A fiscal outlook for Poland: Update 2014

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Contents

Abstract

Poland faces one of the most rapidly ageing population in Europe. The old age dependency ratio is expected to triple until 2060. Against this background, our paper examines the sustainability of Polish public finances and its isolated subsystems. We consider the profound recent reforms including the transfer of 2nd pillar pension obligations to the general government in 2014. Furthermore, we extend our previous computations (Jablonowski et al., 2011) by using data from household budget surveys as well as large pension contributors' and tax payers' databases. Our results show that the pension reforms enacted since 2011 improve the long-term stability of public finances. A risk for fiscal sustainability represents, however, the public health care system which may be severely challenged by the ageing process and a continuing excess cost growth. We assess a number of health reforms including co-payments and a shift to tax financing which have the potential to stabilize the public health care system.

Keywords: Fiscal sustainability, Fiscal policy, Poland, Pension reform, Public health care

JEL classification: H50, H55, H60, H68, J10, H3

1   Introduction

Poland, one of the biggest countries in Central Europe, will confront a rather severe crisis arising from the the development of the so called ageing process. No other EU country (except Slovakia) can expect such a rapid rise in the number of elderly people relative to the working population in the coming 50 years. This process may have severe consequences for the stability of public finances via increasing age-related expenditures to be financed by a shrinking working population. Against this background, the question arises as to whether the Polish fiscal system can be sustained in the long term. Traditional methods of cash/accrual deficit and nominal debt measures focus only on the current development of fiscal situations. Therefore, long-term stability indicators have to be chosen to answer this question. This study provides a sustainability assessment of the fiscal system, applying the methodology of Generational Accounting (GA). On this basis we aim to partially bridge the gap of fiscal sustainability computations for Poland. The methodology of GA was developed initially by Auerbach, Gokhale and Kotlikoff (1991, 1992 and 1994), who sought to illustrate the effects of intergenerational policy. Since the early 90's, GA has become a broadly used method to measure fiscal sustainability.[1]

With this study we aim to update our previous research (Jabłonowski et al., 2011). The current study is based on 2010 data and assumptions, with many updates reaching 2013. We assess not only the sustainability of the overall Polish fiscal system, but also of its smaller subsystems. Thus, we seek to evaluate which isolated subsystems represent the main drivers for the long-term (in-)stability of Polish public finances.

Our study seeks to evaluate past reforms and the consequent need for further action. A number of legal changes have been introduced in the past years, such as the shift of funded contributions to the pay-as-you-go pension scheme and the extension of the minimum retirement age for both men and women to 67. Yet in 2014 a further cut of the funded pension pillar has been legislated with a partial transfer of funded pension assets/obligations to the general government. Against this background we assess whether the recent reforms improve or deteriorate the fiscal sustainability of the pension system. Furthermore, we concentrate on the public health care system, which shows the biggest sustainability gap of Polish public finances. We discuss a number of health care reforms to limit the cost growth and the revenue gap in the public health care sector.

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[1] A further description of the methodology of Generational Accounting is provided e.g. by Raffelhüschen (1999) and Bonin (2001). Hagist (2008) gives an overview of empirical studies using Generational Accounting. A discussion of critical points in theoretical and empirical terms has been provided e.g. by Havemann (1994) or Hagist (2008).

The paper is structured as follows: The data sources used for these calculations are presented in chapter 2. We focus on demographic data and assumptions as well as fiscal micro and macro input data. Furthermore, we discuss in chapter 2 our choice of global parameters (growth and discount rates). With the following chapter 3 we provide the results of the Generational Accounting analyses using different kinds of sustainability indicators. After an examination of the entire general government sector we finally take a perspective on the isolated fiscal systems – namely of the general pension system, other types of social security benefits provided by ZUS, the farmers' and civil servants' social security system, public health care and education. Chapter 4 summarizes the paper providing an additional outlook on future research.

2   Method, Data and assumptions

The current study follows closely the methodology and data used in our previous paper (Jabłonowski et al., 2011). The projection of the general pension system is based – with some updates[2] – on the computations described in detail in Jabłonowski and Müller (2013).[3] Against this background, in the following section we focus only on the core input data and assumptions used in this exercise.

To project the Polish fiscal system into the future we require an update of the population projection, the general government revenues and expenditures for the starting year 2010, age-sex specific profiles for various types of revenues and expenditures, the growth rate of productivity and the respective discount rate. Basically, we rely on 2010 input data, although we applied micro and macro data up to the year 2012 as far as possible. All numbers and values are provided in present values of 2010, if not stated otherwise. The population projection in the following section is calculated by means of a demographic program developed by Bonin (2001).

2.1   *Population projection*

The projections used to compute the fiscal projection of the Polish pension system are based on the latest demographic assumptions of Eurostat, namely EUROPOP2010. These assumptions have been slightly modified and updated by the World Bank. The main difference to the Eurostat assumptions concerns extending life expectancy increases to 2100 – see Table 1 below.

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[2] Some further updates have been considered in our ZUS pension model such as the consideration of future maternity and unemployment state transfers as well as new NDC and initial capital accounts data.
[3] A detailed description of the projection of the disability system can be found in Jabłonowski et al. (2014).
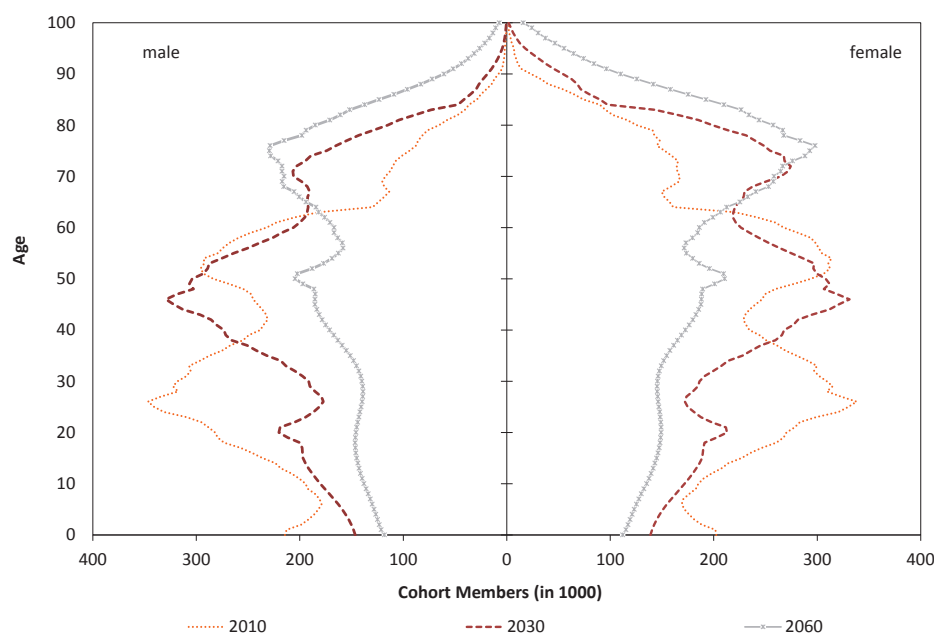
Table 1: Assumptions of the demographic scenarios

	World Bank
Female life expectancy at birth in 2010	*80,7*
Male life expectancy at birth in 2010	*71,3*
Female life expectancy at birth in 2060 (in 2100)	*87,9 (90.0)*
Male life expectancy at birth in 2060 (in 2100)	*82,4 (86.0)*
Fertility – 2010	*1,37*
Fertility – 2060	*1,56*
Net migration 2010	*-2.014*
Net migration 2060	*14.123*

Source: own illustration based on Eurostat and internal World Bank input data

Figure 1 illustrates our population projection – the main basis for our GA calculations. It is said that demography reflects to a great extent the history of the respective country. This becomes apparent when looking at Poland's age specific population structure in the base year 2010. Striking are the two large, so-called babyboomer generations. Firstly, these are the cohorts aged 45-60 in 2010, born one decade after World War II when birth rates recovered. These sizeable age groups are now close to retirement and may therefore put substantial fiscal pressure on the unfunded general pension system – which will be elaborated in the following section. Secondly, the cohorts aged around 20-35 in 2010 are numerous – the children of the first babyboomer generation. After the opening of the Iron Curtain in 1989, Poland displayed a steep fall in natality—as in most formerly communist countries. Consequently, the number of 5-20 years old in the Polish population of 2010 is relatively small.

Figure 1: Structure of the Polish population

Both, low fertility rates and the ongoing and rather steep increase in life expectancy (see Table 1) lead to a significant ageing process in Poland. As a result, the appearance of the Polish population pyramid will considerably change in the coming decades (see Figure 2). Compared with other European countries, the pace of this ageing process is exceptional. This can be illustrated by the old-age dependency ratio, defined as the number of persons aged 65 and older, relative to those between 15 and 64. As illustrated in Figure 2, this indicator will rise from about 20 percent in 2010 to roughly 70 percent in 2060, which is a steeper increase than in any other EU country except Slovakia. Demographic development of this kind puts substantial pressure on a pay-as-you-go (PAYG) pension system and can thus be understood as the main reason for the sweeping pension reforms that are described in the next section. As Figure 2 outlines, the demographic projection used in this study (referred to as *World Bank assumptions*) follows relatively closely the Eurostat forecast. Only in the very long term do we slightly deviate from this benchmark population projection, which can be mainly explained by updated input data and slightly different timing of the main demographic assumptions.

Figure 2: The development of the age dependency ratio in Poland
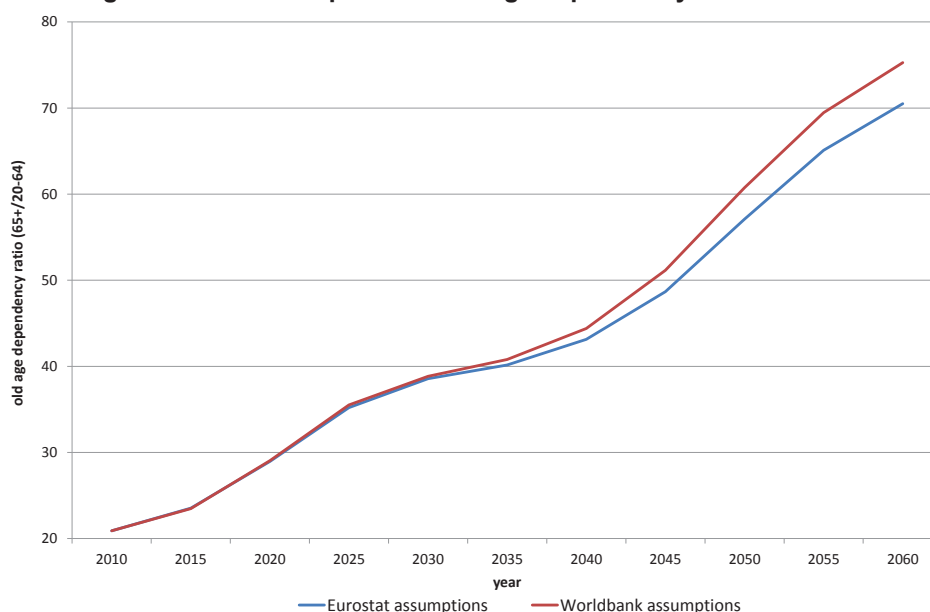
Source: own calculations based on Eurostat data and World Bank assumptions.

2.2 Fiscal data

The pattern for aggregated entries on the revenue and expenditure side reflects available micro-profiles. The input data for the revenues in our model consist mainly of age and gender specific

profiles of the following categories: value added tax (VAT) and excise tax (based on the HBS[4] data), personal income tax (PIT) based on the 2% individual sample from the Ministry of Finance tax database as well as social and healthcare contributions based on the 1% sample of the individual contributors and beneficiaries monthly dataset provided by ZUS for years 1999-2011. Other vital revenue profiles were either provided upon request by the government offices or estimated on the basis of publically available statistics (e.g. education). For the expenditures side we relied mainly on the data provided by the requested government offices and ZUS. Altogether, we managed to separate over 100 different age and gender specific profiles and respective aggregates. Compared to our previous study (Jablonowski et al., 2011) this represents a significant improvement of precision in our projection. In particular, the data quality of indirect and direct taxes, healthcare contributions and farmers' contributions improved. On the expenditure side the data were of comparable quality (with significant improvement in NFZ disaggregated expenditures).

2.3   *Growth and discount rates*

With regard to the main macro-economic assumptions, namely productivity and employment growth, we based our calculations on World Bank estimates. The discount rate as well as the long-term rate of return of FDC assets were set at the level of 3% in real terms in line with the recommendations of the European Commission.[5] We chose these assumptions to ensure international comparability. Alternative levels of the discount rate and productivity growth and their impact on our results are provided in the sensitivity analysis (see Appendix A1). An overview of the long-term development of our main macro-economic assumptions can be found in Figure 3 below.

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[4] HBS stands for Household Budget Survey individual, anonymized database for around 30.000 Polish households, collected and prepared by the NSI. Data for years 2005-2011 were provided by the World Bank for the purpose of this study.
[5] The 3% real discount rate has been chosen by the European Commission for all long-term projections across Europe carried out in the framework of the Ageing Working Group, see also EC (2011).

Figure 3: Overview of the future rates of return
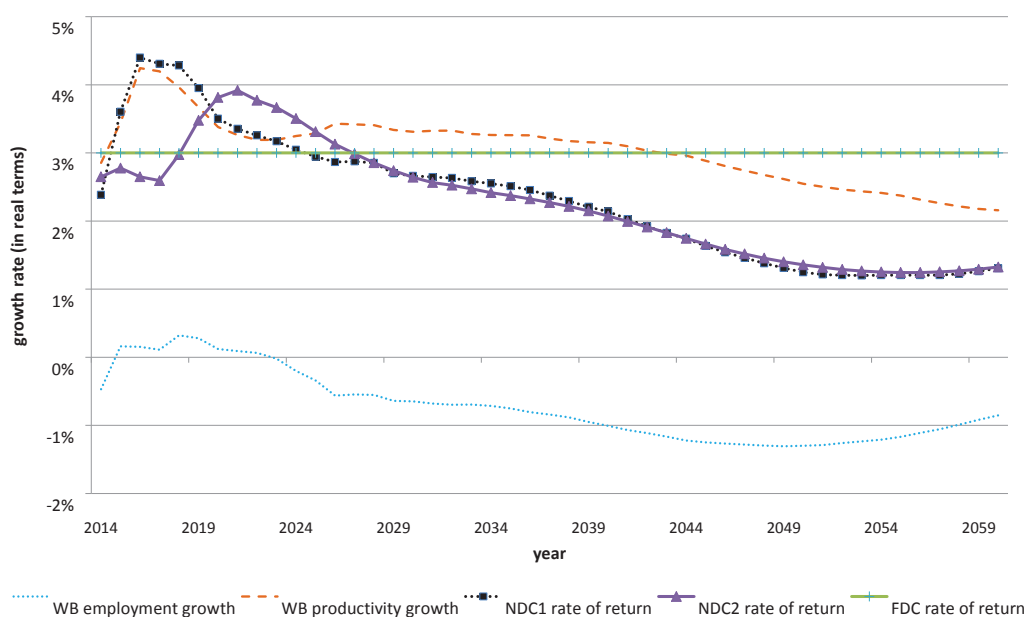
Source: own estimation based on World Bank assumptions.

3 Sustainability Results

3.1 Entire public finances

The core question of this survey is whether current fiscal policy in Poland can be regarded as sustainable – despite the forecasted tripling of the old age dependency ratio until 2060. Firstly we aim to answer this question for the overall public finances before we assess subsystems of government finances in isolation.
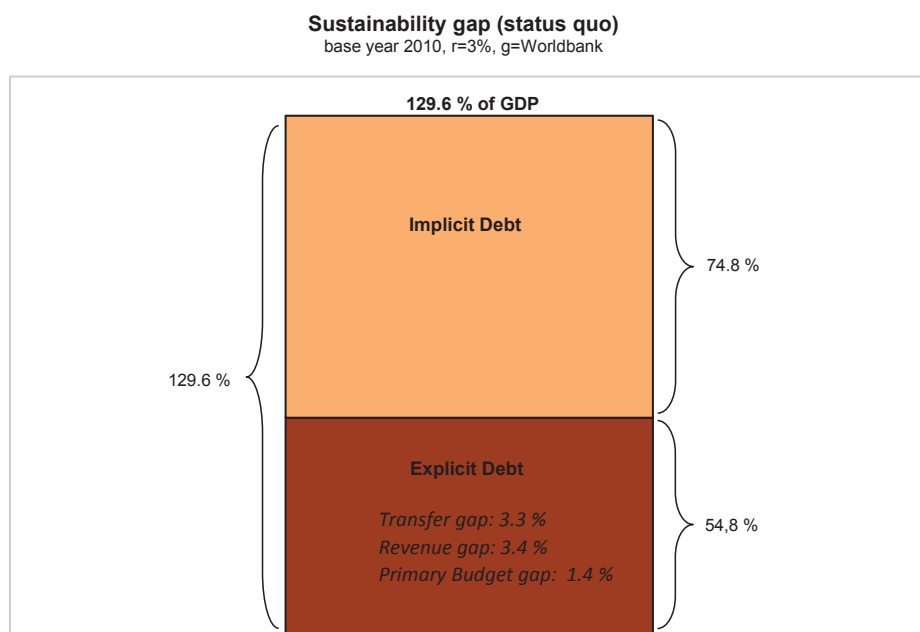
Our results indicate that the explicit debt, amounting to 54.8 % of GDP in 2010, provides only a partial picture of the overall Polish public debt. The implicit debt, which may arise if the current fiscal policy is prolonged in future years, would additionally sum up to about 75 % of GDP. Thus, in total the sustainability gap of Polish public finances amounts to 129.6 % of GDP. From this perspective, Polish public finances are not fully sustainable. Reductions of expenditures and/or increases in revenues will be necessary in future years to close this gap. The dimension of these fiscal changes is illustrated by the transfer and revenues gap. Politicians have the option to increase all revenues by 3.4 % (Revenue Gap) or to reduce all transfers by 3.3 % (Transfer Gap) to close the sustainability gap. In total, the primary balance has to be reduced by 1.4 % of GDP to bridge the sustainability gap.[6] For

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[6] The value of 1.4 % of GDP reflects the Primary Budget Gap (see Box 1). A cut of 0.6 % of GDP of the primary budget balance is alone required to close the gap caused by the explicit debt. Additionally, a reduction of 0.8 % of GDP is necessary to close the gap of the implicit debt. The Primary Budget Gap is akin to the S2 Indicator used by the European Commission (EC). For the EU the S2 indicator added up to an average of 2.6 % of GDP, see EC (2012), p. 43. In comparison to the EC we are not estimating the structural component of the primary balance. Thus the Primary Budget Gap and the S2 Indicator are

a further description of the sustainability indicators see Box 1. The most recent pension reform, namely the transfer of 2nd pillar obligations to the general government, is not included in these results – as it was still in the phase of implementation while writing this study. If we consider this new reform the sustainability gap decreases further to 96 % of GDP.

Overall, the long-term stability has improved significantly in the last years. Compared to our estimates for 2007 base year data, the sustainability gap diminished by about 98 % of GDP which can be to a large degree explained by the reforms adopted by the government since 2010 - further details are provided in Box 2 below. Despite the tripling of the old age dependency ratio until 2060 one may regard the current fiscal policy of Poland as relatively though not completely sustainable. To get a better understanding of the driving forces behind this result, in the next section we assess the long-term stability of isolated sub-systems, such as the public pension and health care system.

Figure 4: The sustainability gap of Polish public finances

Sustainability gap (status quo)
base year 2010, r=3%, g=Worldbank

129.6 % of GDP

Implicit Debt

74.8 %

129.6 %

Explicit Debt

Transfer gap: 3.3 %
Revenue gap: 3.4 %
Primary Budget gap: 1.4 %

54,8 %

Source: own calculations.

not strictly comparable. The reference with the EU average of S2 (2.6 %) and our Primary Budget Gap (1.4 %), however, roughly indicates that Polish Public Finances are relatively sustainable compared to other EU countries.

Box 1: Sustainability Indicators applied[7]

The **Sustainability Gap** indicator measures public liabilities in relation to the base year GDP. It includes not only past debt accrued (explicit debt) but also future public debt (implicit debt) – assuming that the present fiscal policy will hold in the future.

The **Revenue Gap** outlines the necessary immediate and durable adjustment of all taxes and contributions to close the sustainability gap in relation to overall revenues. Its counterpart, the **Transfer Gap**, indicates the required change of all public transfers to close the intertemporal budget constraint in relation to overall transfers. The **Primary Budget Gap** reflects the necessary immediate and durable adjustment of the primary budget balance to close the sustainability gap in percent of GDP. It is akin to the S2 indicator used by the European Commission.[8]

Generational Accounts reflect the net-tax payments over the remaining life-cycle for a given birth year – projecting the current fiscal policy into the future. As they are constructed in a purely forward looking manner, they can usually not be compared across living generations as they incorporate effects of differential lifetime.

The above-mentioned sustainability indicators measure sustainability by one single number. This approach is valuable as it provides a comprehensive indicator of fiscal long-term stability. It is especially appropriate for comparisons of reforms and between fiscal systems. Most policy makers are, however, not yet familiar with such aggregated figures and the underlying concepts. Therefore, we also provide the standard indicator of **Annual Cash Flows**. These cash flows are valuable as they outline "timing effects".

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[7] For a further description of these indicators see Jabłonowski and Müller as well as EC (2012).
[8] In comparison to the EC (2012) we are not estimating the structural component of the primary balance.

Box 2: Comparison of 2007 and 2010 sustainability estimates

The difference between our last sustainability estimates of the base year 2007 and the current results of the base year 2010 may be striking. In fact, the sustainability gap of the entire public finances almost halved and diminished by about 100 % of GDP. A number of reasons explain this improvement of the fiscal long-term stability. Firstly, it has to be underlined that we based our calculations on new and more precise input data. All data and assumptions were updated from 2007 to figures of the period 2010-2012. Furthermore, we applied more detailed age and gender specific micro data for a number of sizeable government revenue items, such as VAT, excise, PIT, NFZ and ZUS pension accounts. In total, these updates led to a slight increase in the sustainability gap. Secondly, we improved the estimation approach for ZUS disability and survivors' pensions. Instead of constant disability prevalence rates we now reflect inflow and outflow probabilities into/out of disability. With the current relatively strict eligibility rules this leads to a gradual drop of future disability prevalence rates. Additionally, survivors' pensions are linked to diminishing old-age pension replacement rates. Besides these modelling factors, recent reforms enacted after 2007 explain to a large degree the lower sustainability gap of the current study. The increase in disability contribution rates alone, legislated in 2010, reduces the gap by about 42 % of GDP. The permanent transfer of a part of 2nd pillar contributions to the unfunded NDC system adopted in 2011 (referred to here as "FDC cut") decreases the gap by about 30 % of GDP. This reform shows an immediate expansion of the revenue side, but also increases future pension expenditures, which are, however, discounted higher in our present value calculations. Finally, the recent rise in retirement ages to 67 (RA67) lowers the sustainability gap by about 10 % of GDP. The overall impact of this reform, enacted in 2012, is relatively small. Some of the gains of the RA67 reform, namely longer/higher contribution and tax payments, are lost due to higher expected disability expenditures.[9]

**Figure 5: Sustainability – where do we come from ?**

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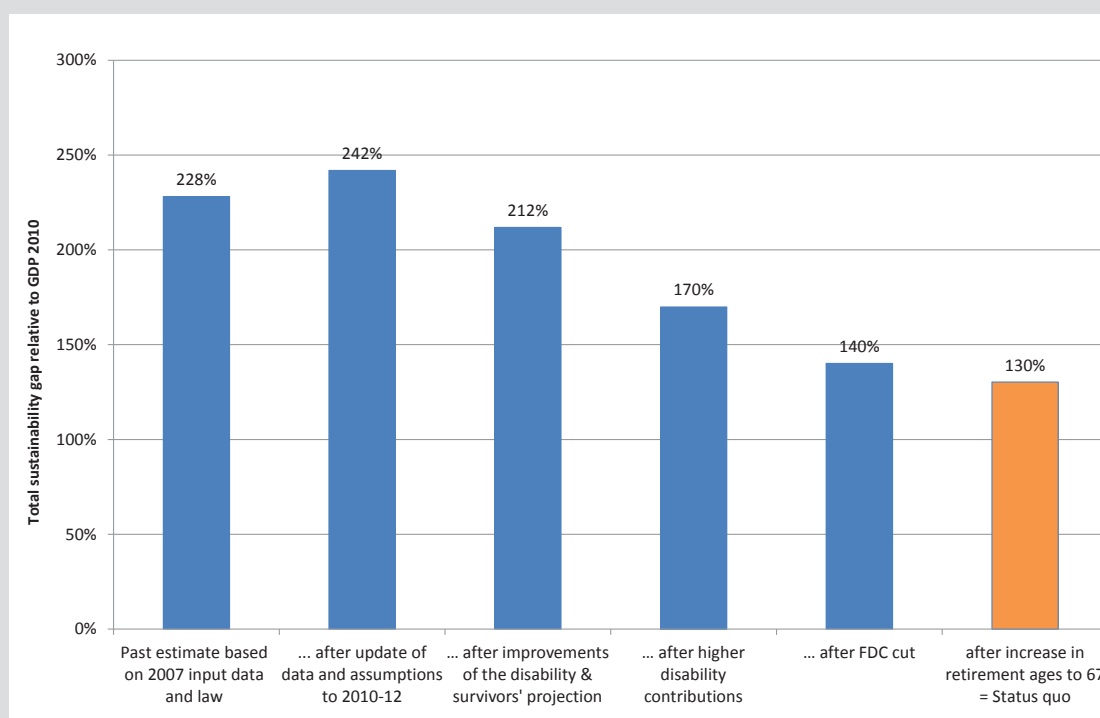
[9] The increase in retirement ages to 67 also prolongs the possible duration in disability. As a consequence, disability expenditures are expected to rise.

3.2 Isolated sub-systems

The ageing process will have a rather diverse impact on the various sub-systems of the general government finances, depending greatly on the age distribution of revenues and transfers as well as the past reforms enacted. To detect the main drivers of unsustainability in Poland we therefore analyze the main sub-systems in isolation. These include 1) the ZUS old age pension system, 2) the disability fund, 3) the general health care system, 4) the farmers' system (KRUS), 5) the education system, 6) the miners' system, and some smaller budget funds, namely 7) the sickness and 8) the accident fund. This analysis of the smaller pieces of public finances helps to assess how the sub-systems react to the demographic changes and how they may contribute to the overall long-term fiscal performance of public finances. In this respect, we do not take the assumption that by default they must be self-financing, but we show the probable development of their financial sustainability in reference to their base year fiscal stance.

We aim to assess the sustainability of sub-systems from two angles with the following two questions: Firstly, will earmarked contributions of a sub-system be sufficient to cover future expenditures? Secondly, can the fiscal subsystem be regarded as fiscally sustainable if we consider not only contributions but also the current level of state budget transfers into the given sub-system? For some systems, such as farmers' or ZUS old age pensions, the difference of results between these two perspectives is large as they are financed to a large degree by taxes. Some other systems by nature are completely funded by the state budget, such as civil servants' pensions or education expenditures. For them, only the second approach, including tax inflows, is applied. The sustainability gaps of sub-systems show to which extent future contributions and taxes will be sufficient to cover the future expenditures of this sub-system. A positive sustainability gap of a sub-system does not have to be interpreted as strictly problematic, as resources of other sub-systems, if available, may be used to close the gap.

Figure 6: Sustainability of isolated sub-subsystems
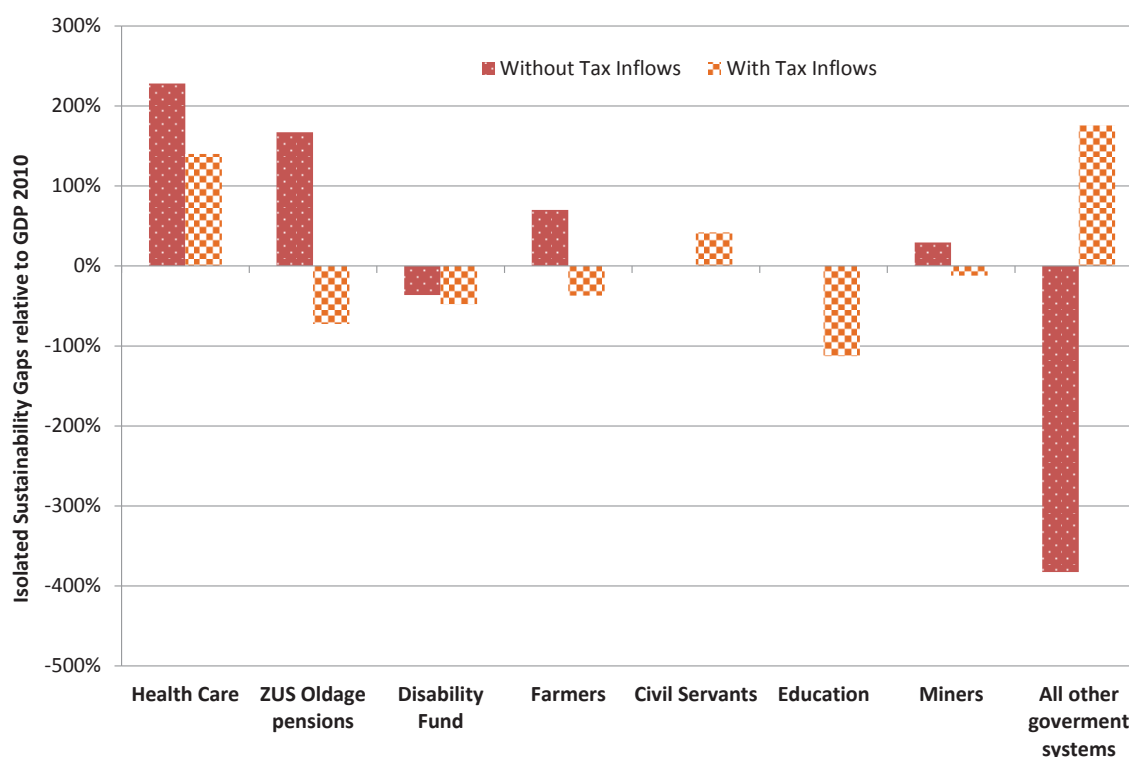
Source: own calculations

Our results show that the main driver of fiscal unsustainability is the public health care system. If we prolong the current tax inflows also in upcoming years, the sustainability gap would amount to 140 % of GDP, without tax inflows the gap would amount to as much as 228 % of GDP. This result is sensitive to a number of assumptions of the future health status, demography and cost development, which are discussed in detail in section 3.2.2. We will, however, show in section 3.2.2 that even when applying very optimistic scenarios, the sustainability gap of the public health care system remains significant. Against this background, we assess various possible reforms to improve the long-term stability of this subsector in section 3.2.3.

The picture for the old age pension system is twofold. It is clear that the current earmarked contributions will not be sufficient to cover the expenditures mainly arising in the next 20 years – when the sizeable cohorts born between 1950 and 1965 enter into retirement. The sustainability gap without taxes amounts to about 167 % of GDP. Deficits also arise as the Polish pension system is still in the middle of a transformation process from the generous pre-1999, pure PAYG system to the two pillar FDC/NDC system. Therefore, the current tax inflow to the ZUS pension fund is very voluminous, adding up to about half of overall revenues. These huge tax subsidies will not be necessary in the next decades, as the negative sustainability gap with tax inflows (-73 % of GDP) indicates. How the recent reforms contribute to the sustainability of the old age pension system is assessed in the following section 3.2.1.

The disability fund seems sustainable under current rules. Its fiscal long-term stability improved significantly after the introduction of more rigid eligibility criteria. These stricter eligibility rules lead to lower inflows into disability. In 2010 alone, the outflows from disability almost doubled the number of total inflows into disability. The disability system can also benefit from the future demographic development. In the next decade the large baby-boomer generations aged 50-60 today will reach the statutory retirement age and leave the disability system. Additionally, fewer retirees will enter into disability in the coming years as future cohorts reaching the high-risk age group, i.e. the cohorts aged 50-64, are less numerous. Last but not least, the increase in contribution rates from 6 to 8 percent of the wage base improved the long-term stability of the disability fund. A deteriorating factor for the sustainability performance of the disability fund represents the increase in retirement ages to 67. This reform prolongs the duration in disability and, consequently, increases disability expenditures. According to our estimates, the disability fund also remains fiscally sustainable after the recent retirement age reform, indicated by the negative sustainability gap in Figure 6.

The education system generates the highest implicit asset in the tax inflow scenario – adding up to 113 % of GDP. This is the only sub-system which is clearly positively affected by the ageing development, namely by the low fertility rates. This evaluation is based, however, on the optimistic assumptions of constant age specific per-capita transfers. In other words, we assume that the number of pupils per class remains constant, schools can be easily shut down and the number of teachers smoothly reduced if the number of pupils decreases. Thus, the highly positive sustainability performance of the education system – and its impact on the entire public finances – should be taken with due care.

The sickness and accident systems can be regarded as sustainable in the long-term, since they are not greatly affected by the increase in the old age dependency ratio.

The civil servants' pension system, on the contrary, seems to be negatively affected by future increases in longevity and resulting increases in retirement duration. Its sustainability gap amounts to about 42 % of GDP. The legislated increase in retirement ages for civil servants (legislated in 2012 and considered in Figure 6) lowers the sustainability gap by about 10 percent. Our projection of this isolated scheme should, however, be judged with caution as we lack precise information on the number of active civil servants.[10]

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[10] We know the probability of being a civil servant for the retirees' age groups. For our projection we keep this probability constant for younger age groups.

The two systems with the highest mismatch between contributions paid and expenditures paid out are the farmers' and miners' systems. Contributions cover only about 10 % of farmers' (20 % of miners') expenditures, leading to a large sustainability gap in these systems if we neglect tax inflows. A possible reform scenario of the miners' pension system is discussed in the appendix. The sustainability gaps with taxes, however, indicate that the currently high inflow from the state budget will most likely not be necessary in future years for both the famers' and miners' subsystem. In fact, we expect a gradual decrease of these two sectors in the coming decades.[11]

A considerable part of the public budget is not covered in the sub-systems discussed above. We refer to these as *all other government systems* in Figure 6. On the expenditure side, government purchases such as infrastructural projects or research and development investments are covered in this category. On the revenues side this includes valued added (VAT), personal income (PIT) and excise taxes as well as other current and capital revenues. If none of these taxes were transferred to other sub-systems, the *all other government systems* would be "overfinanced" – indicated by the implicit wealth amounting to about 380 % of GDP. If we consider, however, the base year tax inflow into the other sub-systems such as the ZUS pension fund then the *all other government system* is generating an implicit liability of about 178 % of GDP. To close the sustainability gap of overall public finances one may consider an increase of revenues of this sub-system (namely of taxes) or a reduction of government purchases.

In the next sections we evaluate in greater detail the sustainability of the two main fiscal sub-systems, the ZUS pension fund (section 3.2.1) and the public health care system (section 3.2.2 and 3.2.3).

3.2.1 The ZUS pension scheme and its reforms

By far the biggest subsystem of government finances is the ZUS pension fund with expenditures amounting to 7.8 % of GDP in 2012. The system is greatly challenged by the tripling of the old-age dependency ratio in the next decades. With this sub-section we aim to assess the fiscal long-term stability of the ZUS pension fund after recent reforms. This includes the current 2013 reform proposal to shift a large share of funded 2nd pillar accounts to the public sector. More details on the past and currently discussed reforms of the ZUS pension funds are provided in Box 3.

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[11] We consider in our calculations a gradual transformation of the farming sector – based on projections of the European Commission. Consequently, we observe an inflow of additional scheme members in the general pension scheme and a decrease of contributors and future pensioners of the KRUS pension scheme. For the miners' system we keep the base year probabilities to contribute to this system constant over time. This fact will lead to a drop in future pensioners in the miners' pension system.

Box 3: Recent major reforms of the ZUS pension fund

2011 Reform: FDC cut

In 2011 the government decided to change the proportions between the notional and funded part of the old-age pension contribution. Since the introduction of the NDC/FDC reform in 1999, the contribution rates remained unchanged until 2011, amounting to 12.22% of gross salary/income, and notionally recorded on the individual NDC account, and 7.3% actually saved on the FDC account. Mainly due to public budget constraints, in May 2011 the government changed the proportions of the contributions transferred to the unfunded and funded pillar. The FDC part was lowered from the initial 7.3% to 2.3% and the NDC part was split into two subaccounts: NDC 1 and NDC 2. The indexation rules for NDC 1 remain unchanged (nominal growth of the wage fund in the economy), whilst the new NDC 2 part, held also in ZUS, will be indexed in accordance with the average past 5 year nominal growth of GDP. The table below explains the exact contribution split in the coming years between NDC 1, NDC 2 and FDC:

Table 2: Old-age pension contribution rates for NDC 1, NDC2, and FDC in the coming years

Years	NDC 1 in % of gross earnings	NDC 2 in % of gross earnings	FDC in % of gross earnings
1999 - May 2011	12.22	0.0	7.3
May 2011-2012	12.22	5.0	2.3
2013	12.22	4.5	2.8
2014	12.22	4.2	3.1
2015	12.22	4.0	3.3
2017 onwards	12.22	3.8	3.5

Source: own illustration based on official act

Moreover, the contribution fees of FDC accounts were cut from the possible maximum of 7% to 3.5%. Also the structure of investment of FDC will change: the limit of the investment in shares will be raised gradually from the current 40% to 90% in 2034.

2012 reform: Increase in legal retirement ages to 67

With the reform proposal, passed by Parliament in May 2012, the statutory retirement age for men and women insured in the general public old-age pension system (NDC/FDC) will gradually rise for women from 60 to 67 (from 2013 until 2040) and for men from 65 to 67 (from 2013 until 2020). The retirement age will be increased by 3 months each year. The reform leaves unchanged the special privileges granted in the past decades e.g. to miners, recipients of bridging pensions, teachers or pre-retirement beneficiaries.

2013 reform proposal: FDC cut 2

The conclusions of the temporary, obligatory review of the sustainability of the pension system, dated early 2013, suggested the need for further improvements in the functioning of the funded pillar of the system. The main points of the recent reform, adopted in parliament in December 2013, are as follows:

- The FDC contribution rate will be fixed at 2.92% without changes in the future, starting from 2014 onwards.
- 51.5% of FDC assets, at first the government bonds, and the respective value of future pension liabilities, were taken over by the general government and recorded on NDC2 accounts.
- The taken over government bonds were redeemed immediately (explicit debt reduction).
- FDC will no longer be obligatory – the window of choice of whether to stay or leave, or switch between FDC funds will be open every two years.
- A new mechanism of FDC related pensions will be introduced, the so-called 'zipper' (*suwak* in Polish): for 10 years before reaching the statutory retirement age, FDC assets will be cashed in at a pace of 10% annually and gradually cumulated on the respective individual NDC2 account.
- The FDC must not purchase government bonds, and their portfolios by law will turn more aggressive, share oriented, mainly focusing on the Polish stock exchange, with still limited possibilities to invest abroad.

Evaluation of fiscal sustainability of the past pension reforms

Various indicators may be applied to assess the long-term fiscal stability of public finances. We start our evaluation of the ZUS pension fund reforms with an illustration of cash flows, followed by a comparison of sustainability gaps for the different reform scenarios. The cash flows shown in the following figures illustrate the annual PAYG contributions and expenditures of the ZUS pension fund.

### *Evaluation of pre-reform cash balances (before FDC cut)*

At the starting point of our projections, in the year 2010 (see Figure 7), the ZUS old-age pension fund was running a large gap between contributions and expenditures – adding up to about 4 % of GDP. This gap can be explained to a large degree by the change to a two pillar FDC/NDC system. In the current transition process, relatively generous pensions from the pre-1999, pure PAYG system need to be financed by the decreasing average contributions to the current NDC system.[12] Additionally, the actuarially unbalanced miners' pension scheme adds to the ZUS deficit. The overall resulting gap between contributions and expenditures is financed by taxpayers.[13]

The shift of FDC contributions to the PAYG system legislated in 2011 shows an immediate impact on the revenue side. Total PAYG contributions increase by about one percent of GDP from 2010 to 2012. Moreover, in the long-term NDC contributions are nearly 1 percent of GDP higher after the shift of FDC contributions than under the pre-reform, "no FDC cut" scenario. Expenditures are (almost) unaffected by the shift of FDC contributions until the year 2025. This can be explained by the fact that only a small number of cohorts retiring before 2025 are participating in the FDC system. Therefore, the shift of FDC contributions affects the average NDC pension level only to a low extent until 2025. On the contrary, younger cohorts participate to a higher degree in the FDC system. For them the shift of FDC contributions to the NDC system translates into an increase in NDC pension entitlements. As a consequence, the legislated shift of FDC contributions leads to a gradual increase in pension expenditures after 2025 – compared to the "no FDC cut" scenario. In the long-term the FDC cut will lead to an extension of the NDC system and to an increase in overall PAYG expenditures by almost 1 percent of GDP.

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[12] Average contribution rates are decreasing without the FDC cut reform as an increasing share of contributors participates in the FDC system.

[13] One can assume that it is mostly the working age population that is financing the current deficit as they pay the highest taxes per capita. Besides the support of the elderly via tax and contribution payments, these young cohorts need to save for their old-age as future NDC pension levels will be less generous. Therefore, one often refers to a double burden for the working population who finances the transition from a PAYG to a (partially) funded pension system.

Figure 7: Annual PAYG Contributions and Expenditures – with and without FDC cut[14]
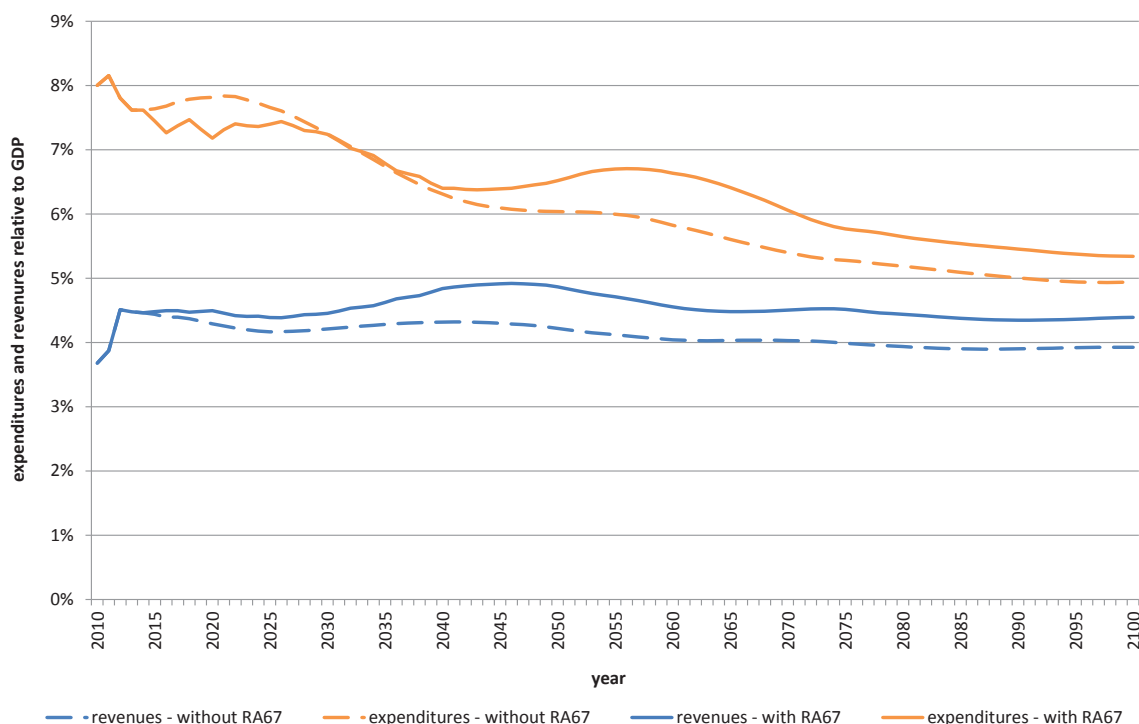
Source: own calculations.

Evaluation of the increase in retirement ages (RA67) on the cash result

The gradual increase in legal retirement ages to 67 for both men and women additionally stabilizes the long-term finances of the ZUS old-age pension fund.[15] Pension expenditures shrink in particular in the period 2015 till 2025. From a fiscal point of view, the relatively rapid increase in retirement ages is well chosen. The years from 2015 till 2025 are exactly the years in which the fiscal pressure is relatively high due to the large retirement inflow of babyboomer generations.

In the first years of the increase in retirement ages (2015-2025) the impact on total pension expenditures is the highest as both men and women are affected by this reform. Thereafter, until the year 2040 the impact of the 2012 reform on the expenditure side is less visible. In this period (2025-2040) one can identify two factors with opposite effects on the level of expenditures. On the one hand, women postpone their retirement in line with the increase in retirement ages until 2040. This

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[14] The fiscal flows shown deviate from Jabłonowski and Müller (2013) due to data updates. Here we consider not only the general old age benefits and contributions but also additional benefit types, such as nursery supplements and miners' benefits also paid from the ZUS pension fund. Contrary to the past estimates, future pension rights accrued due to maternity and unemployment periods are considered. Furthermore, we apply updated NDC and initial capital data based on the 1 % sample. The initial capital of those who did not apply for its estimation was approximated based on the information of applicants.

[15] For this projection we assume that all ZUS scheme members - except for teachers and miners - will shift their retirement behavior in line with the increases in legal retirement ages.

postponement effect leads to a decrease in total expenditures. On the other hand, both men and women are retiring later and are, therefore, entitled to higher pension benefits than under the 2011 legal status. This *entitlement effect* increases total expenditures. Until the year 2040 the *postponement effect* outweighs the *entitlement effect* and expenditures are slightly lower than under the legal rules of 2011. After the year 2040, however, the *entitlement effect* determines the rise of expenditures as more and more pensioners with higher benefits than under the 2011 legal status enter the retiree population. In the long-term an increase in retirement ages leads to a considerable rise of total expenditures by about 0.5 % of GDP – compared to the "without RA67" scenario.

Figure 8: Annual PAYG Contributions and Expenditures – with and without RA67
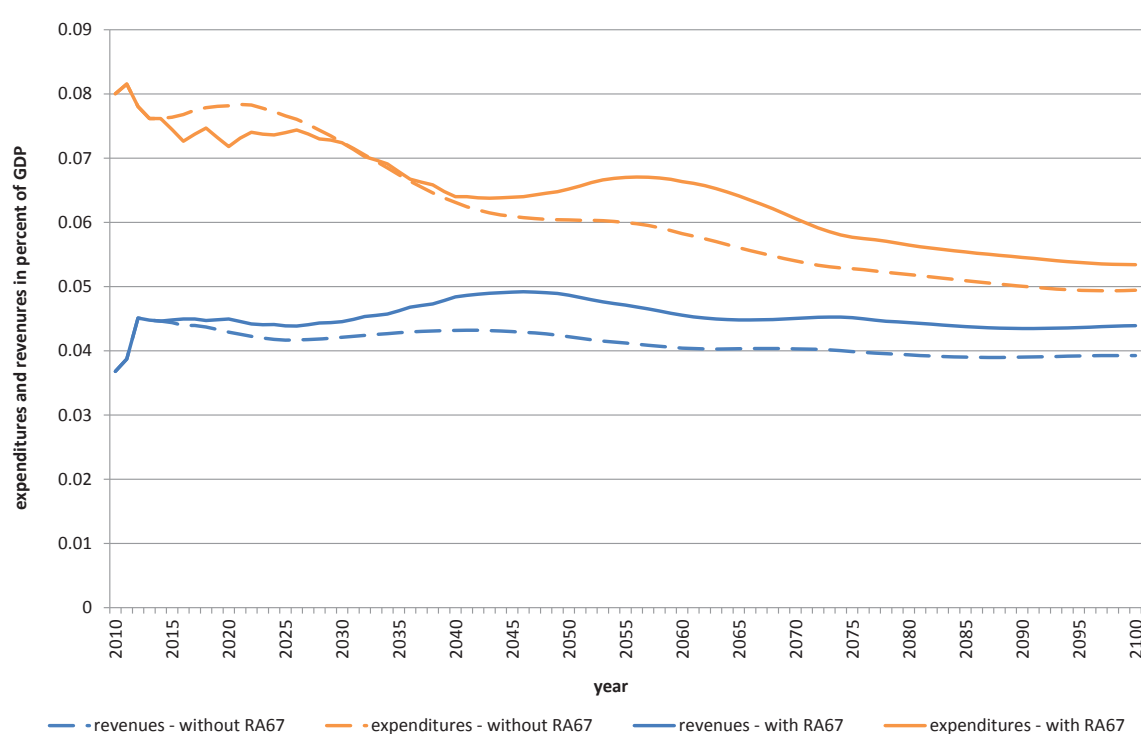
Source: own calculations.

Of course, the increase in retirement ages to 67 also affects other sub-systems of government finances. On the one hand, disability expenditures will increase due to this reform. We can expect that most disability beneficiaries will stay longer in the disability system as the legal retirement age increases. On the other hand, revenues from other sub-systems will rise due to the increase in retirement ages. This concerns mainly personal income taxes and healthcare contributions of employees as well as disability contributions. In total, the RA67 reform improves the sustainability of overall public finances by about 10 % of GDP – see Box 2.

At this point, we would like to underline that our estimations of future cash balances do not take into account changing proportions of minimum pension beneficiaries.[16] Consequently, our picture of future pension expenditures may be regarded as an optimistic projection.

Evaluation of the 2013 reform proposal

The 2013 reform, implemented in early 2014, will, first of all, lead to a significant shift of FDC assets and liabilities to the general government (for more details see Box 3). According to the legal act, 51.5 % of FDC assets, namely those invested in government bonds (around 8.5 % of GDP), would be shifted to the general government. The impact of this reform on future public finances depends on the number of people who opt for a switch back to the mono-pillar system. The latter group pays higher contributions to the NDC pension system. For our projection of the 2013 reform scenario we assume that 50 % of FDC participants choose to switchback to the mono-pillar system.[17] To evaluate the sensitivity of this assumption we show in Appendix A2 alternative scenarios of 0 % or 100 % of FDC participants switching back to the pure NDC system.

Besides the one off transfer of FDC assets, the 2013 reform will lead to a gradual increase in revenues of the pension fund over the next three decades. This development is outlined in Figure 9 below.[18] Firstly, average contributions to the NDC system increase in 2014 by about 0.2 % of GDP if we assume that 50 % of FDC members switch back in mid-2014 to the mono-pillar system, and therefore contribute 19.52 % instead of 16.42 % of earnings to the PAYG system.[19] This rise would amount to about 0.3 % if we assume a 100 % switchback of FDC participants to the mono-pillar system (close to 0 % if we assume a 0 % switchback). After 2014, the steady rise of revenues can be explained mainly by the "zipper mechanism" (explained in Box 3). In fact, the birth years affected by this mechanism over time show an increasing FDC participation. Consequently, rising amounts of FDC pension rights are shifted before retirement to the NDC system.[20] Upon retirement, i.e. after a time lag of about 10 years, higher benefits are then paid out in the unfunded NDC system which will increase the expenditure side by about 1 % over the long-term.

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[16] As outlined in Jablonowski and Müller (2013) one may expect an increasing share of future beneficiaries who fall below the threshold of the minimum pension.

[17] Additionally, we assume that 50 % of future new entrants choose to participate in the mixed pillar, NDC/FDC system.

[18] Please note that Figure 9 does not cover the one off asset transfers in 2014 of roughly 8.5 % of GDP.

[19] For further details on the contribution rates applied in future years see Box 3.

[20] Please note that the amount of FDC assets shifted each year via the "zipper mechanism" depends on the rate of return for the FDC assets. We assume a rate of return amounting to 3 % in real terms. The impact of alternative assumptions is shown in the Appendix.

Figure 9: Annual PAYG contributions and expenditures under the 2013 reform
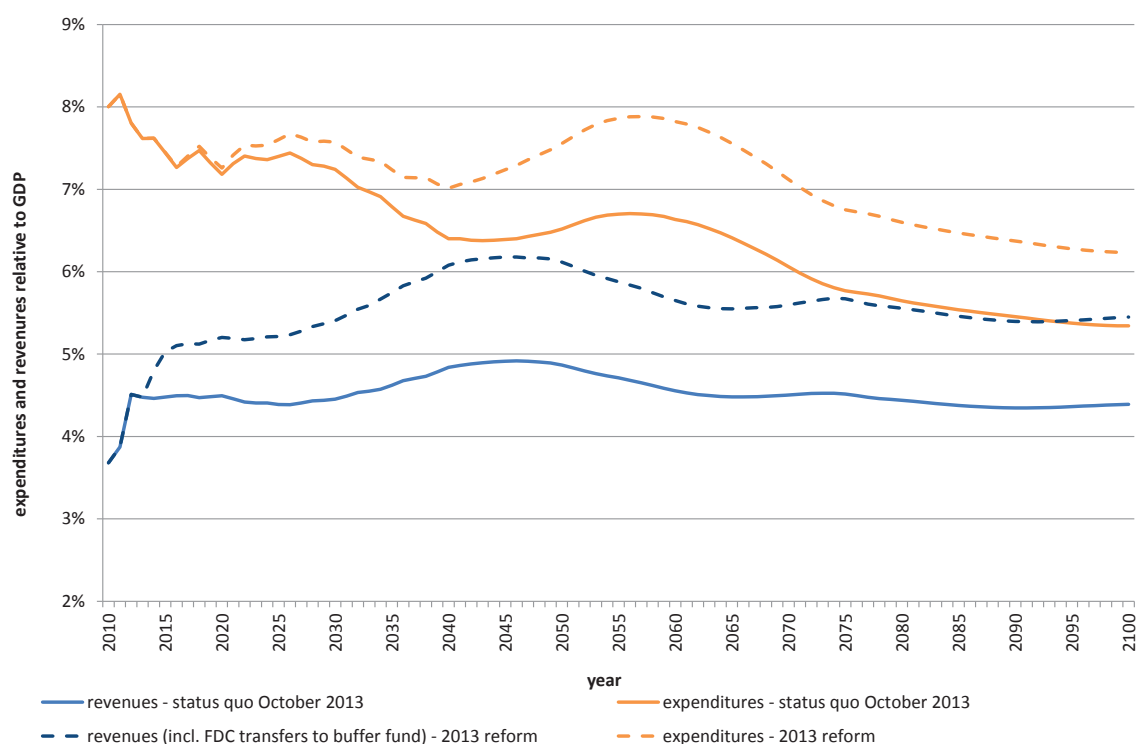
Source: own calculations.

In conclusion, the 2013 reform softens the transition process of the public pension system in the next decades. Namely, the mismatch between ZUS pension contributions and expenditures can be significantly reduced, as outlined in Figure 10 below. Thus lower tax inflows in the ZUS pension system will be required in the decades to come. This result should, however, be judged with caution. A number of risks are not included in our analysis. Firstly, the risk diversification of the Polish old age system diminishes to some extent with the 2013 reform. Furthermore, the vulnerability of government finances in periods of crises increases with the proposed expansion of the PAYG pension system. Both these arguments are discussed in Box 4 below.

Figure 10: Annual mismatch of ZUS contributions and expenditures - after past and proposed pension reforms
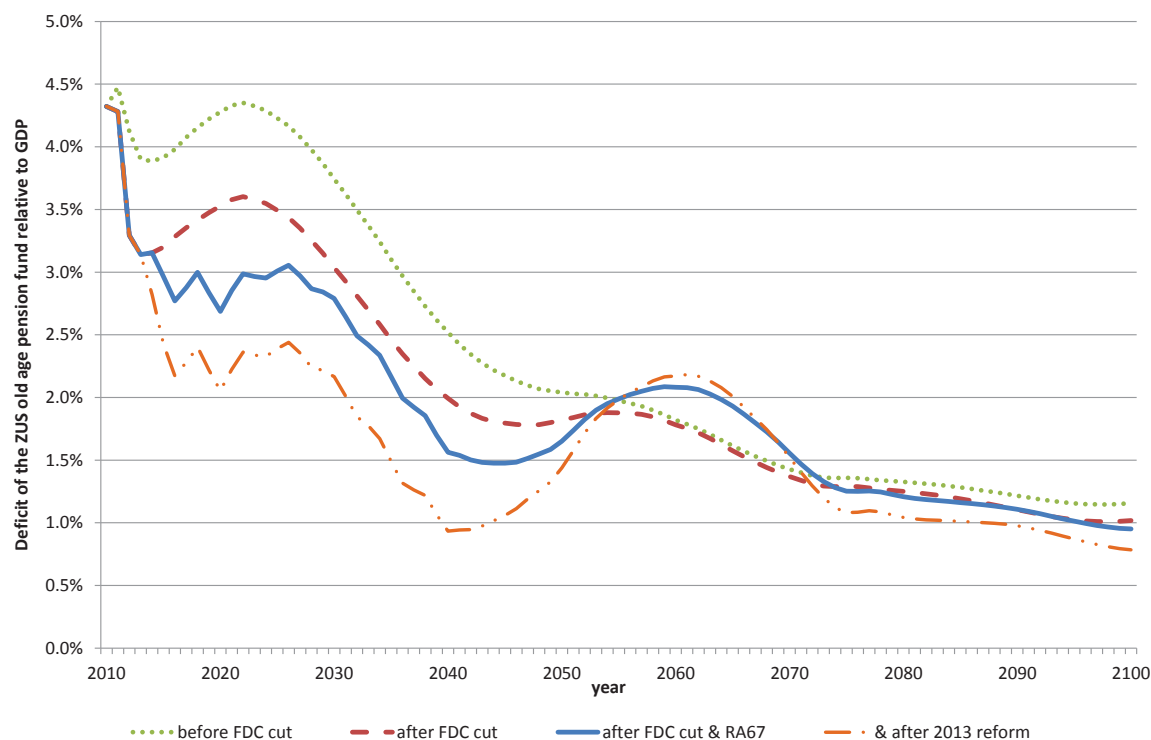
Source: own calculations.

Box 4: Risks of the 2013 reform proposal

An old saying advises not to put all our eggs in one basket. This counsel has been closely followed with the multi-pillar approach of the pension reform in 1999—appropriately titled "Security through Diversity". With the 2013 reform proposal, however, pensioners would mostly put all their contributions in the PAYG-basket. Diversification of risks, i.e. the political risk inherent in the PAYG system and the market risk of the funded system would be considerably restricted as a consequence. Secondly, the vulnerability of the government sector worsens with the 2013 reform. The government has to shoulder significantly higher public pension obligations with its adoption. In periods of economic crises the ZUS deficit would widen even more than under current rules due to the nominal ceilings of the pension scheme. In fact, expenditures are not allowed to drop at the same rate as revenues due to the nominal ceiling of NDC accounts and pension benefits.[21]

It is understandable to shift some of the FDC contributions to the PAYG pension system in order to shoulder the current transition process of the pension system. A full and long-term abolishment of the FDC system may, however, not necessarily be optimal when considering the risks mentioned above. One should consider an abolishment of the nominal ceilings to ease the vulnerability of the government sector after the 2013 reform. Furthermore, to provide improved risk diversification, the (remaining) FDC assets could be invested internationally, e.g. similar to the Norwegian pension fund. This would allow FDC members to benefit from the fruits of other prospering and less ageing economies.

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[21] According to pension indexation rules, pension benefits are not allowed to fall in nominal terms, i.e. a lower nominal ceiling is applied. The same counts for NDC accounts for which the interest rate cannot be negative in nominal terms. See also Art. 25, point 4 of the official act on ZUS pensions.

What if current replacement rates stay constant?

Future average replacement rates of the general pension system will be roughly halved until the year 2060.[22] Politicians may be tempted to abolish the pension rules leading to these pension cuts. Such a reversal scenario may be politically beneficial in the short term, mainly to win the votes of the sizeable cohorts aged 45-60 – which are close to retirement. In the long-term, however, expenditures would rocket upwards if current average replacement rates, amounting currently to 52 % of average earnings[23], are prolonged until infinity. According to our projections – shown in Figure 11 below – aggregate benefits would double to about 16 % until 2060. With the current revenue structure this reversal of pension rules would not at all be financeable. In fact, the sustainability gap of the isolated ZUS pension fund would amount to 473 % of GDP, even if current high tax inflows were prolonged in the future.[24]

Figure 11: The fiscal impact of 52 % replacement rate scenario (reversal scenario)
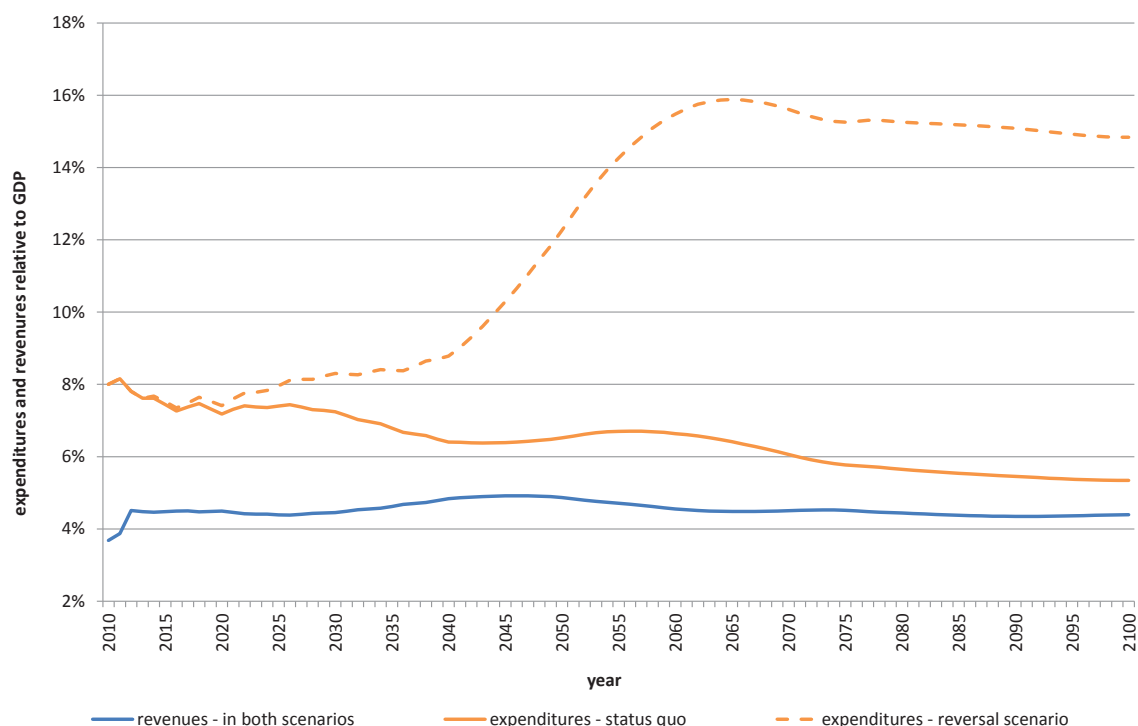
Source: own calculations.

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[22] The future drop of replacement rates depends greatly on the retirement age chosen, the gender and the occupation group, see Jabłonowski and Müller (2013).

[23] The value of 52 % corresponds to the average replacement rates of 62-65 year old retirees in 2011. Differentiated by genders, the average replacement rate for men amounted to 61 % and for women to 43 %.

[24] For this projection we set the average replacement rate from FDC and NDC pensions to a level of 61 % for men and 43 % for women from 2014 onwards. In other words, the government finances the residual between these total replacement rates and NDC/FDC replacement rates. We take these replacement rates as exogenously given and neglect the benefit formula. The fact that cohorts may show different contribution careers is therefore ignored. Furthermore, we assume that retirement ages are increased to the age of 67 as in the status quo scenario.

The cut of replacement rates in future years due to the current NDC benefit formula seems to be unavoidable. In particular younger age groups should, therefore, prepare themselves for this development and assess whether they are saving sufficiently for their old age. In Box 5 we provide a rough estimate of the total and annual savings necessary to obtain the current replacement rates also in future years.

Sustainability gaps under different reform scenarios

Annual cash results, shown above, provide valuable information about the timing effect of reforms. As an additional indicator we show the sustainability gap of the ZUS pension fund under the various reform scenarios discussed above. It reflects not only the fiscal situation in one year (like flow figures) but sums up (in one stock figure) the stability of the fiscal (sub-)system over an infinite horizon.

Figure 12: Sustainability gaps of the isolated ZUS pension fund under various reform scenarios
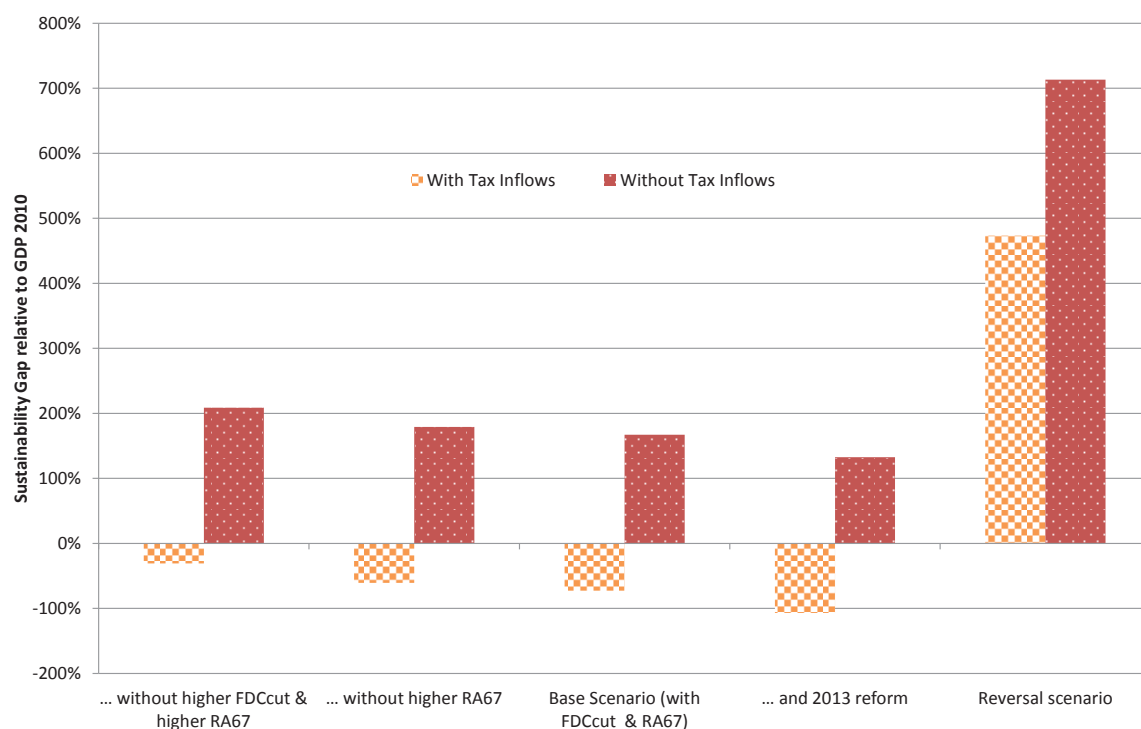
Source: own calculations.

The sustainability gap of the ZUS pension fund depends greatly on the consideration of current tax inflows into the ZUS pension fund. If we project these current budget transfers into the future, on the basis of their base year (per-capita) levels, then the sustainability gap turns negative under (almost) each reform scenario considered – see Figure 12. These negative sustainability gaps indicate that the current huge tax subsidies of the ZUS pension fund (mainly needed to finance the transition of the pension system) will not be necessary in the next decades. A significant degree of tax inflows

will, however, still be required in future years to finance expenditures. Purely earmarked contributions are not sufficient to cover these benefits. In fact, without consideration of tax inflows, the sustainability gap would be substantial under each reform scenario – see Figure 12.

In conclusion, the past pension reforms improved the sustainability gap (with and without tax inflows) of the ZUS pension fund. Also the overall sustainability gap of public finances lowered with these reforms - see Appendix A1. This evaluation holds for both the FDC cut reform and the increase in retirement ages to 67. Thus, in terms of fiscal long-term stability, the ZUS pension fund seems to be relatively well prepared to face the future demographic challenges. The 2013 reform proposal also improves the long-term stability of the pension fund.[25] For a complete evaluation of the 2013 reform the risks – discussed in Box 4 – should also be taken into account.

A full reversal of the current old age benefit formula would severely deteriorate the fiscal sustainability of the pension system and the overall public finances. If we keep the current replacement rates until infinity the sustainability gap of the ZUS pension fund would escalate to a level well above 450 % of GDP (with taxes). This scenario would be a challenge for public finances. Revenues of the entire public sector would need to be increased by about 17 % to finance this scenario.

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[25] It should be noted that future expenditures, increasing with the 2013 reform, are more heavily discounted, being in the remote future. The expected immediate increase of revenues of the 2013 reform, on the contrary, is less discounted as it occurs closer in the future. This different discounting partly explains the drop in the sustainability gap. It is therefore advisable to analyse various sustainability indicators, in this case cash flows and stock figures, to understand the long-term impact of reforms.

Box 5: A rough estimate of savings necessary to guarantee current replacement rates

Replacement rates are expected to drop considerably in future decades. If contributors aim to reach the same replacement rates as current new retirees, amounting to roughly 61 percent of average earnings for males (43 percent for females) in 2011, significant savings are required. We aim to give a rough indication of the total and annual savings necessary to keep replacement rates constant for current contributors. This estimation can be based on generational accounts which indicate the average expected net tax payments of each cohort over their remaining life-cycle. A description of the calculation of necessary savings and the chosen assumptions is outlined in Appendix A4.

The average stocks necessary to guarantee current replacement rates vary by age – as outlined in Table 3. In general, younger cohorts have to set aside a larger amount of money today to guarantee them the current level of replacement rates. Their expected replacement rates are significantly lower than those of current retirees. On the contrary, annual savings necessary to guarantee current replacement rates are more similar across cohorts. Current working cohorts aged 20-50 have to save roughly 10 % of their annual earnings to guarantee them current replacement rates. This corresponds to about 4000 PLN in 2010. For this calculation we assume that annuities are adjusted each year in line with average earnings growth. Younger cohorts can save over a longer period and can benefit from compound interest rate effects – as they are expected to retire in the remote future. As a consequence, savings in terms of annual earnings are more equal across cohorts than stock figures in Table 3.

These estimates outline that significant savings of around 10 % of annual earnings are required to bridge the gap to current replacement rates. We want to underline that these figures should be interpreted as rough estimates. We look on an average person having an NDC account. The results would clearly vary if we differentiate by gender, occupation, employment status, income groups as well as by retirement ages. Furthermore, these figures are sensitive to the assumptions chosen on the wage and employment growth as well as on the interest rate. Last but not least we could not confront our estimates with existing savings due to a lack of consistent data. Future research should analyse more thoroughly the existing and required savings of the old age provision in Poland based on detailed micro data.

Table 3: Average stock and annual savings necessary to guarantee current replacement rates

Age in 2010	20	25	30	35	40	45	50	55
Average stock required to keep replacement rates, per scheme member in 1000 PLN	185.3	176.2	170.9	131.1	105.2	84.5	66.2	12.4
Average annual savings, relative to average earnings	10%	11%	12%	10%	10%	10%	12%	4%
Average savings in 2010, in prices of 2010, per scheme member in 1000 PLN	3.8	4.1	4.5	4.0	3.9	4.0	4.5	1.6

Source: own calculations.

3.2.2 The healthcare system

According to our estimates the public health care sector represents the biggest threat to the long-term stability of Polish public finances. Therefore, it is valuable to take a closer look at this sub-system and possible drivers of future health care expenditures (HCE). Generally, the literature[26] discusses the following factors which determine the long-term trends of HCE:

- **Demographic Development** (determined by base year population structure, fertility, etc.)
- **Health status** (and its change due to rising longevity)
- **Income**
- **Other non-demographic drivers** (such as technological changes, Baumol's Cost disease)
- **Health care policies and institutions**

For our projection of health care expenditures (HCE) we follow closely the standard assumptions on these drivers – e.g. taken by the European Commission (EC, 2011) or the OECD (2013). Our population projection is based on EUROPOP2010 with some minor modifications outlined in section 2.1. We assume an income elasticity of one.[27] On the basis of detailed NFZ data we can divide the population into 13 different age and gender specific health care expenditure profiles and project those NFZ budget groups separately. Thus, we are able to implement various policy and non-policy scenarios for selected health categories only. Long-term care (LTC) is included in our health care expenditure profiles. Our base year profiles shift in line with expected increases in life expectancy in our standard scenario. The unit cost growth follows in general the GDP per capita. Different to the past trend – where HCE on average exceeded GDP per capita growth by 1.7 percentage points in Poland – we assume an excess cost growth of 0.5 % until the year 2050. The choice of these assumptions is discussed more thoroughly in the next paragraphs. To evaluate the robustness of our results we carry out the following alternative scenarios:

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[26] For an overview see e.g. Dybczak and Przywara (2010).

[27] The correlation of income on health care demand is still not fully answered by the empirical literature. A general consensus exists that the relationship between aggregate income and health care expenditures is positive. The exact level of the income elasticity is, however, still fiercely debated. Most recent studies – which increasingly use panel data – measure an income elasticity of around one or slightly below one. Against this background, we apply an income elasticity of one for our projection. For a further overview of the recent literature see Hartwig (2008).

Table 4: Health care scenarios

	Pure Demographics	Healthy Longevity	LTC scenario	Cost pressure	Cost containment = Standard Scenario
Age related profile development	Profile held constant	Profile shifts inline with gains of life expectancy	LTC profile shifts to match German LTC prevalence rates in 2060	Profile shifts inline with gains of life expectancy	Profile shifts inline with gains of life expectancy
Unit cost development	GDP per capita	GDP per capita	GDP per capita	GDP per capita + 1.5 % until 2050	GDP per capita + 0.5 % until 2050
Population Projection	Standard Population Projection Applied - described in section 2				

Our *pure demographics scenario* is based on time invariant age and gender specific profiles for all 13 categories of healthcare treatment. Health care costs are assumed to follow GDP per capita growth. Hence, this scenario reflects only the impact of a changing population structure on future expenditures and revenues.

Will future expected increases in life expectancy go in line with an increasing number of healthy years? This is a crucial question for the projection of HCE. So far the empirical literature has not come up with a clear answer.[28] There are, however, a number of studies which indicate that proximity to death and not age is determining health care costs.[29] Therefore, we apply a *healthy longevity scenario* which assumes that future gains in life expectancy translate fully into an increase of years spent in good health. Technically, we shift health care profiles in line with the age and gender specific rise in life expectancy.[30] Thus the relatively high costs per capita, e.g. of hospital treatment, occur at later ages.

The public long-term care (LTC) in Poland is still in its infancy both in terms of per-capita costs spent as in terms of prevalence rates. While the probability of being an LTC beneficiary in Poland amounts to roughly 6 % in the relevant age groups 80+, much higher prevalence rates can be observed in Western economies. For example, Germany shows prevalence rates of about 30 % in these age groups. The main reason for the low level of LTC coverage among elderly Polish people is informal care, i.e. care by family and friends. This is still the dominant and substituting public LTC in Poland.[31] Changing socio-economic factors, such as higher female labour participation, increasing divorce rates and smaller family sizes may cause a shift in Poland from informal, family-related care, to formal care

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[28] EC (2011), p. 162.
[29] See e.g. Werblow et al. (2007).
[30] Healthy longevity is considered for all types of medical services except for psychiatric treatment and dental services.
[31] See also Golinowska (2010) for a further overview of the LTC system in Poland.

increasing the demand for public LTC. Additionally, relatively generous LTC provision in neighbouring countries, such as Germany, may increase expectations in Poland. Against this background we draw a *what if picture* in our projections showing a **convergence of Polish prevalence rates** until 2060 to the higher German levels.

The **cost pressure scenario** assumes a higher growth of health care expenditures than the GDP growth per capita. This is backed by a number of current studies which reveal that past rises in health care expenditures were largely determined by non-demographic drivers such as medical-technical progress. According to this hypothesis, costly product innovations to cure diseases seem to have dominated over cost-saving process innovations in recent decades.[32] As a consequence, per capita health care expenditures tend to grow faster than general productivity.[33] However, other non-demographic drivers, such as health policies or Baumol's cost disease[34], may also lead to an "excess cost growth" (Smith et. al., 2009) – measured as the residual between per capita health care growth and per capita GDP growth. The IMF (2010) calculates an excess cost growth of 1.2 % for 27 advanced economies in the period 1980-2008 (1.5 % between 1995-2008). The OECD (2013) quantifies an excess cost growth of 1.5 % for OECD countries (1.7 % for Poland) over the period of 1995-2009.[35] Against this background, we consider an excess cost growth of 1.5 % until the year of 2050 in our cost pressure scenario.

So far, politicians in most OECD countries, including Poland, were not able to limit the excess cost growth outlined above. In our **cost containment scenario** – which is chosen as our standard scenario – we assume that governments will be more successful in future years and are capable of limiting excess cost growth to a level of 0.5 %. Thus, this value reflects, in our opinion, the middle ground between a full and zero cost pressure scenario.[36] Full cost containment, i.e. excess cost growth of zero, is assumed from 2050 onwards.

The sensitivity of our results with respect to the above-mentioned scenarios is shown in Figure 13 below. It presents the sustainability gap of the public health care sector (including current tax inflow). These results indicate that the fiscal long-term performance of the public health care system depends only to a small degree on demographic developments. If we consider only the changing population structure (pure demographics scenario), the sustainability gap would amount to roughly 94 %. This scenario considers the change of revenues as well of expenditures caused by the ageing

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[32] See Zweifel (2003).
[33] See Hagist (2008).
[34] See e.g. Baumol (2012).
[35] This value has been estimated using an income elasticity of one.
[36] Of course, the level of future unit cost growth in the public health care sector is uncertain. Therefore, we provide different growth scenarios in our health care projections.

population. Furthermore, if we take the assumption that future gains in life expectancy translate fully into gains in healthy lifetime, the gap would shrink to about 53 % of GDP (healthy longevity scenario).

There are various threats to the long-term fiscal stability of the public health care system. Poland may experience, similar to other countries, a trend from informal to formal care and a consequent expansion of the public LTC system. This may severely affect fiscal sustainability. In our example scenario of a convergence to German prevalence rates until 2060, the gap widens to 154 % of GDP. A growth in unit costs equal to GDP per capita growth seems to be quite unrealistic when we look at past trends. Medical technical changes may also lead in future decades to excess cost growth. Furthermore, labour costs in the public health care sector (wages of qualified medical personnel, i.e. nurses, physicians, etc.) are quite likely to grow in line with labour productivity growth, which will be higher than GDP per capita growth in future decades. In our cost pressure scenario we project the past trends of excess cost growth until 2050. Under such a scenario the sustainability gap would escalate immensely to a level of 365 % of GDP. In our standard scenario we assume cost-containment in future years which reduces the excess cost growth to a level of 0.5 %. Even then, the sustainability gap would amount to about 140 % of GDP. Given the fiscal outlook, cost containment policies may rank very high on the political agenda in future years. Thus, we discuss a selection of such polices in the next section.

**Figure 13: Sustainability of the Public Health Care Sector under various scenarios**[37]
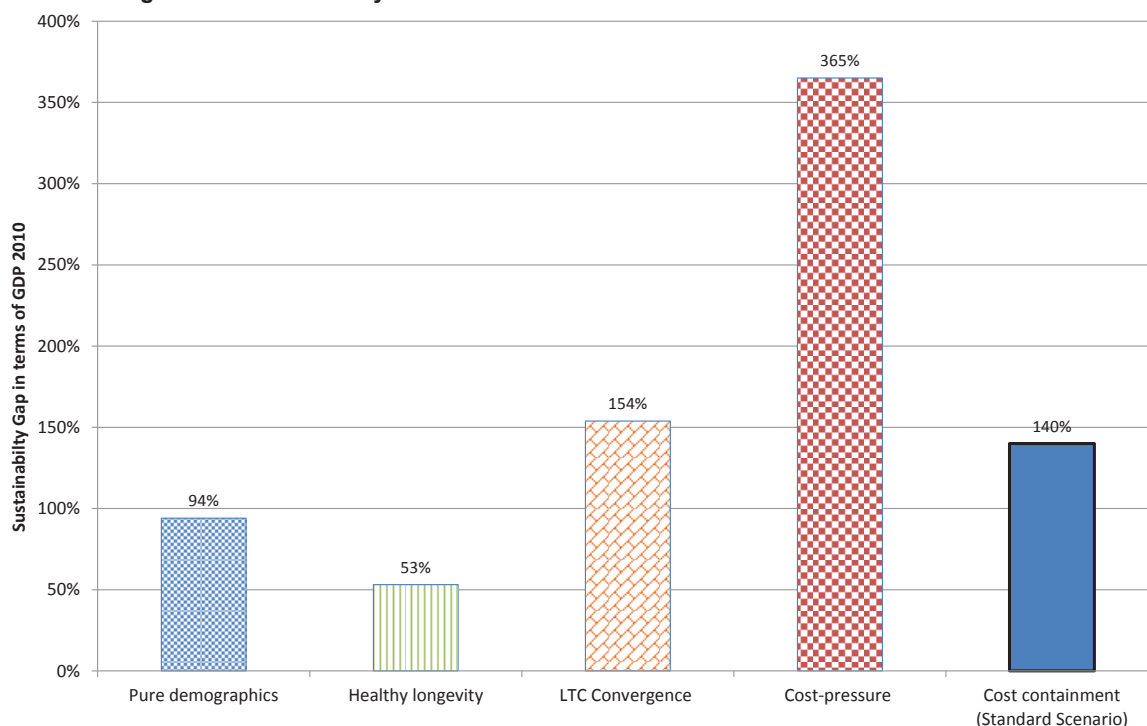
Source: own calculations.

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[37] The impact of these scenarios on the overall sustainability gap of public finances is outlined in Appendix A1.

In theory the NFZ budget plan has to be balanced by law. Therefore, we provide, as an additional sustainability indicator, the necessary contribution development of the NFZ under the above-mentioned scenarios. The results suggest that relatively stable contribution rates can be achieved only if excess cost growth in the health care sector is avoided.

Figure 14: Development of contribution rates under various scenarios
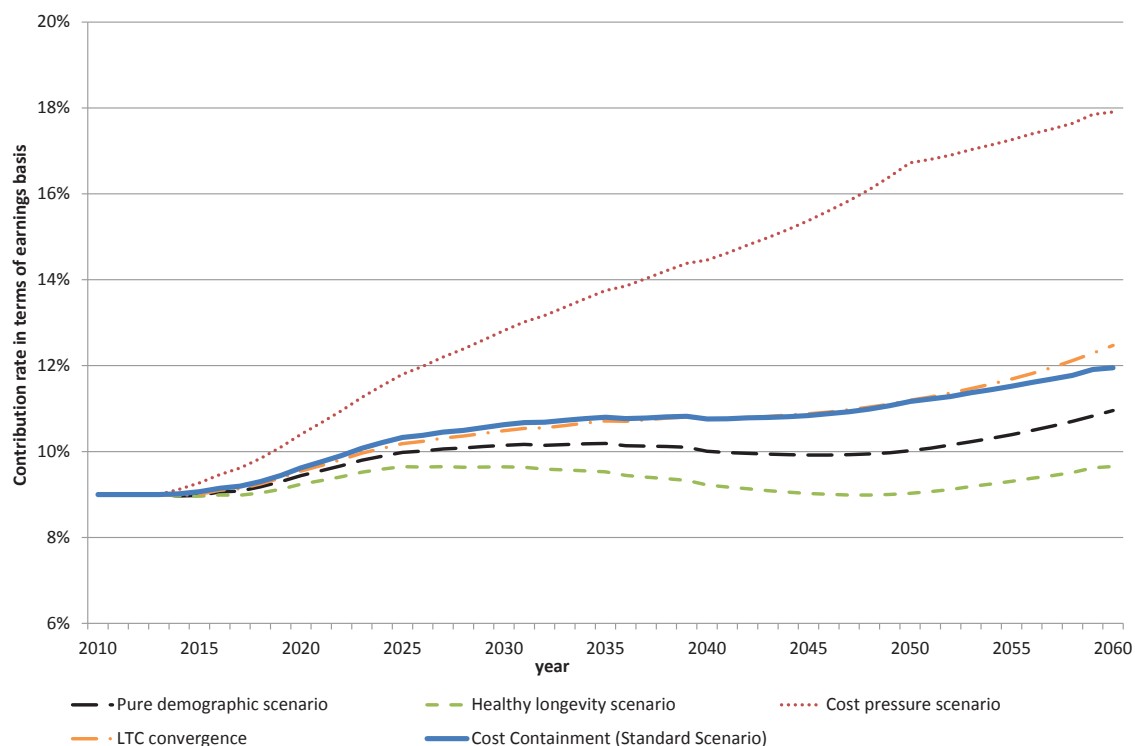
Source: own calculations.

3.2.3 Possible health care reforms

The previous section showed that the fiscal long-term stability of the public health care sector in Poland is highly questionable. Appropriate policy measures may become necessary if the aim is to limit the expected increase in contribution rates and the negative work incentives which go along with it. The literature discusses various health care policies to reduce cost growth in the health care sector, which can be differentiated into macro- and microeconomic policies.[38]

Macroeconomic policies aim to limit the aggregate health care expenditures, e.g. via price and volume controls of medicaments or a shift of costs to the private sector. The latter measures usually have an immediate impact on the health care budget. Macroeconomic policies may, however, be accompanied by negative side effects in terms of access to healthcare and its quality. In fact, it is

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[38] This classification follows closely the OECD (2010), p. 46ff.

possible that in the long-term such health care reforms lead to an additional increase in health spending.

Microeconomic policies aim to improve the efficiency of the public health care system and address either the demand side (consumers) and/or the supply side (e.g. doctors, hospitals) of the health care sector. Demand side policies target a reduction in health care consumption either by improvements in the general health status and/or via reductions of over-consumptions. Typical examples are disease prevention and health promotion policies. Supply side policies, on the contrary, aim to improve the cost efficiency and effectiveness of health care providers. This may include, for example, cost-benefit evaluations or a stronger implementation of market forces (e.g. via outsourcing of laundry services in hospitals).

In addition to the expenditure oriented health care policies outlined above, a change in the financing structure of the public health care system may be considered. In fact, in the light of an ageing population, a shift to stronger tax financing may be beneficial. We will discuss such a revenue reform and their contribution to fiscal sustainability in the next section. Furthermore, we evaluate two possible cost-containment policies for Poland which can be classified as macroeconomic policies. This includes a co-payment scenario which aims to reduce the aggregate coverage of the public health care system by introducing out of pocket payments. Moreover, it aims to reduce over-consumption in the health care sector and may therefore be classified as a microeconomic demand-side policy, too. Secondly, we assess a general reduction in services covered by the public health care system. Of course, there are a wide range of other measures to improve efficiency and to limit cost growth in the health care system which may also be considered in Poland (OECD, 2013) but are not covered in this study. Our assessment starts with a description of the three reform scenarios, followed by an evaluation of their fiscal impact.

1. Co-payments

The Polish public health care sector already applies co-payments for, for example, the purchase of medicaments. For other health care services, however, no costs have to be covered directly by patients. In this sense Poland does not follow the health care systems of the majority of other European Economic Area (EEA) countries. In fact, 22 out of 30 of the EEA countries also use co-payments for other health care treatment such as hospital care or doctor visits.[39] The benefits of a co-payment are, generally, seen in the reduction of overconsumption in the healthcare sector. In other words, one aims to reduce possible moral hazard behavior with this instrument. Additionally, co-payments are used as additional resources to the health care system. In this respect they may be

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[39] See Magda and Szczygielski (2011), p. 30.

used to cushion the fiscal pressure outlined in the previous section. There are, however, also critics of co-payments, who argue that not only overconsumption but also necessary health care treatment may be reduced by this instrument. Against this background, co-payments should be set at a level not too high, especially for lower income groups which show a high elasticity of demand. However, very low co-payment values are also not advisable as the administration costs may then outweigh the additional revenues.

A possible reform scenario for Poland

To measure the impact of co-payments for the sustainability of the public health care sector we consider a reform scenario prepared by Magda and Szczygielski (2011). They discuss the introduction of a co-payment rate of 25 % – which is regarded by a number of studies as the optimal co-payment level.[40] This rate is applied for primary health care (PHC) and specialist treatment. For hospital treatment the rate is reduced to 10 %. It is important to underline that co-payments are not applied for chronic diseases or for very costly treatments such as oncological treatment, cardiovascular disease and diabetes. Furthermore, recipients of social assistance as well as children and young people until the age of 18 are exempted from the coverage, i.e. we follow reform variant 2 of Magda and Szczygielski (2011).[41] The authors assume a reduction in health care demand of between 0 % and 15 %, depending on the type of medical services. Based on this reform framework, they predict annual revenues amounting to 3.36 % of overall Polish HCE, which corresponds to 4.8 % of total public HCE.[42] We implement their reform scenario (variant 2) and the resulting gains in revenues from 2015 onwards in our projections.[43]

2. Excluding certain medical services

As an alternative cost containment policy, governments may decide to cap the basket of services covered by the public health system. Otherwise, choices on the provision of medical services may be made by physicians who have to select between treatments under tight budget constraints (already today). To avoid such a situation, society should discuss the catalogue covered by the public health system. Society most likely agrees that access to vital and costly treatment should be guaranteed to

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[40] See e.g. Cutler and Zeckhauser, p. 587.

[41] Some groups are currently exempted from health care contribution payments, namely farmers and the unemployed. Their contributions are financed by the state budget. Against this background, it should be discussed whether these groups are also exempted from co-payments. For more details on the structure of NFZ contributions see (in Polish): http://www.nfz.gov.pl/new/art/5549/2013_07_24_przychody_NFZ_2012.pdf

[42] These revenues include not only direct co-payment revenues, but also gains from a reduction in health care demand.

[43] For this projection we apply the relative revenue estimates of variant 2 in relation to total (planned) expenditures of Magda and Szczygielski (2011), differentiated by PHC (15.5 %), ambulatory specialist care (15.1 %), hospital treatment (6.0 %) and separately contracted health services (6.9 %). This projection is feasible as we project these medical services separately in our model. We take the simplifying assumption that the probability of receiving social assistance is spread equally across age and gender groups.

all income groups as far as possible, in accordance with the Polish constitution. "Luxury", i.e. not strictly required health care treatment, as well as low-cost health care services, on the contrary, may not be seen as an integral part of the public health care system. Also, economic arguments may speak against a (full) public provision of selected health care services, such as dental services.[44] Against this background, we consider a partial exclusion of the following three medical services from the public health care catalogue:

      a.   Dental services

      b.   Health resort services

      c.   Long-term care services (LTC)

A full exclusion of these three heath care categories from the public sector may not be desirable if the aim is to provide access to vital and costly treatment to all income groups. For instance, LTC costs may be rather voluminous if the duration in LTC lasts over a number of years. Therefore, it is reasonable to limit only a part of these medical services. In case of LTC one may, for example, consider that only the first year or the first two years of LTC costs are borne by private pockets, i.e. a so-called *waiting period* may be introduced.[45] The high cost risk of a longer duration in LTC would still be covered by the public health care system. For our exclusion scenario we assume that the public services in the field of dental treatment, health resorts as well as LTC can be reduced by 1) one third or alternatively 2) by one half. In our base year of 2010 this would lead to a reduction of total public health care costs of about 1.5 % and 2.2 % respectively.[46] We introduce this reform from 2015 onwards.

3.   A shift from contribution to tax financing

In most countries a large proportion of public health expenditure is funded via contributions paid by the working age population. As a result, the highest fiscal burden of the ageing population is imposed on these younger cohorts. One answer to the cost pressure and demographic challenge ahead could be to finance public health expenditure via taxes as they are more equally paid across age groups. Against this background, we evaluate a shift to a full tax financing of health care expenditure and its

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[44] A number of specific characteristics of dental illness speaks in favour of market provision. In comparison to other diseases, dental illnesses can be better predicted, are less "emergent" and can be easier prevented. Moreover, dental treatment occurs, generally, several times over the life-cycle. Thus, individuals should be better able to judge the quality of these services – compared to other diseases. See also Sintonen and Linnosmaa (2000), p. 1254. Market-based provision of dental services may, therefore, be more efficient.

[45] Most of LTC cases remain in LTC for a limited time span. In Germany, for example, the majority of LTC beneficiaries stay in the system for less than three years (Häcker and Hackmann, 2012).

[46] The biggest part of this reduction is due to dental services, which currently amount to 2.4 % of overall public HCE. LTC contributes to 1.3 % of public HCE and health resorts to 0.8 %.

impact on fiscal sustainability. While currently about one fifth of expenditure is funded from the general budget, this proportion increases to 100 % in 2014 in our reform scenario.[47]

The fiscal impact of the reform scenarios

Both cost-containment reforms improve the fiscal sustainability of the public health care sector.[48] The introduction of co-payment leads to a drop in the sustainability gap by 31% of GDP – see Figure 15. A partial exclusion of the selected budget categories from the public health care catalogue by 33 % or 50 % (described above) reduces the sustainability gap by about 13 % and 19 % of GDP respectively. The impact of these reforms on the overall sustainability gap of public finances is outlined in Appendix A1. Contribution rates would shrink by about 0.9 percentage points (pp) over the long term under the co-payment scenario. The exclusion of certain medical services would lead to a smaller drop in contribution rates by 0.35 pp (33 % exclusion) and 0.5 pp (50 % exclusion) respectively. A complete shift in health care financing to taxes would decrease the sustainability gap by about 36% of GDP. Thus, it shows a similar impact on the long-term finances as the introduction of co-payment. Figure 15 underlines that a stabilization of the public health care system can (most likely) only be reached by a package of reforms. The implementation of all three discussed reform proposals could, for example, reduce the sustainability gap by about 86 % of GDP.

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[47] Under this scenario, for health care revenues we apply an average tax profile reflecting the weighted sum of our age and gender specific VAT, PIT and excise tax profiles.

[48] In our standard scenario, the cost-containment scenario, we already assume that excess growth in the public health care sector can be limited to 0.5 pp. The reform scenarios analyzed in this section are seen as an additional tool to limit future cost growth.

Figure 15: Sustainability gaps of the public health care system under various reform scenarios
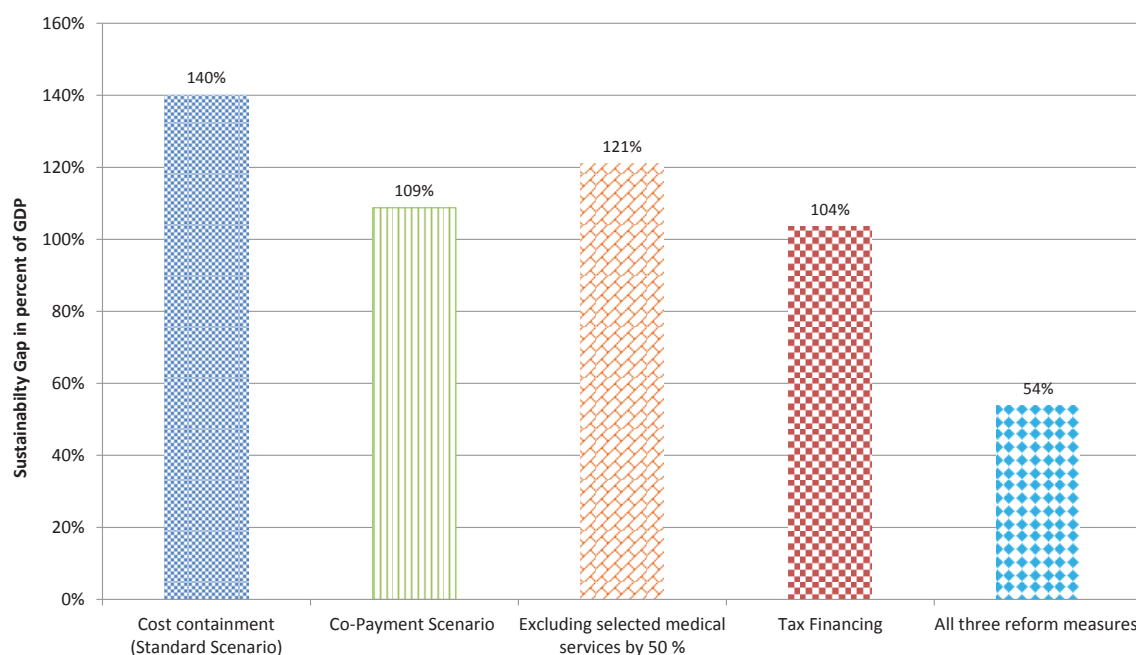
Source: own calculations.

In conclusion, Polish politicians will have to take action to cope with the phenomenon of excess cost growth and with the burden of an ageing population. We assessed two possible cost-containment policies, an introduction of co-payments and a partial exclusion of the selected budget categories. Our analysis showed that co-payments can be seen as more effective in capping excess cost growth in the health care sector. Of course, the exact design of co-payments may still be discussed by politicians. The exclusion of children and social assistance beneficiaries, considered in our estimations, may be desirable. A further exclusion of the elderly population would, however, limit the potential gains of this reform significantly and should therefore be carefully evaluated. A stronger shift towards tax financing represents a further promising reform to stabilize the health care system in the long term. With this reform future health care revenues are less affected by the ageing population as the fiscal burden is shared more equally across age groups. Furthermore, the analysis showed that there is no single magic bullet to stabilize the health care system in future years. In fact, most likely a portfolio of policy measures will be required to limit excess cost growth and to cope with the costs of an ageing population.

Figure 16: Health Care Contribution Rates under various reform scenarios
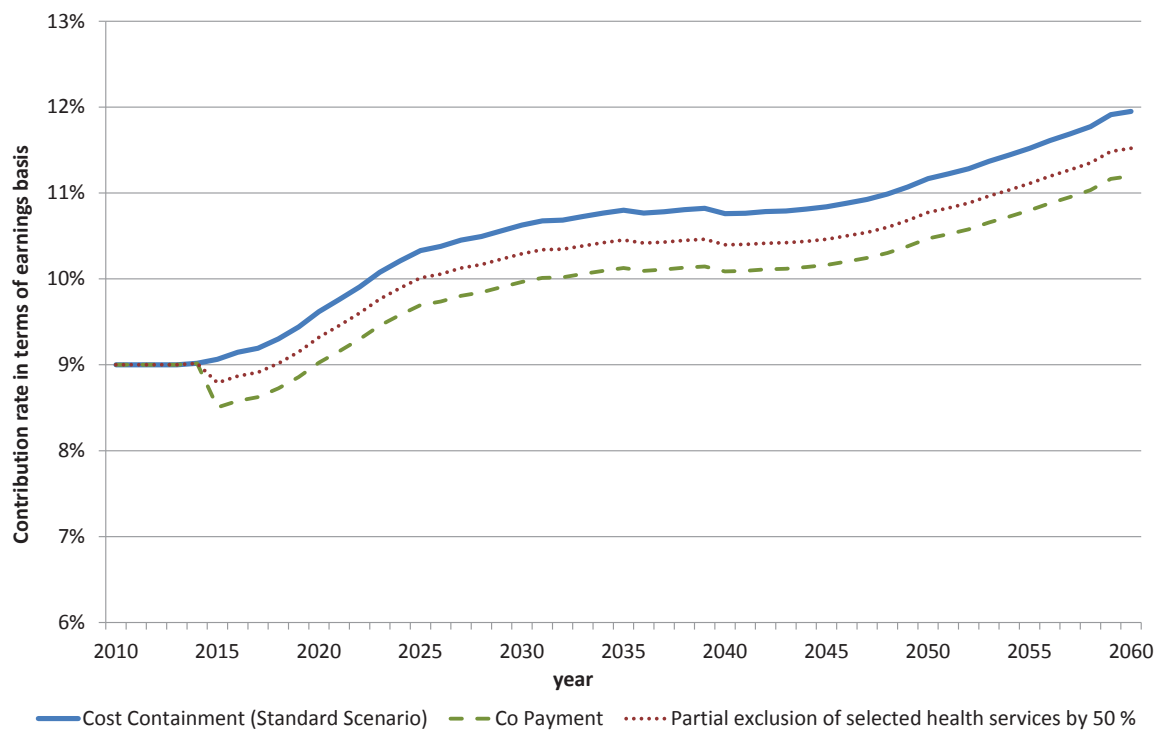
Source: own calculations.

4 Conclusion and Outlook

Our study showed that Polish public finances can be regarded as relatively sustainable despite the projected tripling of the old age dependency ratio until 2060. The sustainability gap of the entire public finances improved after the recent fiscal reforms and amounts to around 130 % of GDP in 2010. A durable cut in benefits or an increase in revenues of around 3 % would be necessary to close this gap. The transfer of 2nd pillar obligations to the general government is not included in these results yet as it was still in the phase of implementation while writing this study. If we consider this reform, the sustainability gap decreases further to 96 % of GDP.

However, the long-term fiscal stability differs widely between sub-systems of public finances. The old age pension system will stabilize in the coming decades. All three recent pension reforms contribute to this positive fiscal outlook, namely 1) the partial shift of contributions from the mandatory FDC to the NDC system, 2) the gradual increase in the statutory retirement age to 67 and 3) the new reform to transfer large parts of the funded 2nd pillar assets/obligations to the public sector. As a consequence, the current high tax inflows into this system may be used to some degree for other government activities or allow to reduce the excessive deficit in future years. Moreover, our projections show that if we keep current replacement rates constant in the future, pension expenditures would almost double over the coming 50 years from 8 % to about 16 % of GDP. An abolishment of the NDC pension benefit formula which reduces replacements rates, therefore, seems unadvisable. It is also certain that substantial savings (roughly 10 % of average earnings) are required for the current working population to close the gap between current and prospective replacement rates. The disability fund can be regarded as sustainable under current rules, too. Its fiscal long-term stability improved significantly after the introduction of more rigid eligibility criteria and an increase in contribution rates from 6 to 8 % of the wage base. The expected gradual decline of the sizeable farming and mining sectors in Poland over the coming decades also has a positive effect on fiscal sustainability. Their pension schemes, currently heavily subsidized by the state budget, are therefore shrinking too. Last but not least, current public expenditure on education is expected to decrease in relation to GDP with declining fertility rates. The public health care system, on the contrary, may well turn into the rotten apple of public finances. If we project its excess cost growth observed in past years into the future, public finances are severely challenged. Against this background, we evaluate two possible cost-containment policies: 1) a co-payment system and 2) a partial exclusion of selected health care services. Our results indicate that co-payment is more effective in capping excess cost growth in the health care sector. Additionally, we assess a shift from a contribution to a fully tax-financed public health care system. We show that such a revenue reform has significant potential to stabilize future health care finances, with a comparable effect to co-

payments. However, one single health care reform alone will most likely not be enough. In fact, politicians should consider a set of health care policies to cope with the upcoming challenges of excess cost growth and an ageing population. We discussed three examples of reform measures. There are, however, a wide range of other health care policies which deserve further attention (OECD 2010, 2013b). These include a strengthening of disease prevention and health promotion policies. In fact, we have shown that healthy ageing can significantly cushion the costs incurred by a steadily increasing life expectancy.

As in the case of any long-term projection, our estimates should also be judged with caution. We project public finances under current information and fiscal policies. Behavioural changes and possible feedback loops can be reflected only to a limited degree. For example, one may imagine that the future drop in old age retirement benefits may lead to a higher inflow into the disability system, which keeps its relatively generous benefit rules. Furthermore, our projection of some budget items could be improved in future years. For example, for minimum pension expenditures we considered constant base year probabilities to receive this benefit. Under current indexation rules this may be unproblematic as the minimum pension will decrease to insignificant values over the coming decades – if its indexation with 20 % of wage growth is prolonged. A continuation of these current minimum pension rules seems, however, unlikely. Future research may therefore estimate the impact of, for example, different minimum pension indexation rules on the sustainability of public finances.

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Appendix

A1: Sensitivity Scenarios

A number of political and non-political scenarios have been assessed in this study. Their impact on the sustainability gap of the entire public finances is outlined in Table 5 below. The table is divided into health care scenarios and ZUS pension fund scenarios which are explained in greater detail in section 3.2.

Table 5: Total Sustainability Gap under various political and non-political scenarios

Scenarios	Sustainability Gap of entire Public Finances, in % of GDP
Standard scenario	**130%**
Heath care - Alternative Scenarios	
Pure demographics	84%
Healthy longevity	43%
LTC convergence	144%
Full cost pressure	355%
Co-Payment Scenario	99%
Excluding selected medical services by 33 %	118%
Excluding selected medical services by 50 %	111%
ZUS pension fund - Alternative Scenarios	
… no Increase in retirement ages to 67	140%
… no Increase in retirement ages to 67 & no FDC cut	170%
… with 2013 reform	96%
… with reversal scenario	676%

Source: own calculations.

The results depend on the choice of the discount rate. The smaller the discount rate chosen, the higher the results, and vice versa. Increases in the wage growth assumption lower the sustainability gap. This result may be counterintuitive as in a number of other countries the opposite direction can be observed. In our calculations it is mainly caused by pension indexation rules. A higher wage growth translates into higher revenues of the pension system as taxes and contribution grow in line with this factor. Pension benefits, on the contrary, increase (in real terms) only with 20 % of earnings growth. As a consequence, a higher wage growth improves the sustainability of public finances as the revenue side grows faster than the expenditure side.

Table 6: Sensitivity of sustainability gaps with respect to the discount rate and wage growth

		Wage growth difference to standard scenario (until 2050) in percentage points				
		-1.0	**-0.5**	**0.0**	**0.5**	**1.0**
Discount rate	**2%**	200%	200%	200%	198%	196%
	2.50%	169%	166%	163%	158%	153%
	3%	142%	137%	**130%**	122%	112%
	3.50%	128%	122%	114%	105%	95%
	4%	118%	112%	105%	96%	86%

Source: own calculations.

Higher life expectancy, generally, leads to an increase in sustainability gaps as, for example, pension benefits are paid out over a longer period time. The impact of longevity assumptions on our results is, however, not very significant – see Table 7. The reason may be found in the two biggest sub-systems of public finances, namely the ZUS pension fund and the public health care system. Their expenditures react to changes in mortality. Benefits of the ZUS pension fund, NDC pensions, are linked via the benefit formula to changes in longevity at retirement. Hence higher life expectancy compared to the standard scenario leads to lower NDC pension benefits (and lower life expectancy leads to higher NDC pension benefits). Also the age-specific costs of our health care projection react to changes in life expectancy. According to the assumption of healthy longevity – described in section 3.2.2 – health care profiles shift in line with higher/lower gains in life expectancy.

Table 7: Sensitivity of sustainability gaps with respect to life expectancy assumptions

| Standard Scenario	Increase in life expectancy until 2100 - double the amount of the standard scenario	Increase in life expectancy until 2100 - half the amount of the standard scenario
130%	144%	124%

Source: own calculations.

A2: Revenues and Expenditures of the 2013 reform under various FDC switchback scenarios

The impact of the 2013 reform on future NDC revenues and expenditures depends greatly on the number of FDC members who opt for a switch back to the mono-pillar system. Against this background, we show in Figure 17 a sensitivity of our cash flow results under various assumptions. Besides our standard scenario, in which we assume that 50 % of FDC participants choose to switchback to the mono-pillar system, we also outline alternative scenarios with 0 % and 100 % of FDC participants choosing to switchback to the pure NDC system.

The proportion of FDC members choosing to switchback determines considerably the flow of revenues until 2040. In fact, the higher this proportion, the larger the revenue flows into the NDC system. This fact can be explained by the higher average contributions paid by mono-pillar participants. This *contribution effect* is, however, gradually outweighed by higher pre-retirement transfers, channelled via the zipper mechanism (*transfer effect*). From 2040 onwards the transfer

effect equals more or less the contribution effect. Thus, overall revenues shown in Figure 17 are almost equal after 2040 under all three switchback scenarios.[49] Expenditures are also more or less the same under each switchback scenario as all FDC pension rights are transferred via the zipper mechanism eventually to the PAYG system, and as we assume here equal rates of return for both NDC2 and FDC (equal to GDP growth).[50]

Figure 17: Revenues and Expenditures of the 2013 reform under various FDC switchback scenarios – FDC rate of return: GDP growth –


Source: own calculations.
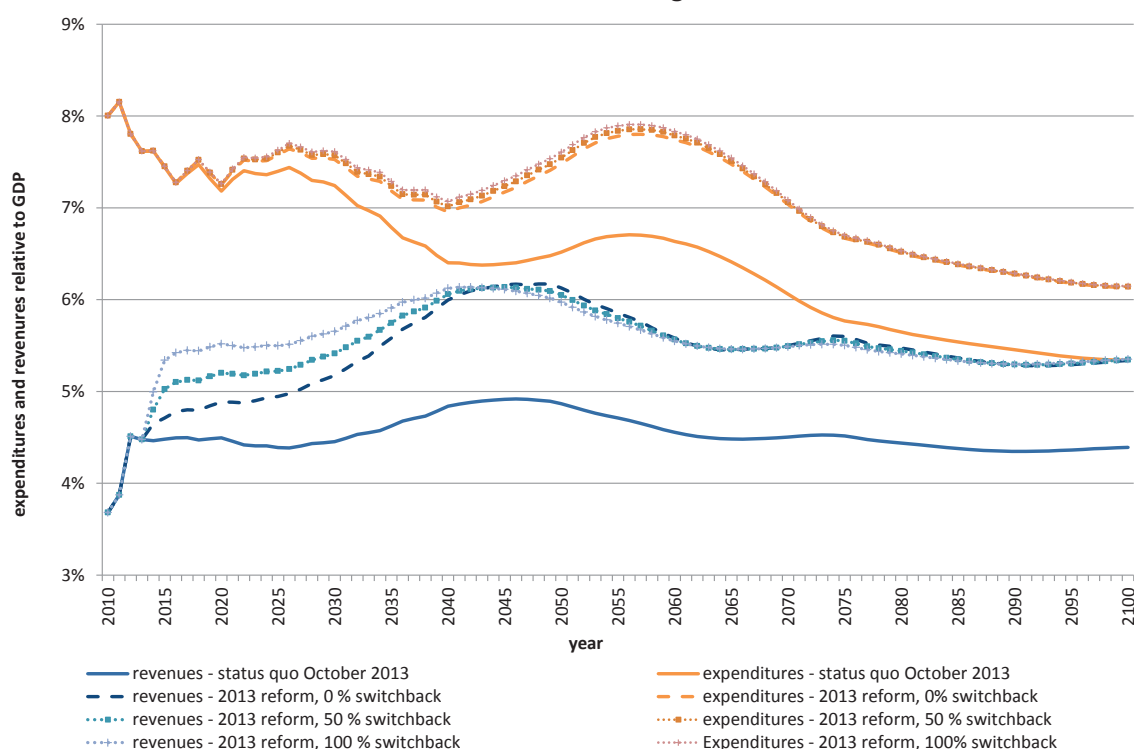
The assumed FDC rate of return for the results of Figure 17 equals GDP growth. In our standard scenario the FDC rate of return is, however, different. To ensure comparability with international guidelines of the European Commission we assumed a 3 % rate of return (in real terms) in the base scenario. Our results are almost unaffected by the different choice of the FDC rate of return – as outlined in Figure 18 below. Only after the year 2045 are revenues slightly, larger the more individuals stay in the FDC system. These individuals could benefit from the higher assumed FDC rate of return which also translates eventually in slightly larger expenditures in the long-term.

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[49] Looking at Figure 17, one may at first glance favour a 100 % switchback scenario as it leads to higher revenues over the time horizon of 2010-2100 and relatively equal expenditures. Such a comparison is, however, not complete since, for example, in 2100 still significant FDC assets are existent under the non-100% switchback scenarios but not under the 100 % switchback scenario. These assets are not visible in Figure 17 – as long as they are not transferred via the zipper mechanism.

[50] The tiny deviation in the long-run can be explained by the fact that NDC1 accounts grow in line with the wage bill of the ZUS pension. The latter wage bill is slightly higher than GDP growth (applied for NDC2 and FDC) due to an inflow of mainly farmers into the ZUS pension system. This effect disappears over the long-run as the transformation process in the farming sector is assumed to end by 2060.

**Figure 18: Revenues and Expenditures of the 2013 reform under various FDC switchback scenarios
– FDC rate of return: 3 % in real terms –**

Source: own calculations.
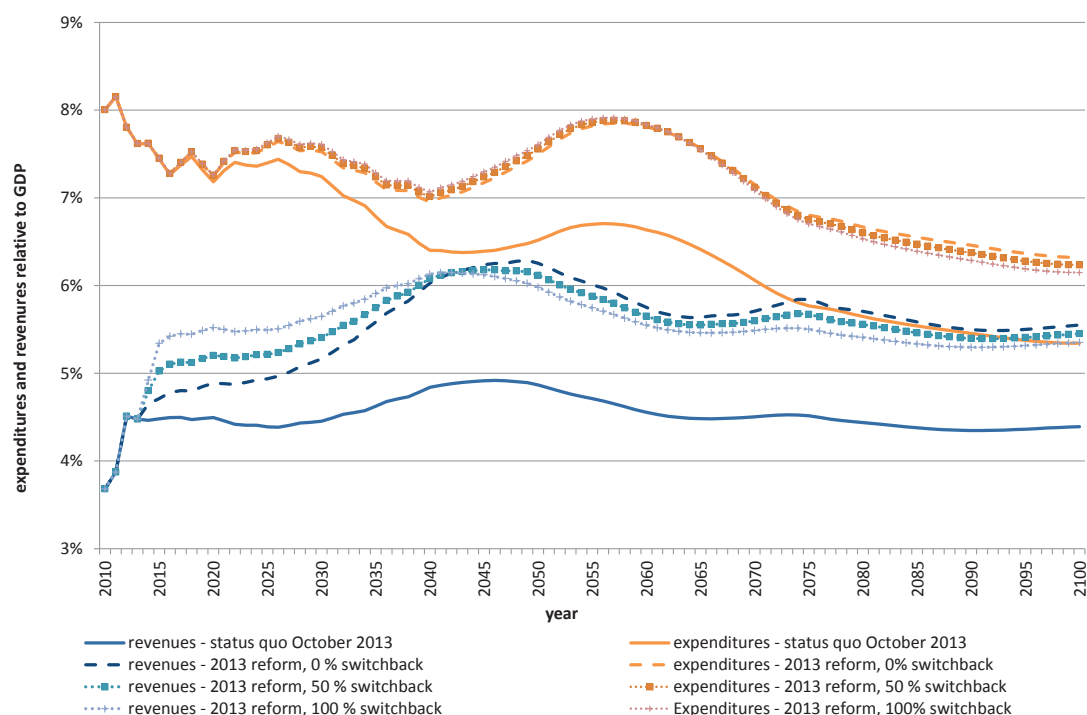
A3: Miners old-age pension system and its possible reform

A profession which profits from the early retirement privileges in an infinite time horizon is mining, limited to underground coal mining. Legal rules set for this group in 2005 petrify the old system rules, where a pension was based on contributory and non-contributory periods.[51] With these highly generous rules, compared to the general pension scheme, and effective average retirement ages of around 50, large tax subsidies are necessary to finance the miners' system. Currently, about 80 % of expenditures are financed from the budget. Against this background, reforms of the miners' pension scheme may be arguable. A possible reform may include a gradual transformation of the miners' pension system into the general pension scheme. We model such a scenario and assume that all newly-hired miners enter into the common NDC/FDC system and have to follow the statutory retirement ages enacted in this system. Earlier retirement channels may be considered in such a scenario but are not taken into account in this exercise.

Since the first miners covered by the above-mentioned rules would reach current common miners' retirement age of 45-50 in about 25-30 years from now, the positive impact on public finances of the proposed reform would be visible in the relatively distant future.

Before showing the results of the above-mentioned reform scenario, we would like to mention a number of limitations regarding the data quality and our assumptions of our projection:

- Firstly, the precise number of miners entitled to the miners' pension is uncertain. In our previous study we relied on the overall number of miners hired in the public sector published by the NSI, which currently amounts to 170,000 miners. In the current study we corrected the number of miners to the newly-hired data of the Ministry of the Economy. The improved data specification

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[51] For more details on this system and its projection see Jablonowski and Müller (2013).

suggest that the actual number of miners hired for underground work, as physical workers or technical supervisors, amounted to 112,000 in mid-2013. According to law, only underground workers are entitled to the miners' old-age pension. The new, lower number of miners has a twofold effect on our computations: on the one hand, the smaller number of miners' contributors decreases the contribution inflow into the isolated miners' sub-system. On the other hand, it decreases the presumed number of future miners' pensioners.

- The number of miners' contributors hired underground in the state-owned black coal mines depends not only on the play of the supply-demand factors for the subsoil stocks of extractable coal, but also on the strategic government plans on their use, and the technological means applied to do it. In this respect we see the limitation of our projections which are based entirely on the demographic trend.

The assumption for the miners' old-age pension system reform is that all newly-hired miners after 2015 are treated as ordinary NDC/FDC scheme members.

Figure 19 shows the consequent rapid outflow of the miners-contributors and contributions paid from the system. The system itself will slowly go extinct for another 40 years until the moment of the expected death of the last entitled miners' pensioner.

Figure 19: Miners' pension expenditures and contributions under the reform scenario (in prices of 2010, without growth effects)
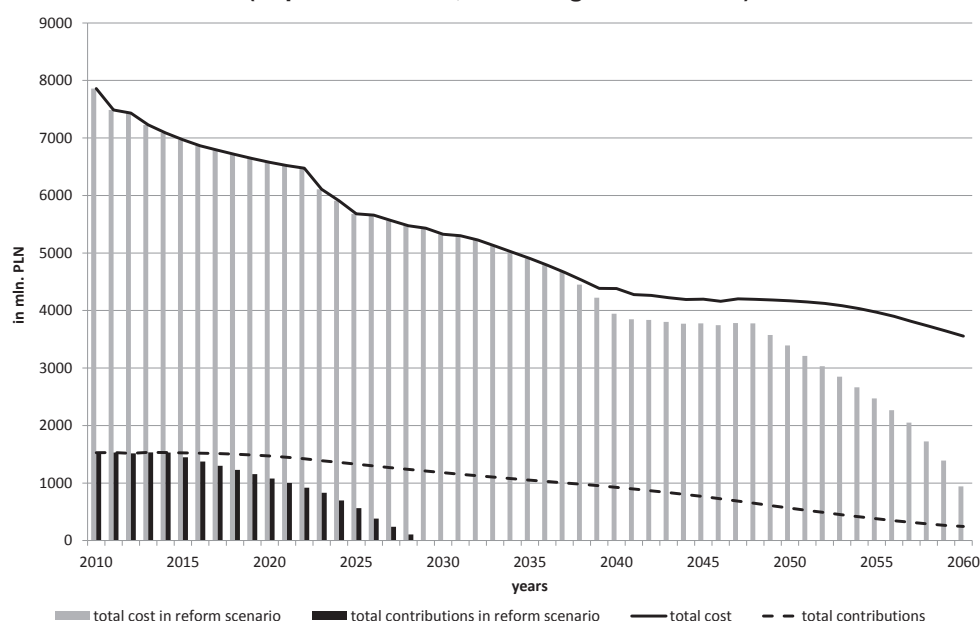
Source: own calculations

In addition to the isolated miners' pension system the long-term stability of the general pension scheme would also improve due to the inflow of new contributors. In our scenario every next cohort of new miners, from 2015 onwards, enters the NDC/FDC system and is treated as a common employee with the average per capita expected income path and retirement ages. In total, the sustainability gap of Polish public finances improves by about 1 % of GDP.[52]

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[52] For this reform we based our projection on the following assumptions. We assumed an average entrance age into the mining sector of 20 years and an average retirement age in the miners' system of 50 years. Furthermore, we assume for simplicity that miners are comparable to the general population in terms of longevity and average earnings. The probability to work in the mining sector was assumed to add up to 1.25 % per male citizen for non-retired age groups.

However, the simulation of the reform of the miners' pension system has to be taken with caution: the mines, as a part of the fuel production industry, are highly dependent on the available resources and market rules – the demand for coal and its price. Therefore, the number of black coal mines and miners hired should be more carefully investigated.

A4: A rough calculation of savings necessary to guarantee current replacement rates

We provide a rough estimate of savings necessary to guarantee current replacement rates in Box 5. In the following passages we briefly outline the calculation procedure used for these figures as well as the main assumptions chosen. We can base the estimation on generational accounts which indicate the average expected net tax payments of each cohort over their remaining life-cycle. Under the reversal scenario, which keeps replacement rates at its current level, generational accounts are considerably lower than in the status quo scenario due to the higher net pension wealth. The difference between the generational accounts in these two scenarios – outlined in Figure 20 – indicates the stock of pension wealth per citizen necessary to be set aside today (under the real interest rate of 3 %) in order to keep current replacement rates. As not every citizen is participating in the ZUS pension system, we weight this stock with the age and gender specific probability of taking part in ZUS.

Figure 20: Generational accounts of current contributors – status quo vs. reversal scenario
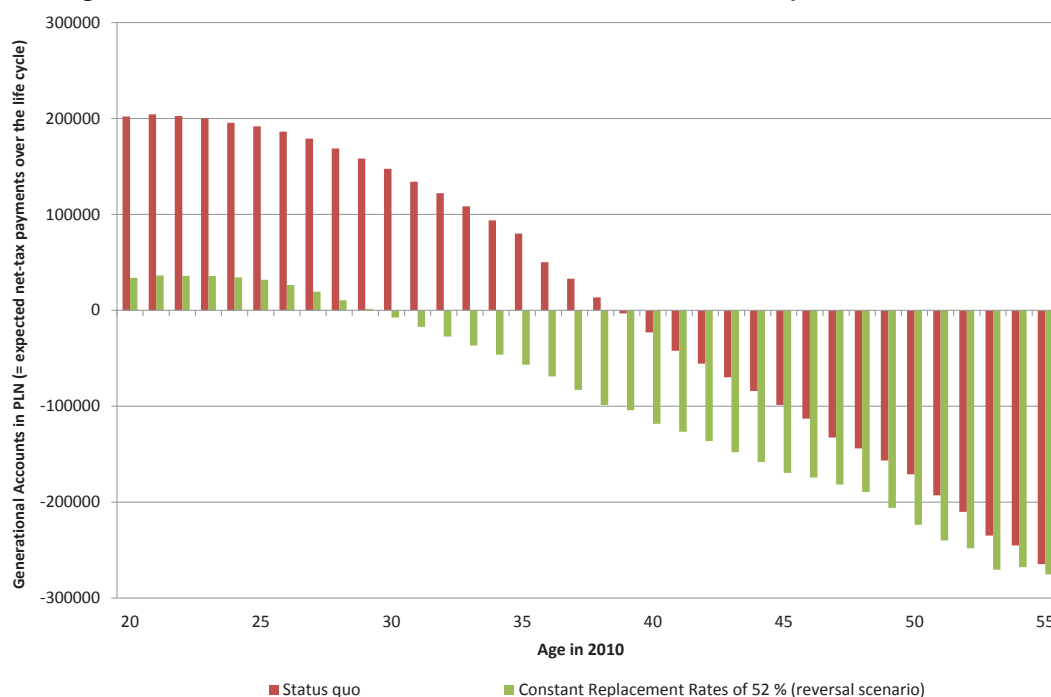
Based on the base year present value of necessary savings *PV*, we can estimate annual savings *A* for each age group *x* (in year 2010) to be paid over *n* periods until the future year of retirement. In this course, we consider the increase in retirement ages legislated in 2012. Annual savings are adjusted each year by the general earnings growth *g* (outlined in Figure 3). To simplify the formula (outlined in Eq. 1 below), we applied the average earnings growth (in real terms) of the period 2012-2040, which amounts to 3.3 %. The long-term interest rate *r* amounts to 3 % in real terms. In other words, the annual savings correspond to a constant proportion of average earnings over the entire savings period. Average earnings in our starting year of 2010 amount to 38,700 PLN.

Eq. 1

$$A_x = PV_x * \frac{(r - g)}{(1 - (\frac{(1 + g)}{(1 + r)})^n)}$$

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