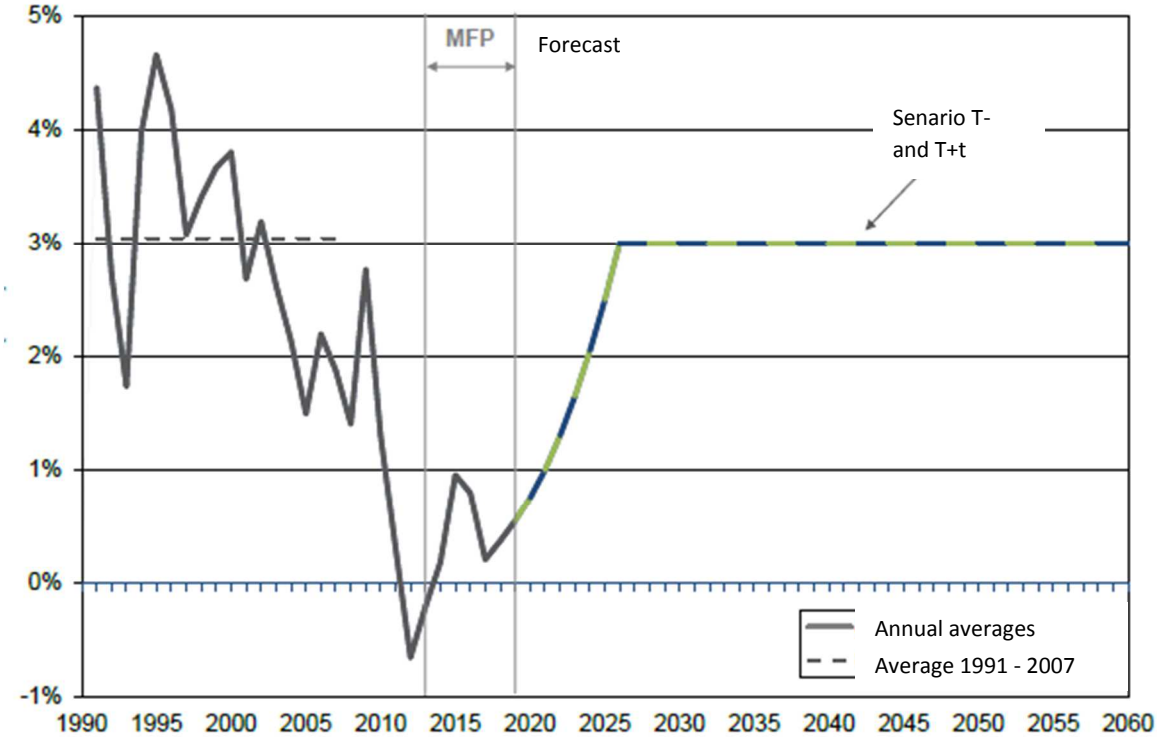
The direct effect of an aging population can be considered via the labor force. In the EU Commissions aging reports (2015) the demographic transition is modeled by splitting the total population into age groups. The sizes of these age cohorts are then multiplied by age cohort specific participation rates. This allows for a detailed projection of the labor force using the information about the development of age groups. Afterwards the labor force measure is multiplied by the non-accelerating wage rate of unemployment (NAWRU) to get the number of full employed workers. The NAWRU and all other parameters are held constant.

Moreover, net-migration is assumed to be exogenously determined. In particular, the TFP growth and the development of the capital stock are assumed to be exogenous to the demographic transition, and both are assumed to remain at historical values. In addition, despite the recent debate of the secular stagnation hypothesis, in the calculations for the sustainability report, the real interest rate – rather than being determined endogenously within the model – is simply assumed to return from its current level to its historical long-run average of three percent (Figure 4).

[2] The European Commission has developed a very elaborated procedure to calculate potential output by smoothing the time series of the input variables. The EU Commission uses this procedure for their aging reports. The approach used by the Federal Ministry of Finance is simpler but uses some variables and parameter values from the EU Commissions database.

Figure 4

Assumption about the real interest rate



Source: Werding (2016).

Based on this approach the economic development, measured by GDP, is derived until 2060. This highlights that this is not a forecast of the most likely economic development. This approach is rather an assessment of the impact of the demographic transition holding all other things constant. As we have argued in the introduction this is important for the discussion about economic policy because the transition is under way even if it is currently not very noticeable.

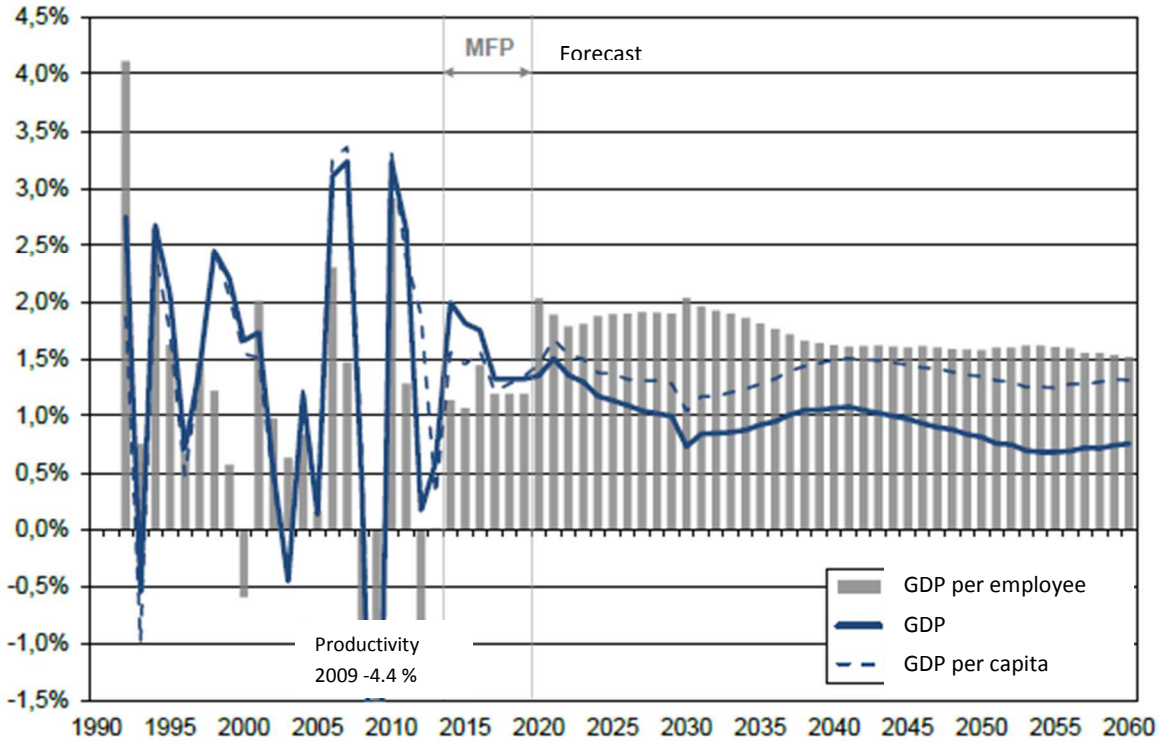
Current situation and long-run outlook

In this section, we present the results for the economic development based on the above-mentioned methodology used in the sustainability report of the Ministry of Finance (2015). To emphasize the sensitivity of the economic development with regard to the assumptions for the demographic variables the two scenarios (pessimistic T- and optimistic T+) are used in the calculations.

In the pessimistic scenario (T-) GDP growth will decline from 1.5% in 2021 to 0.8% in 2060 (Figure 5). The effects of the demographic transition become visible when we compare this development with the growth rates of GDP per capita and GDP per employee. Between 2020 and 2030 the decline in GDP growth is accompanied by declining rates of per capita GDP growth while growth rates of GDP per employee increases. This is caused by the retirement of the baby boomers during that period. From 2030 to 2060 the decline in GDP growth is more closely related to the decline in GDP growth per employee. This time the effect of the declining labor force dominates the development.

Figure 5

Economic Growth in Scenario T-

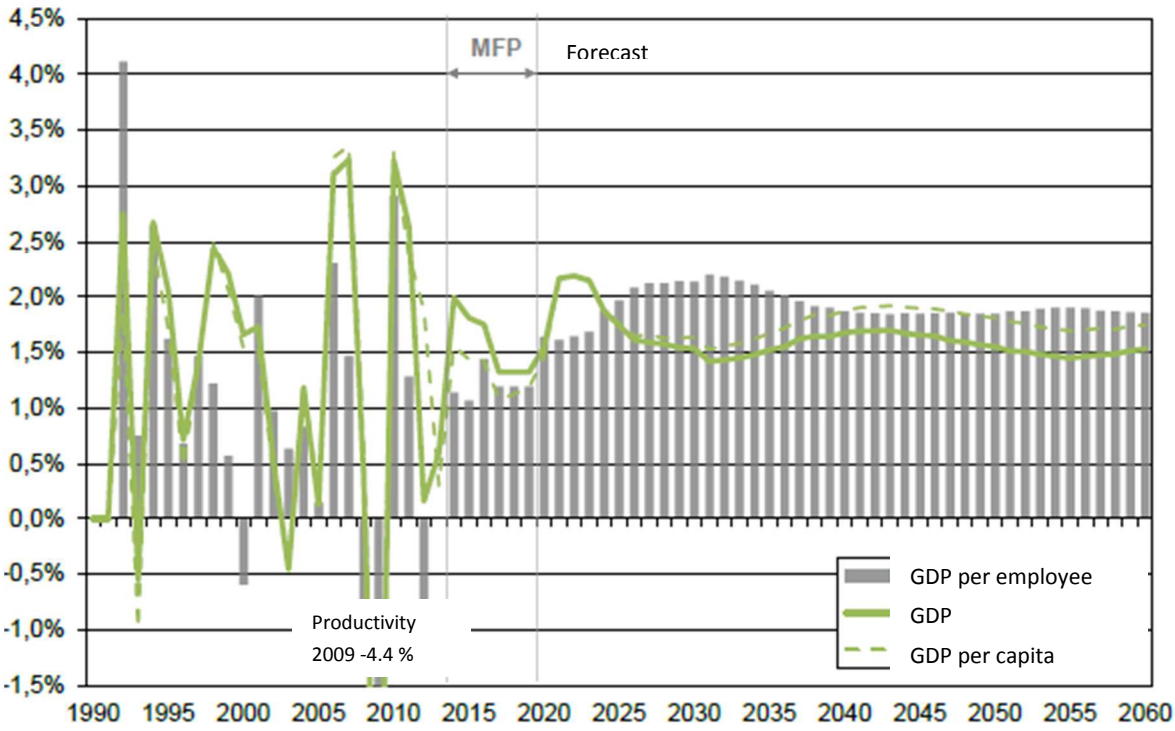


Source: Werding (2016).

In the more optimistic scenario T+ the developments of the economic variables are mainly the same but the magnitude of the economic effects are less pronounced (Figure 6). The GDP growth rate declines in the same period from 2.2% to 1.5%. The decline of GDP per employee is much weaker and GDP per capita increases. Therefore, the development is more related to the shrinkage of the labor force.

Figure 6

Economic growth in Scenario T+



Source: Werding (2016).

Additional channels of the demographic transition on economic growth

The simplicity and transparency is clearly an advantage of the presented approach. However, a review of the literature shows that there are other channels, through which the demographic transition might affect economic growth and therefore the sustainability of public finances. In the following, we discuss some of them along the input variables in the production function.

Effects of the demographic transition on K

The second important source for long-run economic growth is the development of the capital stock. In the approach of the EU Commission, it is assumed that in the long-run the investment share is constant to a long-run historical average. Moreover, to avoid jumps in the transition from the actual investment share to the long-run average it is assumed that it takes place gradually in a linear manner.

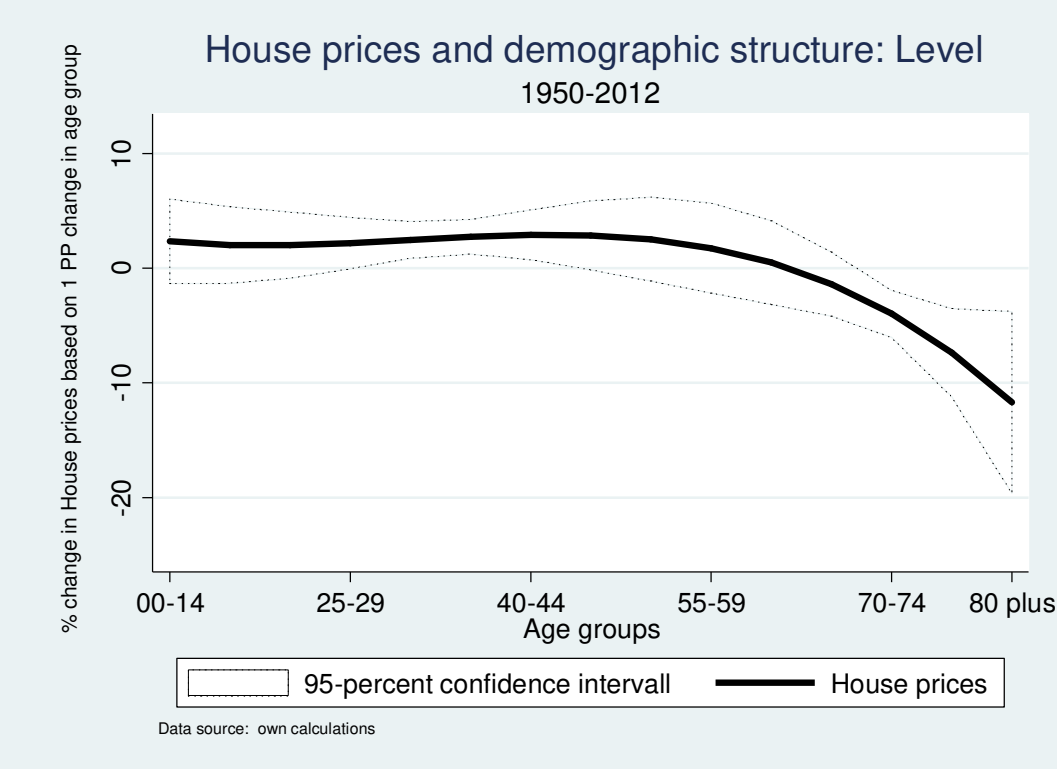
However, the discussion about the secular stagnation hypothesis is related to the discussion about the effects of the demographic transition on private savings and therefore private investment. It is argued that the demographic change dampens saving and therefore investment. A weaker savings demand is accompanied by a reduction of the real interest rate what conflicts with the assumption of a constant interest rate in the simulations. The requirement for this line of reasoning is that the main feature of the demographic transition is the decrease of the population size. If this cohort effect dominates then a reduction in the number of savers will reduce savings as well.

If we take into account that the increase of life expectancy could work in the opposite direction the overall effect is ambiguous. Recent simulations by Carvalho et al. (2016) show that if households are aware of an increasing life expectancy they will save more for their retirement period. Moreover, under plausible assumptions this effect is expected to overcompensate the cohort size effect. It is therefore an empirical question what effect the demographic transition dominates.

This discussion is not only meaningful for physical capital but for all classes of assets. If people want to save more the demand for assets increases. If the supply of assets is inelastic the prices of these assets should increase as well. In contrast, if asset demand is mainly related to the cohort size of savers the demographic change should create a downward pressure on asset prizes. This is the so-called asset meltdown hypothesis. In a recent paper, Jäger and Schmidt (2017) analyzed the relationship between population size, life expectancy and house prices for a panel of 13 industrial countries. As in Fair and Dominguez (1991) the coefficients of the age cohorts are assumed lie along a polynomial. Moreover, the expected life expectancy at age 20 is included in the estimation.

Their results indicate that it is likely that the cohort-size effect dominates the life-expectancy effect. In particular, the coefficients of age cohorts derived from the estimated coefficients of the polynomial show that larger age cohorts between age 30 and 40 are positively related to house prices. In contrast, larger age cohorts above 70 are negatively correlated with house prices (Figure 7). It is therefore to be expected that the ongoing demographic change reduce the amount of saving and therefore the amount of investment and the value of assets. The conclusion is that the effect of demographic change on output growth in more pronounced than assumed in the presented simulations for the sustainability report.

Figure 7



Source: Jäger and Schmidt (2017).

Moreover, it is also likely that the demographic change hinder public investment. This could be the case if elderly people discount future payoffs more heavily than younger people do. Experimental studies point in this direction. In this case, elderly people will support public investment programs less than younger people do. In an empirical study, Jäger and Schmidt (2016) find a negative relationship between demographic variables and public investment expenditures in a panel of 19 OECD countries. Again, weaker public investment expenditures would have a dampening effect on economic growth.

Effects of the demographic transition on A

There is also some evidence that labor productivity depends on the age of the labor force. Two countervailing effects are mentioned in the literature (Aiyar et al. 2016). A positive effect from aging on labor productivity results from the fact that

workers become more experienced with their working age. A negative effect results from the fact that skills depend on the stock of knowledge accumulated during the education period. The combination of these two factors leads to an inverse U-shaped pattern of labor productivity. A strong increase until age 40 and decrease afterwards. The empirical literature finds a statistically and economically significant effect. Consequently, it becomes more difficult to increase productivity to stabilize economic growth in an aging society.

A second important determinant of labor productivity is R&D. If the number of researchers is an important factor for the development of innovations, a decreasing population size could also reduce the number of researchers. However, this effect could be outweighed by the stronger accumulation of human capital. Again, the increasing life expectancy could encourage more investment in human capital (Lee 2016). One approach could be to make Germany more attractive for foreign researchers. It is also possible to increase the number of young researchers by making these jobs more attractive.

IV. **Effects on public finances**

Public finances are directly affected by the demographic transition and indirectly by the effects on economic growth. We start the discussion by showing the development of public expenditures that are mainly affected by the demographic transition. In this context, the no-change assumption is crucial because it is very likely that economic policy will react in some way if the demographic change becomes visible. Nevertheless, to prepare these policy reactions it is very valuable to show what is likely to happen without these reforms. In what follows, the additional assumption that the revenue to GDP ratio is constant over the whole simulation period is used. This assumption is questionable because the overall revenue system in Germany has an income elasticity slightly above one.

To show the quantitative importance of these considerations we again use the simulations from the fourth sustainability report of the Federal Ministry of Finance (2015). It is obvious in Figure 8 that the demographic change will increase the

public expenditures considerably. Using again the two scenarios T- and T+ the path for public expenditures are simulated until 2060. The simulations show that the developments of expenditures will be quite stable until 2020. Consequently, the debt to GDP ratio will decrease. After 2020 however the demographic transition will become more visible and therefore the fiscal stance worsens.

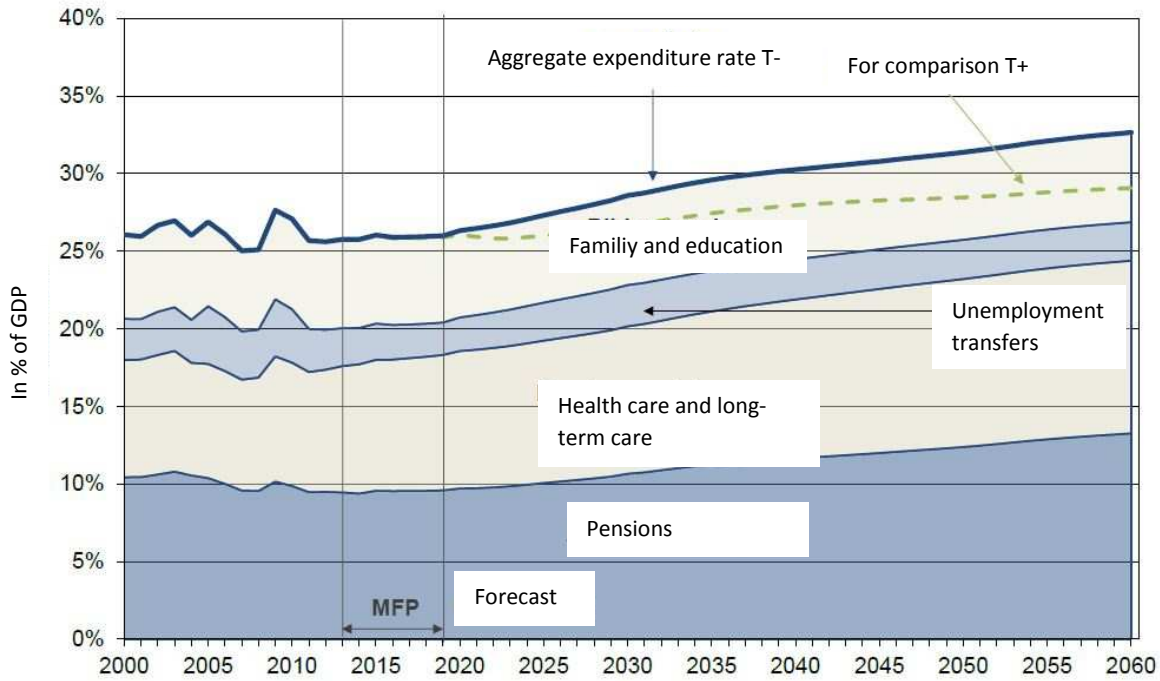
If we look at single categories it is obvious that the expenditures of the pension insures will be directly affected by the increasing age dependency-ratio. However, two countervailing effects will dampen this development. The first is the demographic factor included in the formula to calculate the pension payments. The second is the increasing participation rate of elderly people.

The second expenditure category that is highly affected by the aging process is the insurance for long-term care. It is assumed that these costs are mainly driven by labor productivity, wages and the increasing number of cases. However, the expected increase in expenditure from one to two percent in relation to GDP is not very pronounced.

This also applies for the expenditures of the health care insurance. However, these expenditures depend on the respective stock of knowledge in health care that is unknown currently. From this perspective, the expenditure path is highly uncertain.

Figure 8

Development of public expenditures



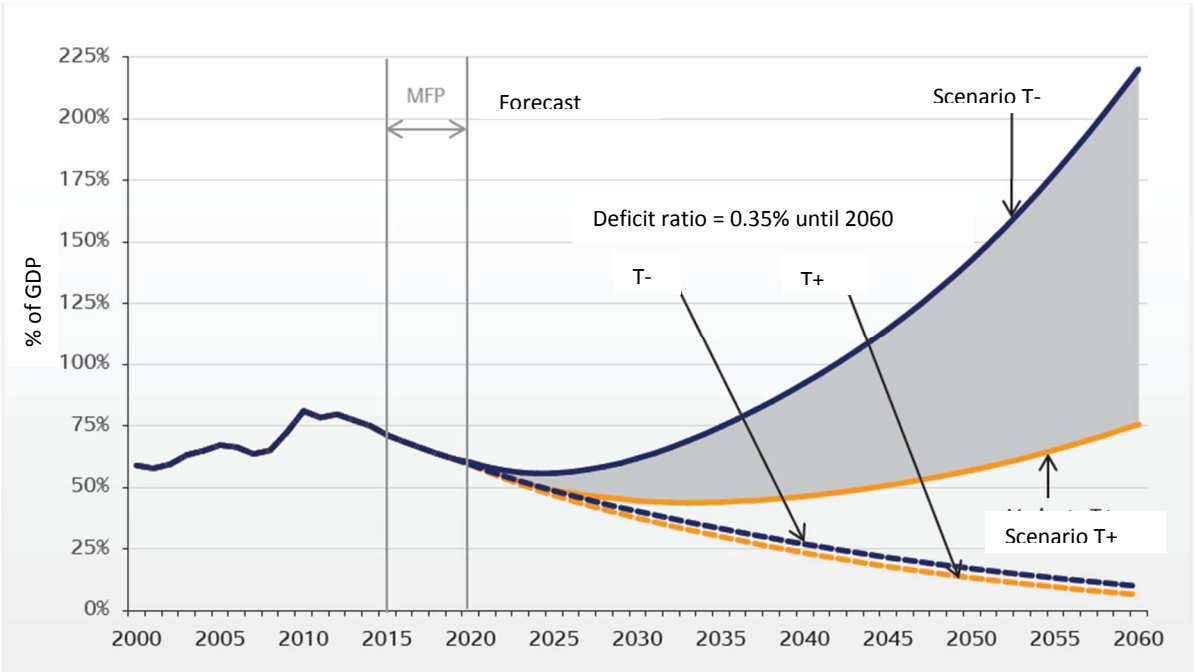
Source: Werding (2016).

Overall, the medium-term outlook for the development of public debt is still favorable. Although the debt to GDP ratio increased substantially due to the need to stabilize the banking sector during the financial crisis the ongoing economic recovery in Germany combined with strong increases in revenues enabled the federal government to reduce the debt to GDP ratio since then. This development was supported by a prolonged period of very low interest rates. This enabled the federal government to reduce the yield payments considerably. In the peak phase of the European debt crises the yields for government bonds even became negative for some maturities. Due to this development, the federal budget turned into surplus. Since this economic upswing is likely to continue over the medium term the public budget outlook deteriorates only afterwards.

However, after 2025 when the demographic change becomes more pronounced increasing age related expenditures in combination with the assumption of a constant revenue to GDP ratio leads to a substantial increase in public debt relative to GDP (Figure 9). Therefore, the question arises whether this is a sustainable development or not. Unfortunately, there is no clear answer to this question. However, a first approach is a negative definition. A steady increase of the debt to GDP ratio is clearly not sustainable (Schmidt 2014). In contrast, a stable debt to GDP ratio is often seen as a sustainable development. If a sustainability gap is identified fiscal consolidation is needed to stabilize the debt to GDP ratio. Then the question arises what the necessary amounts are to improve the budget. To answer this question it is common in Germany to use the following indicators.

Figure 9

Development of the public debt ratio



BMF (2016).

The first indicator (S1) measures the necessary annual improvement in the primary public deficit (in percent of GDP) that is necessary to reach a debt ratio of 60% in 2060. The goal of a debt to GDP ratio of 60% was established in the Maastricht treaty of the European Union.

The second long-term indicator (S2) measures the necessary annual improvement in the primary public deficit (in percent of GDP) to meet the intertemporal budget constraint. Future revenues are sufficient to cover all future expenditures even from past debt.

The first medium-term indicator (S12030) measures the gradual improvements that are necessary until 2020 to reach a debt ratio of 60% in 2060. s12030 measures the necessary annual steps.

The second medium-term indicator (S2mt) measures the necessary gradual improvement until 2020 to meet the intertemporal budget constraint. s1mt measures the necessary annual steps.

Table 2

Sustainability indicators for the general government budget in Germany

Indicators	Scenario T+	Scenario T–
	Long-term sustainability gaps (immediate adjustments starting in 2016)	
$S1$ [a]	0.27	2.31
$S2$ [b]	1.22	3.81
	Medium-term indicators (gradual adjustments from 2016 to 2020)	
	1) cumulative consolidation need ("sustainability gaps")	
$S1^{2030}$ [c]	–1.10	0.15
$S2^{mt}$ [b]	1.25	3.94
	2) annual adjustments until 2020	
$s1^{2030}$ [c]	–0.22	0.03
$s2^{mt}$ [b]	0.25	0.79

Annotations: All figures indicate reductions required in annual primary deficits of the general-government budget, measured as a percentage of GDP.

Underlying fiscal objectives:

a) Reaching a debt ratio of 60 % of GDP by 2060.
b) Observing the intertemporal government budget constraint over an infinite time horizon.
c) Reaching a debt ratio of 60 % of GDP by 2030.

Source: SIM.13 („Social Insurance Model, 2013 version").

Source: Werding (2016).

The results of these sustainability measures or sustainability gaps are presented in Table 2. In the positive scenario S1 indicates a quite small sustainability gap. The primary deficit in relation to GDP has to be improved by 0.3% annually until 2060. In the negative scenario (T-) the sustainability gap is not considerably larger. However, the problem with this indicator is that the time horizon is quite arbitrary and changes from one report the other.

This problem can be avoided by using the indicator S2. To meet the intertemporal budget constraint that has an infinite time horizon the consolidation needs are substantially larger.

If we look at the medium-term the problem of the time horizon is even more pronounced. If we take the indicators seriously, the consolidation needs in Germany in the medium-term are negligible. Nevertheless, the problem is that the foreseeable longer-term worsening of the demographic development is not fully taken

into account by these measures. It underestimates the consolidation needs or shift them into the future.

The conclusion form these indicators therefore has to be that the federal government in Germany should start now to reform the social security system in a way that they are able to cope with the foreseeable demographic change. The advantage would be that these reforms could have to some extend a preventive character. Private households therefore would have time to adjust their decisions for example for saving to this new environment.

An easy to implement reform of the pension system is to increase the retirement age. The increasing life expectancy is one argument in favor of this measure because it is not simple an increase of lifetime. At the same time health of older people improve substantially. For this reason, the council of economic experts (SVR 2011) suggested to tie the retirement age to the increasing life expectancy by a rule. Under the current law, the retirement age will increase from 65 to 67 in the year 2030.

However, this is not sufficient to reduce the age related expenditures considerably. To avoid future discussions about a discrete increase of the retirement age a rule could be implemented. The council of economic experts suggested to split the lifetime after age 20 between working life and retirement period by 7 to 3. Using this rule it is to expect that the retirement age would be raised to 69 in the year 2060. At the same time, the retirement period would increase to 20 years in 2060.

V. Conclusions

It is definitely more than adequate to place the discussion of the economic consequences of the demographic transition on the top of the political agenda. Currently the demographic transition might not receive sufficient attention because it is overlaid by strong immigration. However, the consequences of declining birth rates and of increasing life expectancy are real, and they are foreseeable for the long-run. Responses to this demographic change have to be implemented now because they need time to become effective, and because otherwise the challenges will tend to grow even further. Simulations conducted by the German ministry of finance can be used as guidance for what measures are most efficient to dampen the effects on public finances. The overall effects are so substantial that a single measure is not sufficient.

A first option is to increase the fertility rate to dampen the demographic change in general. However, the simulations show that this has only limited effects on public finance. Even if this policy is successful, it will take a long period to generate economic significant effects. In contrast, it is also shown by simulations that migration has a quite strong impact on public finances. An explicit migration policy is therefore an additional option to reduce the sustainability gap in the future.

Another approach is to strengthen economic growth. To reduce the reduction of labor supply during the demographic change one option is to increase the participation rate in general and of woman in particular. Improved childcare and more flexible labor contracts in particular with regard to part time work could increase the labor supply within an age cohort.

Other starting points is an increase of productivity. One approach is to promote investments in human capital. However, the aging on the labor force could reduce the effectiveness of this policy. In general, it is likely the effects of the demographic transition on economic growth are so substantial that policies to increase productivity or other sources of economic growth are not able to compensate the negative impact. However, they might dampen the negative effect.

Overall, it seems to be unavoidable to reform the social security system. In particular, the heightening of the retirement age should be high on the agenda. There are many jobs were it is not necessary that people retire at age 65. In particular, if older people are healthier today than in former times. The Council of Economic Experts in Germany therefor suggested connecting the retirement age to the increasing life expectancy by using a constant ratio of the working period and the retirement period.

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