A LONG-TERM ASSESSMENT OF THE POLISH DISABILITY FUND AND ITS POSSIBLE REFORM

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Executive summary

The profound changes introduced to the public old-age pension system in Poland in 1999, 2011, 2012 and 2014 left the disability benefit scheme unchanged. The lack of adjustments in this socially sensitive field causes inconsistencies in macro and microeconomic perspectives. The reform proposed by the government in 2010 aimed at removing these inconsistencies by the creation of the linkages between the notional defined contribution account (NDC) created for the future old-age pensioners and the disability benefit formula. More precisely, the old formula, based on the length of the contributory and non-contributory periods, would be replaced by a formula, which links disability pensions to the amount of the old-age NDC pension entitlements. Due to presumed negative effects on replacement rates, the reform has been rejected. In our study we try to re-evaluate its assumptions with use of the ‘three-side approach’: 1) long-term cash balance projection of the disability pension system, 2) intergenerational redistribution effects, and 3) adequacy of future individual pension levels estimated via adequacy ratios, which show the relation between the initial average pension level and the average salary in the economy. We focus on pure disability expenditures. Survivors’ pensions also paid out from the disability fund were disregarded.

The analysis starts with the outlook on the main drivers of the disability expenditures. We identified that legal rules, namely the generosity and eligibility criteria, have the largest impact on the number of disability pensioners. This statement holds in particular for Poland where the reform of 1997 and 2005 1) significantly limited an inflow to the system with the tightening eligibility criteria and 2) increased the outflows via reclassifying of the beneficiaries from the disability scheme to the old-age pension scheme, once the statutory retirement age is reached. As a consequence, the number of the disability beneficiaries dropped in Poland from nearly 2mn in 2005 to 1.3mn in 2010. In the long term, additionally, the ageing process may influence the number of disability beneficiaries. For Poland a tremendous increase in the number of potential disability pensioners - reflected by the high risk age group 50-64 - is predicted in the period 2025-40.

According to our calculations the disability finances will significantly improve in coming years under current rules (status quo scenario). While the contributions stay relatively constant in terms of GDP, expenditures will drop considerably in the coming decades. Mainly, tighter eligibility criteria explain this decline of expenditures over time. Average benefits remain relatively stable in the long term.

The NDC reform, regarded from these three perspectives, shows a shift of the abovementioned equilibrium point of three perspectives towards further improvement of public finances. On the contrary, benefits levels would shrink significantly compared to the status quo scenario. Upon introduction of the reform,
the average newly disabled male (female) persons up to age of about 41 (51) years could count on the minimum pension, only. Over time also older age groups would fall under the threshold of the minimum pension. These low benefit levels represented a main reason for the rejection of this disability reform in 2010. A link of disability benefits to NDC accounts may be, nevertheless, favorable as it would provide a consistent calculation of disability and old-age pensions. Otherwise, in future years old age pensions could be significantly lower than disability benefits, which may lead to additional inflows into the disability scheme. Against this background, our study assesses a modification of the 2010 NDC reform proposal. We have shown, that a change of the parameters used in the NDC benefit formula may considerably increase future benefit levels and therewith the chance for a political adoption of the 2010 NDC reform.

According to the reform introduced in May 2012 retirement ages will be increased to 67 (briefly called here 67RA) for both men (until 2020) and women (until 2040). The impact of this reform is twofold: on the one hand, revenues are increased as contributors (most likely) work longer and, therefore, pay for a longer period into the disability pension system. In the 67RA scenario revenues are higher than under a pre-reform scenario by 5% in 2020 and by 11% in 2050. On the other hand, expenditures are affected quite significantly by the increase in retirement ages. In the 67RA scenario expenditures are higher than under a pre-reform scenario by 28% in 2020 and by 58% in 2050 as the possible duration in retirement is prolonged considerably. Additionally, this rise can be explained by a higher inflow into disability as with the abolishment of early retirement channels important alternative paths to leave the labour market are cut. These findings outline that increases in old age retirement ages lead to negative side effects on disability finances.
Table of Contents

Executive summary .........................................................................................................4
1. Introduction ..........................................................................................................12
2. Legal Framework: Status quo .................................................................................14
   2.1. Status quo scenario .......................................................................................14
       2.1.1. Basic legal requirements .................................................................14
       2.1.2. The benefit calculation formula .......................................................15
       2.1.3. Medical background for the disability benefit granting ......................16
       2.1.4. Restriction in case of additional earnings .........................................17
       2.2. The NDC reform proposal ............................................................................17
   2.3. Increase in legal retirement age from 2012 ....................................................19
3. Drivers of disability ................................................................................................20
   3.1. Introductory remarks .....................................................................................20
       3.2. General overview of disability trends ......................................................21
           3.2.1. The Polish perspective ....................................................................23
       3.3. Age ..............................................................................................................25
       3.4. General Health status ................................................................................28
       3.5. Composition of diseases causing a disability ..............................................31
       3.6. Gender ........................................................................................................35
       3.7. Legislative Reforms .....................................................................................36
   3.8. Summary and main conclusions ....................................................................40
4. Methodology and Indicators ...................................................................................42
   4.1. Long-term fiscal stability · the methodology of the Generational Accounting ....42
   4.2. Long-term fiscal stability and intergenerational redistribution Indicators ........44
   4.3. Adequacy Indicators .....................................................................................46
5. Data and assumptions ............................................................................................48
   5.1. General overview on factors influencing the number of disability pensioners.....53
   5.2. Incidence rates ..............................................................................................54
       5.2.1. Two types of incidence rates · a definition .............................................54
       5.2.2. Two types of incidence rates · an exemplarily application .....................55
       5.2.3. The impact of higher retirement ages & cuts of early retirement channels on disability incidence rates..................................................57
   5.3. Exit probabilities · deriving probabilities to leave the disability system ..........61
       5.3.1. The impact of higher retirement ages on exit probabilities .................62
6. Results ..................................................................................................................64
   6.1. Introductory remarks .....................................................................................64
   6.2. Evaluation of the legal status before the increase in retirement ages .............64
       6.2.1. Long-term cash balance without increase in retirement ages ..........64
       6.2.2. Intergenerational redistribution and sustainability without increase in retirement ages .................................................................67
       6.2.3. Adequacy · 2010 legal status .................................................................69
   6.3. Increase in legal retirement ages to 67 ...........................................................73
6.3.1. Long-term cash balance - retirement age 67 ........................................ 73
6.3.2. Intergenerational redistribution and sustainability
       - retirement age 67 ........................................................................ 75
6.3.3. Adequacy - retirement age 67 ......................................................... 76

6.4. Evaluation of NDC reform....................................................................... 76
6.4.1. Long-term cash balance - NDC reform scenario ............................... 76
6.4.2. Intergenerational redistribution and sustainability - NDC reform ....... 77
6.4.3. Adequacy - NDC reform ................................................................. 77

6.5. Higher mental illness scenario ................................................................. 83
6.5.1. Long-term cash balance - Higher mental illness scenario ................. 83

7. Summary and conclusions......................................................................... 86

Literature ....................................................................................................... 89
Our reports ................................................................................................... 104
Central European Observatory Project's reports ......................................... 106
Table of Boxes

Box 1. The significance of minimum pensions for current and future disability benefit levels ................................................................. 71
Box 2: Comparison of future old age and disability pension levels ......................................................... 79
Box 3. Limitations of our NDC pension simulation ........................................................................... 81

Table of Tables

Table 1. Aggregate revenues and expenditures of the disability fund, mn PLN ....................... 49
Table 2. Aggregated expenditures by disease type 2010 ............................................................. 50
Table 3. Aggregated expenditures by disability category ......................................................... 51
Table 4. Aggregated expenditures by disease category, disease type and gender .......... 51
Table 5. Alpha values in the status quo .................................................................................. 59
Table 6. Corrected alpha values in higher retirement scenario ........................................... 59
Table 7. Indicators of sustainability and intergenerational redistribution - status quo .... 69
Table 8. Indicators of sustainability and intergenerational redistribution - RA67 ........... 75
Table 9. Indicators of sustainability and intergenerational redistribution - RA67 & cutER .... 75
Table 10. Indicators of sustainability and intergenerational redistribution - NDC reform .... 77
Table 11. Adequacy Ratios – Old age vs. Disability ................................................................. 80
Table 12. Assumptions – mental illness scenarios ............................................................... 84
Table 13. Split options for the coming years between NDC 1, NDC 2 and FDC ............ 92
Table 14. Correction coefficient ............................................................................................... 92
Table 15. Applied demographic assumptions ........................................................................ 93
Table 16. Comparison of model approach and assumptions .............................................. 96
Table 17. Comparison of real wage growth applied ............................................................... 97
Table of Figures

Figure 1. Visual overview of chapter 3 – drivers of disability .............................................. 21
Figure 2. OECD countries with increasing disability recipiency rates ................................... 22
Figure 3. OECD countries with decreasing disability recipiency rates .................................. 22
Figure 4. International comparison of disability expenditures (in % of GDP) ....................... 24
Figure 5. Age specific disability prevalence rates in Poland ............................................... 26
Figure 6. The disability dependency ratio: 1999-2060 ........................................................ 27
Figure 7. Life expectancy at birth across the EU .............................................................. 28
Figure 8. Healthy life years in the EU and Poland ............................................................. 30
Figure 9. Total payments by disease type in % of overall expenditures for the disability benefits in 2010 ................................................................. 32
Figure 10. Composition of the key diseases in overall number of hospitalized cases in 2010 ................................................................................................................. 33
Figure 11. Number of cardiovascular hospital cases per 1,000 inhabitants by age group ................................................................. 33
Figure 12. Number of cancer hospital cases per 1,000 inhabitants by age group ............... 34
Figure 13. Number of mental illness hospital cases per 1,000 inhabitants by age group .... 34
Figure 14. Prevalence (per 1,000 Males / Females) of hospital cases of cardio diseases by age ............................................................................................................. 35
Figure 15. Prevalence (per 1,000 Males / Females) of hospital cases of tumor diseases by age .................................................................................................................. 36
Figure 16. Prevalence (per 1,000 Males / Females) of hospital cases of mental diseases by age .................................................................................................................. 36
Figure 17. Disability reform and the decrease in beneficiaries .............................................. 37
Figure 18. Early retirement vs. disability expenditures in Poland ........................................ 38
Figure 19. Unemployment vs. disability expenditures in Poland ........................................ 39
Figure 20. Eligibility incidence rate - the example of cardiovascular diseases ...................... 55
Figure 21. Eligibility incidence rates by disease type - example of male completely disabled .................................................................................................................. 56
Figure 22. Eligibility vs. disability incidence rates - the example of a male completely disabled .................................................................................................................. 57
Figure 23. Hospitalisation rates - the example of cardiovascular diseases ............................ 58
Figure 24. Disability incidence rates of cardiovascular diseases - Higher retirement and abolishment of ER scenario ......................................................................................... 60
Figure 25. Exit probabilities (due to other reasons than average mortality) of disability pensioners by age and gender and degree of disability ............................................... 62
Figure 26. Shift of exit probabilities due to the increase in retirement ages .......................... 63
Figure 27. Development of disability expenditures/revenues - before the increase in retirement ages (g=AWG, r=0) ................................................................. 65
Figure 28. Inflows and outflows in/out of disability beneficiaries by age, in the year 2010 ................................................................. 67
Figure 29. Generational Accounts (r=3%, g=AWG) - legal status before increase in retirement ages .................................................................................................................. 68
Table of contents

Figure 30. Adequacy ratio, status quo scenario (in per cent of the average wage in the economy) ........................................................................................................... 70

Figure 31. Age- and gender-specific probabilities to receive a minimum benefit
- partial disability benefits ........................................................................................................ 71

Figure 32. Development of the minimum pension in relation to average wages ........ 72

Figure 33. Development of disability expenditures/revenues
- higher RA (g=AWG, r=0) .................................................................................................... 74

Figure 34. Development of disability expenditures/revenues
- status quo scenario (g=AWG, r=0) ..................................................................................... 77

Figure 35. Adequacy ratio, NDC reform scenario (pension relative to average wage) ....... 79

Figure 36. Impact of changing parameters of the 2010 NDC reform proposal ............ 82

Figure 37. Higher mental illness scenarios (g=AWG, r=0) ..................................................... 84

Figure 38. ZUS model - Relation of the minimum pension to the average salary
(dotted line for CD, solid for PD) .......................................................................................... 98

Figure 39. RCG Model - Development of the minimum pension (comp)
in relation to average wage ................................................................................................. 99

Figure 40. ZUS model - Deficit projection of the entire disability fund ...................... 100

Figure 41. ZUS model - Deviation of the deficit projection of the entire disability fund
to status quo for alternative political scenarios ................................................................. 100

Figure 42. RCG model - Deficit/surplus projection of pure disability finances
for alternative political scenarios ......................................................................................... 101
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1. Introduction

Poland, the biggest country in Central Eastern Europe, will be confronted with an exceptionally fast pace of aging in the coming decades\(^1\). In view of this development, the Polish government adopted profound changes of the old age pension system in 1999. Based on a multi-pillar approach a new mandatory funded pension scheme (FDC) was introduced. Furthermore, the former defined benefit system was converted into a notional defined contribution scheme (NDC).

Contrary to the old age pension scheme, the benefit formula of the disability benefit system - the second largest social security scheme - was left unchanged\(^2\). To unify the formula and to provide a consistent calculation of disability and old-age pensions, the government attempted to introduce a disability reform in 2008 and again in 2010. The aim of the reform was, among others, first, to link new disability benefits to the notional contributions recorded on an individual pension accounts (so called NDC) and, second, to remove the income ceilings for disability beneficiaries, who continue their labor activity. The latter component was intended to increase the comparably low employment rates of disability pensioners. Despite these labour spurring intentions, the reform proposal was rejected in December 2008 by the President of Poland. The second attempt with the same act proposal from 2010 also failed due to strong opposition within the government. The main reason of the refusal were forecasts of significantly dropping average disability benefits under the reform proposal. Nevertheless, a comeback of the disability reform proposal is likely. With different benefit formulas pension levels of old age and disability will increasingly diverge. As a result, due to existing inconsistencies, the disability beneficiaries who reach the statutory retirement age may expect, in many cases, higher old-age pension levels than individuals retiring under the new NDC/FDC system. The current legal framework may, therefore, not be feasible from legal and political viewpoints.

Against this background, the aim of our paper is, first, to assess the long-term performance of the disability system under the legal status quo. This analysis focuses on pure disability expenditures. Survivors’ pensions, also paid out from the disability fund, are disregarded. Second, we benchmark the current disability framework with the 2010 reform proposal. In this context, we will focus on the

\(^1\) No other EU country (except Slovakia) will experience such a rapid rise of the number of elderly people relative to the working population.

\(^2\) It should be noted that, despite the lack of changes to the disability benefit formula, a major reform of the assessment and disability definitions was legislated in 1997. This legal act shifted the assessment responsibility to ZUS and changed the approach from health detriment to work incapacity.
Introduction of the NDC benefit formula. We will not evaluate the proposed abolishment of income ceilings – which was also part of the 2010 reform. Third, we will outline the impact of recently discussed increase in legal retirement ages on the disability pension system. It will be shown that this reform act, adopted in May 2012, will as a side effect increase considerably the number of disability expenditures.

We believe that the proper evaluation of these complex reform scenarios requires a broader perspective. What seems acceptable from the perspective of public finances, may be too restrictive from the viewpoint of an individual, suffering from disability. Therefore, all political scenarios will be analyzed from three perspectives. Firstly, we take the macro viewpoint and evaluate the long-term fiscal stability based on the indicator of cash balances. Secondly, we show the intergenerational redistribution inherent in the disability system on the basis of generational accounts. Thirdly, we take an individual perspective and assess the adequacy of future pension benefits in relation to earning levels. We hope that such ‘three-side’ evaluation may serve as a source of quantitative arguments in the discussion between policy makers, academics and representatives of the society, upon renewed discussion on the reformed disability pension system in Poland.

The paper is structured as follows: Chapter 2 describes the legal status quo of the disability pension system and the assumptions of the 2010 reform proposal. Chapter 3 outlines the general drivers of disability, evaluated from an international perspective as well as from the perspective of Poland. Chapter 4 explains the notions of the applied indicators, followed by chapter 5 that clarifies the data and assumptions used in computations. Following, in chapter 6, the simulation results are presented and discussed. Chapter 7 concludes this survey with a short summary of the main findings.
2. Legal Framework: Status quo

The aim of our study is to benchmark the NDC reform proposal made in 2010 with the legal status quo of the disability system. The following two sections, therefore, provide an overview of these two legal frameworks.

2.1. Status quo scenario

2.1.1. Basic legal requirements

The disability benefit provided by the Social Insurance Institution (ZUS) is granted when three conditions are fulfilled:

- a person must be unable to work,
- such person has required number of contributory and non-contributory periods,
- the inability to work occurred during contributory (e.g. employment or payments of contributions) or non-contributory periods (e.g. during a sickness leave), or no later than 18 months after the end of these periods.

The inability stems from the physical or mental inability that seems hopeless to cure after professional requalification. The law recognizes three levels of disability:

- total inability to work and autonomously exist,
- total inability to work,
- partial inability to work.

The working experience periods required to receive the disability benefit are, in principle, as follows:

- 1 year - if an inability occurred before the age of 20,
- 2 years - if an inability occurred at the age range of over 20 to 22,
- 3 years - if an inability occurred at the age range of over 22 to 25,
- 4 years - if an inability occurred at the age range of over 25 to 30,
- 5 years - if an inability occurred over the age of 30\(^3\).

Disability benefits may be granted for unlimited or limited period of time. The benefits for the unlimited period are granted to the persons whose inability seems incurable. The legal amendments from 2005 significantly limited the number of the benefits granted for an indefinite period. Since then, the benefits are granted up to 5 years, unless given case seems medically hopeless from the point of view

\(^3\) For this group the 5-year period of the working experience should fall within last 10 years before an inability occurred, with some additional restrictions.
of possibility to return to working abilities before 5 years. In abovementioned, hopeless cases, when the remaining period until the statutory retirement age is shorter than 5 years, the disability benefit is granted until the statutory retirement age.

2.1.2. The benefit calculation formula

Obliczanie wysokości renty jest skomplikowaną procedurą, dlatego konieczne są wstępne uwagi na temat etapów obliczeń i wykorzystywanych zmiennych.

The disability benefit formula is a quite complex procedure, so the initial remarks on the computation stages and used variables might be useful. The calculation of the disability benefit amount for year \( j \) consists of several steps. Firstly, a person that applies for the disability benefit shall choose any 10 consecutive years from his/her carrier path, out of the last 20 years of the carrier \((j-20)\) that will serve as a background for the individual index of the basis for contribution rates (IBCR), expressed in percentage points. Obviously, 10 consecutive years with the highest salaries are chosen: the IBCR is an average of the annual gross income earned in chosen 10 consecutive years in relation to respective annual average salaries in the economy. The IBCR maximum level is limited to 250%. The individual IBCR serves then as a multiplier for the general base amount \( (BA) \), a countrywide common for all types of social benefits. BA is computed as an average gross salary in the entire economy in the last quarter of the year \( j-1 \) net of the social contributions. In effect, the individual basis for contribution rates \( (BCR) \) is expressed in Polish zloty.

\[
BCR = IBCR \cdot BA
\]  

Further crucial individual indicators necessary to calculate the benefit level are: number of contributory periods \( (x_{cp}) \), non-contributory periods \( (x_{ncp}) \), and hypothetical carrier path \( (x_h) \). The contributory periods are those when the social contributions were actually paid, whilst non-contributory periods are those for which given person was regarded as insured, though the contributions were not paid. The non-contributory periods taken to the disability benefit formula cannot exceed 1/3 of contributory periods.

\[
x_{ncp} \leq \frac{1}{3} \cdot x_{cp}
\]  

The hypothetical carrier path is computed in specific cases when the low sum of contributory and non-contributory periods would significantly limit the benefit amount due to short period of working experience, so it serves as a sort of compensation of the job opportunities that are lost due to disability. In principle, the compensation period should increase the carrier path to 25 years:

---


\(^5\) Expressed in months, though, for the purpose of this study, we round them to full years.
However, the hypothetical carrier path is limited by the number of years that left until an applicant reaches the age of 60. For somebody who reaches, e.g. the age of 60 in 10 years the value of $x_H$ cannot be higher than 10, while a younger person who reaches the age of 60 in 30 years could reach a maximum value of $x_H$ amounting to 25.

The initial monthly disability benefit for a person completely unable to work (DBC) who applied for a disability benefit in year $j$ is computed as follows:

\[
DBC_j = 24\% \cdot BA_j + 1.3\% \cdot BCR_j \cdot x_{cp} + 0.7\% \cdot BCR_j \cdot x_{ncp} + 0.7\% \cdot BCR_j \cdot x_u
\]

The disability benefit for a person partly unable to work amounts to 75% of that benefit calculated for a person completely unable to work.

The disability benefit is fixed for a period of time stressed in the decision of the ZUS, based on the opinion of the ZUS assessment doctors or a medical commission, who examined and certified a given case, and is valorised annually according to law. For the persons completely unable to work and autonomously exist (DBCE), the disability benefit is increased by the nursing supplement (NS).

\[
DBCE_j = DBC_j + NS_j
\]

### 2.1.3. Medical background for the disability benefit granting

On basis of the rules established back in 1983, the basis for the disability status was a health detriment, divided into 3 invalidity groups. The decisions were issued by the regional and communal commissions of the assessment doctors.

---

6 So far the percentage valorisation was applied amounting to 20% of the salary growth in the economy in the year $t-1$, but in 2012 the new formula was introduced, based on so called amount valorisation, equal for all beneficiaries (71PLN in 2012). Respectively, for the DBP the valorisation amounted to 53.25PLN.

7 Regulation of the Minister of Labor, Salaries and Social Affairs dated 5 August 1983: “w sprawie składu komisji lekarskich do spraw inwalidztwa i zatrudnienia, trybu postępowania, trybu kierowania na badanie przez te komisje oraz szczegółowych zasad ustalania inwalidztwa”. (OJ 20 August 1983).

With the reform of 1997 two main changes were introduced: 1) the ZUS overtook the responsibility for the medical examination for the purposes of the disability, and 2) the assessment of the disability was changed from the health detriment to the work incapacity. Furthermore, since 2005 the medical inspection that serves as a background for the granting or refusing disability benefits consists of two instances: the first one, when only one ZUS assessment doctor (lekarz orzecznik) evaluates the health status, and the second, when the medical commission confirms or rejects the first instance decision. The commission gathers if an objection or a complaint to the first instance decision was made. When the period, for which the decision was valid expires, the process repeats with the same order of the instances.

2.1.4. Restriction in case of additional earnings

If a disability beneficiary keeps earning additional income, which amounts up to 70% of an average salary in the economy in the past quarter, it does not limit the disability benefit payment. If an additional income is higher than 70%, then the benefit is decreased by the amount of excessive income, but not higher than listed lump sums: 503.82PLN in case of a person completely unable to work and 377.89PLN in case of a person partly unable to work. If an additional income amounts to 130% of the average salary in the economy or more, then the benefit payment is suspended (so called salary ceiling). The respective marginal values of an additional annual gross income in 2011 for the benefit limitation (over 70%) amounted to 2 844.40PLN, whilst an additional income ceiling, which suspended the benefit payment, amounted to 52 824.80PLN. The lowest granted disability (and old-age pension & survivors') benefit in 2011 amounted to 728.10PLN for the person completely unable to work and 560.13PLN for the persons partly unable to work. The basis amount (BA) equals to 2 822.66PLN in 2011 and 2 974.69PLN in 2012. The nursing supplement amounts to 195.67PLN in 2012.

2.2. The NDC reform proposal

The first significant pension system reform, introduced in 1999, left the disability benefit system unchanged. In consequence, the growing inconsistency occurred between the notional defined contribution scheme (NDC) combined with the compulsory funded pillar (FDC), and the old disability benefit scheme. With different benefit formulas, pension levels of old age and disability will increasingly diverge. As a result, due to existing inconsistencies, the disability beneficiaries who reach the statutory retirement age may expect, in many cases, higher old-age pension levels than individuals retiring under the new NDC/FDC system. Therefore, in 2010 the government introduced the reform proposal that would, among others, link the disability benefit formula with the NDC (old age pension) account.

---

9 For detailed insight into the medical decision statistics see Annex 5.
A description of the main parameters, presumptions and input data we use for our simulation of the NDC reform is provided in the Annex 3. The general assumptions of the reform act itself are listed and described below:

- the new, NDC-linked disability benefit formula would cover only persons born after 1948,
- the 5-year contributory and non-contributory period, required to happen within the last 10 years before the occurrence of the disability would be abandoned for a person completely unable to work, who may prove 30 (women) or 35 (men) years of working experience,
- the salary ceilings mentioned in 2.1.4 would be removed,
- in case if the job is continued despite acquiring a theoretical entitlement to the retirement, the old-age pension would be suspended, until actual cease of the job.

The disability benefit for a person completely unable to work (DBC) who entered the disability system in year j would equal to the ratio of the basis for contribution rates (BCR) and the expected unisex life expectancy of a 60 year old person (LE_{60}) expressed in months.

\[
DBC_j = \frac{BCR_j}{LE_{60}}
\]

(8)

The individual disability benefit basis BCR is equal to the sum of the pension contributions collected on the notional individual pension account (NDC) and the initial capital (IC)\(^{10}\).

\[
BCR_j = NDC_j + IC_j
\]

(9)

If the individual was a member of the mandatory funded defined contribution pension scheme (FDC), then, the contributions collected on the individual pension account are raised by the correction coefficient equal to \(\frac{19.52}{12.22}\). A further description of this necessary correction of the disability system reform is provided in Annex 3. In this course also the possible effects of the recent old age pension reforms are discussed.

To avoid the situation when the very young persons without sufficient number of contributory and non-contributory periods (=30) resulting in low value of NDC account were exposed to poverty, the individual hypothetical career path is added to the basis of the disability benefit. In case when the new disability benefit is granted to an individual aged below 60 (or born in 1951 and later), who does not have the required 30 years of the contributory and non-contributory periods, then the disability benefit basis (BCR) is increased by the average monthly contribution,

\(^{10}\) http://praca.gazetaprawna.pl/artykuly/439601,rzad_szykuje_rentowa_rewolucje_budzet_panstwa_zaoszczedzi.html,1,6
for each month that is missing to fulfil the 30 years between the day (year) of application for disability benefit \((\text{Date}_{60})\) and the year of 60th birthday \((\text{Date}_{60})\). The basis for contribution calculation (hypothetical income - H) is computed as a ratio between the disability benefit basis BCR and the overall number of months of the contributory and non-contributory period \((W)\):

\[
H_j = \frac{BCR_j}{W_j}, \quad \text{where } W_j = x_{\text{CP}} + x_{\text{NC}}
\]  

(10)

The equation below reflects the disability benefit formula extended by the hypothetical career path (for an FDC participant aged below 60, with insufficient (lower than 30) number of the contributory and non-contributory periods):

\[
\text{BCR}_{j,\text{FDC},H} = \omega_5 \cdot \text{ND}_{j} + \omega_1 \cdot \text{IC}_{j} + H_j \cdot \min\{30, \ \text{Date}_{60} - \text{Date}_{j}\}
\]  

(11)

\[
\text{DBC}_{j} = \frac{\omega_5 \cdot \text{ND}_{j} + \omega_1 \cdot \text{IC}_{j} + H_j \cdot \min\{30, \ \text{Date}_{60} - \text{Date}_{j}\}}{\text{LE}_{60}}
\]  

(12)

The disability benefit for a person partly unable to work (DBP) is calculated as 75% of the disability benefit for a person completely unable to work \((6)\).

**2.3. Increase in legal retirement age from 2012**

Further to the reform proposal, passed by the 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). Actually, the retirement age would be increased by 3 months each year, but our model recognizes whole years cohorts, so in the results we will observe retirement age increase by 1 full year every 4 years. In principle the retirement age (RA) for men would increase as follows: 2016 RA=66, 2020 RA=67. Regarding women, their retirement age would be increased as follows: 2016 RA=61, 2020 RA=62, 2024 RA=63, 2028 RA=64, 2032 RA=65, 2036 RA=66, 2040 RA=67. The detailed table with birthdates, ages, and respective earliest retirement dates can be followed in Annex 1.1 and 1.2.
3. Drivers of disability

3.1. Introductory remarks

A key factor to assess the long-term stability of the Disability Fund is the number of disability pensioners and its future development. In this chapter we will discuss the main determinants for the development disability beneficiaries. Additionally, we outline the past and future trends of disability pensioners observed across OECD countries and in particular in Poland. This analysis can profit from a growing number of international disability studies.

Generally, the literature – see e.g. NBER (2011)\textsuperscript{11} – identifies 5 main factors, which determine the trend of disability beneficiaries over time: 1) age – generally, the probability to become disabled increases with age, 2) general health status – if the health of the overall population increases, one may expect less people suffering from disability, 3) changes of the composition of diseases – as the severity and duration of particular diseases differ, the variations of the relative importance of diseases (e.g. mental illnesses) lead to changes in the disability recipiency trends, 4) gender – disability risk may differ and change between genders, 5) legal rules – if eligibility rules are tightened, then less people are expected to receive disability benefits. A visual overview of determinants of disability beneficiaries and of the subsections that we devote to each of these factors is provided in Figure 1. Each subsections starts with a discussion of the international trends. Thereafter, the development in Poland is compared to the international observations. The chapter concludes with a summary and outlook of the possible future disability trends in Poland. The findings will serve as basis for the long-term projection of the disability trends in section 6.

\textsuperscript{11} The NBER Working Paper Series (NBER) dedicated the topic of disability a special focus in 2011. It published a number of OECD country studies on disability. Unfortunately, Poland was not covered by NBER. The majority of these papers can be found in our bibliography.
3.2. General overview of disability trends

Disability expenditures mark one of the most significant items of public expenditures in OECD countries. They represent the 2nd largest benefit type of social security spending, after old-age pensions. About 10% of overall social security expenditures in the OECD has been spent for disability benefits in the last two decades. With this level disability expenditures are 2.5 times higher than spending for unemployment benefits, the third largest expenditure type of social security spending.\textsuperscript{12} On average, the OECD countries spend 1.2% of GDP on disability benefits alone. This figure reaches 2% when including sickness benefits and even 4-5% in some countries.

In terms of the number of disability beneficiaries, about 6% of the working population receive disability benefits in OECD countries. During the last decade the disability recipiency rates – defined as a share of disability recipients aged 20-64 in the overall working age population – have been slightly increased for the majority of the the OECD countries (see Figure 2 below).\textsuperscript{13}

\textsuperscript{13} See OECD (2010a), p. 49-58.
In an international comparison, however, the trend of disability recipiency rates has been rather manifold across OECD countries. More than 50% of these countries (e.g. US and UK) experienced a rise of the disability recipiency rates in the last years (see Figure 2). It is interesting, that most of these countries started with comparably low disability recipiency rates (below 6%) in the 90s. The fiscal pressure to cushion a rise of disability beneficiaries may have been, therefore, lower in these states. A diametric picture, i.e. a shrinking of the recipiency rates, has been observed in a number of other countries. Most of these states – which include a number of Central and Eastern European countries (PL, SK and HU) - showed relatively high recipiency rates (above 6%) in the 90s. This fiscal pressure triggered comprehensive reforms of the disability system in countries such as Netherlands, Portugal and Poland.
Also the structure of disability beneficiaries changed in recent years on an international level. In comparison to the last decade, there is an increasing number of young people and women receiving disability benefits in OECD countries. The probabilities to leave the disability insurance because of death or retirement are still on a rather low level. In most OECD countries only about 1-2% of all beneficiaries leave the disability insurance per annum due to other reasons than death or retirement. With higher inflow of new disabled persons than outflow due to any reason, the disability development is mostly a one-way road.\footnote{See OECD (2010a), p. 67.}

The employment rate of disabled people amounts on average to 42% in the OECD countries, whereas the average employment rate of healthy people adds up to 75%.\footnote{See OECD (2009), p. 11.} Disability benefits represent the main income source of many people who are partially able to work. This applies for most countries, and the significance of disability benefits as main income source is still rising in the OECD.\footnote{See OECD (2010a), p. 33, 49-58.}

\subsection*{The Polish perspective}

According to the recent available international comparison by the OECD, in Poland about 0.9% of GDP (in 2009) is spent to finance disability benefits - this equals 9% of overall social expenditures.\footnote{See OECD (2010a), p. 58, and the OECD StatExtracts database.} The Polish expenditure level, weighted with the GDP, corresponds to the average in OECD countries - see Figure 4. What is indeed remarkable is the reduction of disability expenditures observed in Poland in the period 1995-2009. In terms of GDP, spending for disability benefits has decreased by 67%, from 3.6% of GDP in 1995 to 0.9% of GDP in 2009.
This drop of the expenditure side can be partially explained by a re-classification of social security benefits. Most benefits above the statutory retirement age have been re-labeled since 2006 as old age benefits and beneficiaries were shifted into the old-age pension scheme respectively. Only a small and shrinking proportion of mainly war veterans is still eligible to obtain disability benefits above the statutory retirement age. This re-classification, however, does not lead to a reduction of overall social security expenditures but only of disability expenses paid from the disability fund.

Another driver for the reduction of disability benefits marks the past tightening of eligibility criteria. During the 90s a large number of individuals able to work (mis)used the disability benefits to leave the labor market early before reaching the statutory retirement age. With reforms enacted in 1997 and 2005 this cripple early retirement path was significantly reduced in Poland. Firstly, the 1997 reform centralized the medical examination process in the ZUS and changed the perspective from the general health status to the health problems particularly related to work incapacity. Consequently, it strengthened the decision control and narrowed the range of the diseases which eliminated from the labor market. Secondly, the 2005 reform significantly reduced the possibility to obtain the lifetime total disability status and introduced the second instance of the decision makers, which vastly reduced potentially generous decisions of the single ZUS assessment doctor. As a result, Poland is one of the few OECD countries which have significantly reduced the disability recipiency rate in the last decade (see Figure 3).

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In 2007 a moderate level of 7% of the working age population – as compared to the OECD average of 6% – received disability benefits. The total number of disability beneficiaries decreased from 2.7 million in 1997 to 1.2 million in 2010. Also, the number of new beneficiaries was reduced from a level of 155 thousands in 1997 to 47,000 in 2010. We will outline later in this study (see chapter 6) that this low inflow into disability relative to high outflows (due to deaths and other reasons) significantly affects the long-term stability of the disability system.

3.3. Age

One of the main determinants of the individual disability risk is age. The probability to be recipient of disability benefits, i.e. the prevalence rate, is clearly increasing with age. For younger age groups between 20 and 34 years they amounted to 2% across most OECD countries. For older cohorts aged 35 to 49 prevalence rates are in the range of 4-6%. The oldest age groups of the working age population, cohorts aged 50-64, show the highest prevalence rates of about 10-15% in OECD countries. With respect to the probability to become disabled, this age group close to retirement is, therefore, regarded as the high-risk group.

Also in Poland prevalence rates are highly determined by age. In 2010 only 1% of the group aged 30-34, and 3% of the age group 35-49 received disability benefits. In the high-risk group, i.e. in the group of the 50-64 year-olds, each tenth individual is a disability recipient. Also in terms of the total number of disability beneficiaries, the age group 50-64 is rather significant. Almost two thirds (64%) of total disability beneficiaries belonged to this age group in the period 2005-2010.

As shown in Figure 5 the tightening of the eligibility rules affected all age groups to a similar extent. In consequence, the prevalence rates decreased in all age groups by about 40%, i.e. from 16% to 10% in the period 2005-2010.

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19 The prevalence rate is defined in this context as the percentage of a certain age group of the population that receives disability benefits.

Drivers of disability

Figure 5. Age specific disability prevalence rates in Poland

The development of the high-risk group, namely the cohorts aged 50-64, may significantly determine the future total number of disability beneficiaries number and, hence, future overall disability expenditures. The dotted lines in Figure 6 illustrate the trend of this group for the period 1990-2060. In the EU27 the high risk group has been growing by about 21% over the past two decades. For Poland the increase was even steeper. Here the high-risk group rose by 37% since 1990. For the EU this increasing trend will steadily continue until 2025.

For Poland, however, the number of persons in the high risk group will slightly diminish until 2025. Thereafter, a further massive increase in the 50-64 year old persons can be expected as the baby-boomer generations born around 1985 enter this high-risk group.

The development of the high risk group alone does, however, only show one side of the coin. To predict the fiscal pressure of the disability fund one should confront this figure with the development of potential contributors, i.e. of the working population. For the specific purpose of this study we derive the disability dependency ratio. This indicator may be compared to the old age dependency ratio. It shows the proportion of the high-risk group (aged 50-64) in relation to the working and contributing population (aged 20-64). This indicator may give a rough indication of the demographic impact on disability finances. Figure 6 demonstrates the disability dependency ratio for the period 1990 till 2060 for the entire EU27 as well as for Poland.
For the EU the trend is clear: the ratio of the high risk group to the working population has been constantly risen in the past two decades. While in 1990 only 28% of the working population was aged 50-64, this ratio has been increased to 31% in 2010. According to the latest Eurostat population projections the disability dependency ratio will further increase to 36% in 2025. Thereafter, the ratio will stay relatively constant.

For Poland the disability dependency ratio is determined by the two relatively sizeable cohorts, the so called baby-boomer generations, born around 1955 and around 1985. The large cohorts born around 1955 have entered the high-risk group (age 50-64) gradually in the last decade – see Figure 6. Consequently, the disability dependency ratio increased from a level 25% in 2000 to 32% in 2010. The large cohorts born around 1985 will turn 50 years from 2030 onwards. As a result, the disability dependency ratio will increase to 41% until 2040 - a level which is significantly higher than the EU27 average.

In conclusion, the future ageing process will lead to a higher fiscal pressure for European disability systems as the high-risk group (aged 50-64) will grow at a faster pace in the coming decades as the working age group, i.e. potential contributors. This is also the case for Poland. The timing of the increase is, however, different in Poland than for the overall EU27. After a considerable increase in the high-risk group in the last years - which was cushioned by stricter eligibility criteria - the disability dependency rate will stay relatively constant in the next decade until it will (most likely) further increase in the period 2025-40. The next demographic challenge of the disability scheme, therefore, lies ahead only a few more years.
We will outline in section 6 to which extent this ageing development will affect future disability finances.

### 3.4. General Health status

A further factor, which influences the risk to become (or stay) disabled is the general health status of the society. Different indicators may be applied to measure this health status. These include: 1) life expectancy, 2) healthy life years and 3) health surveys. The first one we use is the **life expectancy at birth (LE)** which reflects the mortality of the respective country. This indicator differs significantly across the EU - as shown in Figure 7 below. For example, in Sweden a new born in 2010 can expect to live 81 years, whilst his counterpart from Lithuania may expect 73 years of life. Generally, in Central and Eastern European (CEE) countries LE is 5 years lower than in other EU countries. The average new born in CEE countries can expect to live 75 years. The Polish LE is slightly over 76 years. The observed heterogeneity of LE across the EU can be mainly explained by socio-demographic characteristics such as income, education level and family structures as well as by general advances in healthcare.21

*Figure 7. Life expectancy at birth across the EU*

A common feature of all EU countries represents the increase in the life expectancy. Alone in the period 1995-2010 this value has increased by three years in the EU. According to the population projections of Eurostat (EUROPOP2010) this trend is expected to continue in the coming decades. LE is predicted to increase by another eight years until 2060. This ageing process most likely will develop

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even more rapidly in CEE countries (see steeper slope in Figure 7) leading to a convergence of LE across the EU in the long-term. A new born Pole in 2060, e.g., according to Eurostat, may expect to live 9 years longer than his/her present counterpart.

Based on the indicator of LE one may conclude that the general health status is increasing over time in Poland as well as in other EU countries. Consequently, the probability to become disabled should decrease over time - if all other determinants are being constant. General health status trends, however, cannot be clearly answered by the indicator of LE. The question is whether additional years of life gained by a higher longevity are spent in good or in bad health? An answer is provided by the indicator of healthy life years, also called the disability free life expectancy. It is measured on the basis of mortality statistics and data on self-perceived disability.22

As shown in Figure 8 the number of expected healthy life years have not significantly increased across the EU despite a rise of the total life expectancy in the period 2005-2010. In other words, one may conclude that the gain of additional years is mostly spent in poor health status.

Remarkable is the decline in the number of healthy life years in Poland in the period 2005-2010. The 2005 value may be a statistical outlier.23 Nevertheless, one may conclude also for Poland that the health status has not improved in the last years. Over the period 2006-2010 healthy life years have been relatively constant.

Interesting is also the gender gap: women in Poland can expect to spend about 62 years in good health, which comes close to the EU average - despite the relatively low Polish life expectancy. On the contrary, men can expect to enjoy only 58 healthy life years, three years less than the average man in the EU. This observation may to some extent explain the higher disability recipiency rates of men in Poland.24

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22 More information on the methodology to estimate the indicator of healthy life years is provided by Eurostat.
23 Healthy life years are estimated inter alia based on household survey data (EU-SILC) which may not always be fully representative for the overall population.
24 See also chapter 3.6 on further gender aspects.
Figure 8. Healthy life years in the EU and Poland

Source: own calculation based on Eurostat.

Slightly different results have been shown by the Polish National Statistical Institute (NSI, 2011). Based on households’ self-evaluation survey the NSI concludes that the health status has improved in the period 2004 to 2009. While in 2004 39% of the population has judged their own health as being not good, this value dropped to 34% in the year 2009. The NSI health survey showed that the self-evaluated health status has improved in all age groups and for women and men likewise.

Generally, one may expect that the healthier the population, the lower is the probability to become disabled. So far the data gives no clear indication of an improvement of the health status both in the EU and in Poland. Despite an increase in the life expectancy the number of years spent in good health has not considerably increased in recent years.

For our study we draw two conclusions from this analysis for Poland:

- First, as the general health status has not changed remarkably in the last years, it does not explain the recent drop of disability recipiency rates. This implies that other factors must have determined the drop of disability beneficiaries.
- Second, despite a predicted increase in life expectancy for Poland and the EU no statements can be made about the future general health status in the society and resulting changes of disability probabilities.

While the overall health status may not have changed significantly, the composition of diseases, i.e. of the causes of disability, has changed in the last years. This issue is addressed in the following sub-section.
3.5. Composition of diseases causing a disability

The distribution of disease types follows closely the patterns observed in other countries. According to the WHO (2009) cardiovascular and mental diseases as well as cancer represent the most important chronic diseases in Europe.\(^{25}\) The relative importance of these disease types has changed in recent years. People become increasingly incapable of work due to mental illness. Currently, 30-45% of all new disability benefits are granted due to reasons of mental disability.\(^{26}\) According to WHO (2009) the trend of an increasing rate of mentally disabled is expected to continue also in coming decades. The composition and change of illnesses and its possible implications for fiscal policy will be addressed in the following paragraphs.

Disease types vary with respect to the entrance and exit probabilities. Recent studies have e.g. shown that mental illnesses often occur at relatively young ages.\(^{27}\) Consequently, the duration in disability may differ widely between disease types. For instance, mentally disabled may stay over a longer time horizon incapable of work and receive disability benefits. Additionally, the severity of disability may differ between disease types. Some illnesses (e.g. diseases of bones and muscles) lead more often to a partial disability, while other diseases (e.g. tumors), generally, do not allow to work at all. Changes of the disability structure may, therefore, have a significant impact on the future number and composition of disability beneficiaries and consequently on future expenditures. Against this background, light shall be shed on the age specific entrance probabilities, i.e. on incidence rates of the most dominant disease types. Unfortunately, such a differentiation is not applicable for exit probabilities due to data constraints, which significantly limits the outcomes of the analyses for highly mortal diseases, such as tumors.

The probability to be a disability pensioner of a certain disease type can be measured relatively easily based on administrative data from ZUS. The 6 most dominant causes of disability payments in Poland are currently: 1) cardiovascular diseases (CVD), 2) mental and behavioral disorders as well as 3) muscular skeletal diseases followed by 4) nervous system disorders, 5) Injuries and 6) tumors - more information on the applied data can be followed in the chapter 4. Figure 9 shows exemplarily the relative importance of each disease type in per cent of overall disability expenditures in 2010.


\(^{26}\) See OECD (2010b), p. 3. In some countries such as Denmark or Switzerland the group of mentally disabled even represents 50 % of new beneficiaries, and even 70% in younger cohorts. The reason for this rise is not clear. On one hand the prevalence for mental illness may increase in the population. On the other hand, mentally ill individuals may be been previously undiagnosed.

\(^{27}\) See OECD (2010b).
The aim of this sub-chapter is, however, not only to analyze the illness composition in the ZUS disability fund, which may depend on the rigidity of the disability system, but also to examine the actual illness composition and its recent change in Poland. In fact, the relative weight of diseases observed in the ZUS disability system (see Figure 9) may not necessarily match with this actually observed spread of illnesses in the society. An objective estimation of the actual illness composition in Poland is relatively difficult. For our following analysis we base on hospital data collected by the National Institute of Public Health (NIZP-PZH). It outlines the causes and frequency of hospital stays in Poland.\textsuperscript{28} The following Figure 10 outlines the most frequent reasons for hospitalization.

\textsuperscript{28} For more information on the data source see Wojtyniak and Goryński (2008), p. 87.
Figure 10. Composition of the key diseases in overall number of hospitalized cases in 2010


For cardiovascular as well as muscular skeletal diseases prevalence rates are steeply increasing with age. The highest probabilities to be hospitalized due to these two diseases types show the group of 50-64 year-olds.

Figure 11. Number of cardiovascular hospital cases per 1,000 inhabitants by age group

For mental diseases the picture is quite different. According to WHO (2009) in particular women aged 15-44 suffer from this disease type. For the future the WHO predicts that men close to retirement age will be increasingly affected by mental illness.\(^{29}\)

In Poland the group aged 35-54 shows the highest illness prevalence rates for mental illnesses (according to hospitalization data). The distribution of prevalence - shown in Figure 13 below - is relatively stable over time. Interesting is, however, the decrease in prevalence rates for the age groups 65+. In Poland hospital cases of mental illnesses have increased significantly by 45% in the period 1990-2004.\(^{30}\)

\(^{29}\) Mladovsky et al. (2009), p. 45-47.
\(^{30}\) Potrykowska and Orzelewski (2008), p. 54.
As outlined, mental diseases are often diagnosed at relatively young age. Under the condition that the exit probabilities are equal to other diseases this would imply that the average duration in disability is higher for individuals who suffer from mental illness. The observed trend in OECD countries of a higher share of mentally disabled, therefore, would lead to an increasing number of beneficiaries over time. This aspect shall be considered in our calculations for Poland (see sections 6).

3.6. Gender

The probability to suffer from a certain disease type is often highly gender-specific. While, e.g., breast cancer mainly affects women, men suffer more often from lung cancer. Additionally, more women are affected by mental diseases.\footnote{See WHO (2010), p. 74-76.}

Also the age-specific incidence rates vary by gender. Men, generally, fall ill 10 years earlier from cardio-vascular diseases than women – due to the safeguarding impact of estrogens.\footnote{See WHO (2010), p. 74-76.} Women are, on the contrary, earlier affected by cancer. In total, more men than women receive disability benefits in Poland – a similar relation has been observed in the gender-specific healthy life years (see chapter 3.4). In other countries such as Norway it is the other way around.

Most OECD countries experienced a rise of the share of female disability beneficiaries\footnote{See OECD (2010a), p. 63.}. In Poland a similar trend may be expected. Historical data of the period 2003-2010, however, shows no evidence of such a trend (yet) – see Figure 14 to Figure 16.

**Figure 14. Prevalence (per 1,000 Males / Females) of hospital cases of cardio diseases by age**
As the spread of diseases differs between genders we differentiate our calculations not only age but also gender-specific - see also discussion of data inputs in chapter 5.

3.7. Legislative Reforms

In the short term legislative reforms show the highest impact on disability recipiency rates. Poland provides here a good example. While most OECD countries have experienced an increase in disability recipiency rates in recent years (see also Figure 2), the number of disability beneficiaries dropped significantly in Poland (see dotted line in Figure 17 below) - despite a rise of the high-risk group (see subsection 3.3). Due to the ageing process alone (solid line), the number of beneficiaries would have increased from 2.4 to 2.6 million in the period 1995-2007 - if we assume a constant age-specific prevalence rate. The actual development, however, was different (dotted line). This decrease can be mainly explained by the disability reforms of the year 2005. With these legal changes eligibility criteria have been considerably tightened.
However, the recent trend of disability recipiency rates in Poland may also be explained by legal changes in other social security systems as they may be a substitute for disability benefits. Generally, earnings from employment represent the main income source for the working age population. In addition to employment earnings, a number of alternative income types exist, namely: 1) unemployment, 2) early retirement as well as 3) disability benefits. All these income types may be substitutes for each other. As a consequence, changes in the demand for one income type may be determined by alterations of the relative attractiveness of an alternative income source. A switch from one income source to another is, however, not always that simple. Certain criteria need to be fulfilled to be eligible to these income sources. While for early retirement a certain age needs to be reached, unemployment and disability benefits are only granted if the status of unemployment and respectively disability is given. The switching from one alternative income source to another, i.e. the cross elasticity of demand, therefore, depends on the possibility to reach a certain status but also on the chances and costs (including the probability and rigidity of penalties) to pretend a certain status. In conclusion, the demand of disability benefits may be determined by the relative attractiveness of other social security benefits and the chances and costs to switch to these other systems.

A number of international studies verify the hypothesis that changes of the relative attractiveness of other social security system have an considerable effect on disability recipiency rates. According to Jönson et al. (2011), the relatively low generosity of early retirement schemes explain to some extent the high prevalence rates in Sweden. Banks et al. (2011) come to a similar conclusion for the UK. Rigid eligibility criteria for unemployment and early retirement benefits have led to an increase in disability recipiency rates. In Luxembourg the inverse trend was
observed. A decrease in disability beneficiaries was accompanied by an increase in unemployment benefit recipients – during a period of stable economic growth.\textsuperscript{34} Moreover, for France Behaghel et al. (2011) state that disability benefits served as a substitute for other social security programs.\textsuperscript{35}

Also for Poland the substitutive character of disability benefits to other social security programs becomes apparent. Clear is the negative correlation between early retirement and disability expenditures observed in past years. As shown in Figure 18 below the share of GDP spent for early retirement has been increased by 85\% in the period 2000-2009. In the same timespan disability expenditures decreased by 54\%.

\textbf{Figure 18. Early retirement vs. disability expenditures in Poland}\textsuperscript{36}

![Graph showing early retirement vs. disability expenditures in Poland](image)

Source: own illustration based on Eurostat.

One explanation for this diametric development may provide the tightening of disability eligibility rules. Stricter disability criteria may have spurred individuals to apply for alternative income sources outside the labor market such as early retirement benefits.

As stated, a negative correlation between unemployment and disability expenditures has been observed in some countries such as Luxembourg.\textsuperscript{37} In Poland, however, the picture for these two expenditure items is different.

\textsuperscript{34} See OECD (2009), p.14.

\textsuperscript{35} Further country reports on disability trends e.g. in Germany and Spain have been published in the NBER Working paper series. For Poland – according to our knowledge so far no comprehensive analysis on the disability system is existent.

\textsuperscript{36} Total expenditures serve here as a proxy for recipiency rates. This is unproblematic as pension levels in both schemes have not changed significantly in the shown period.

As shown in Figure 19, both unemployment and disability expenditures were shrinking in recent years. This observation may be explained by two factors. First, the main alternative for disability pensions represents not unemployment but early- and old-age benefits. A large number of disability benefits were simply shifted to the old age pension scheme in Poland. Second, the drop of unemployment expenditures observed in the last decade was less influenced by changes of disability rules than by high GDP growth and a resulting fall of unemployment rates in Poland. Alone in the period 2000-2009 unemployment rates more than halved from a level of 18 to 8%. The economic boom and the positive labour market trend in past years may, therefore, have cushioned an inflow of beneficiaries from the disability fund to the unemployment scheme.

**Figure 19. Unemployment vs. disability expenditures in Poland**

![Graph showing unemployment vs. disability expenditures in Poland]

Source: own illustration based on Eurostat.

Furthermore, the legal framework of the old age pension system may affect the disability recipiency rates. Two factors may play a role for substitution effects: 1) the minimum and legal retirement and 2) the relative generosity of old age pensions to disability pensions.

Currently, most disability beneficiaries leave the disability scheme at the minimum retirement age in Poland (see chapter 5 on exit probabilities). The legal framework of the old age pension scheme, namely the value of legal retirement ages may therefore have a significant impact on disability recipiency rates. Against this background, the envisaged increase in the legal and minimum retirement age may have a considerable effect on the disability fund – as the substitution possibilities between disability and old age (of cohorts aged 55-61) is considerably reduced. The impact of this reform scenario on disability finances is, therefore, outlined in chapter 6.
The relative generosity of old age pensions to disability pensions may also have an effect on the disability recipiency rates. If e.g. a currently 55 year old, as it is generally the case under the current legal status quo, can expect higher pension levels from the old-age system than from the disability system he/she may have a higher probability to apply for, and possibly to obtain, the old-age pension. With dropping future adequacy ratios of old-age pensions one may, therefore, expect higher inflows into disability - if the disability formula is not reformed (NDC reform scenario).

In conclusion, not only legal reforms of the disability system itself but also changes of the relative attractiveness of other social security systems such as early retirement, unemployment and old age benefits may have an effect on disability recipiency rates. These feedback loops should be taken into account in order to analyze the overall impact of fiscal changes. Exemplarily, we therefore show in chapter 6 the side effects of higher legal retirement ages on disability finances.

3.8. Summary and main conclusions

Finally, we summarize the main findings of this section devoted to the main drivers of the disability. We analyzed the most recent studies and compared the international trends of disability with the situation in Poland. We identified 5 main factors which determine the development disability beneficiaries over time: 1) age, 2) general health status, 3) changes of the composition of diseases, 4) gender and 5) legal rules. We start our summary with the most predominant factors.

From an international perspective legal rules (see chapter 3.7) of the disability system - and of other social security systems - seem to have the largest impact on the number of disability pensioners, at least in the short and midterm. This statement holds in particular for Poland where the reform of 1997 and 2005:

1) significantly limited an inflow to the system with the tightening eligibility criteria and.
2) increased the outflows via a reclassifying of the beneficiaries from the disability scheme to the old age pension scheme, once the statutory retirement age is reached. As a consequence, the number of the disability beneficiaries dropped in Poland from nearly 2mn in 2005 to 1.3mn in 2010.

In the long term the ageing process (see section 3.3) may considerably influence the number of disability beneficiaries. For Poland a tremendous increase in the number of potential disability pensioners - reflected by the high risk age group 50-64 - is predicted in the period 2025-40. We will outline in section 6 to which extent this ageing development will affect future disability finances.
Additionally, the composition of the diseases (see section 3.5) may affect the level of expenditures spent for disability. We showed that the main disease types in Poland are currently: 1) cardiovascular diseases (CVD), 2) mental and behavioral disorders as well as 3) muscular skeletal diseases followed by 4) nervous system disorders, 5) injuries and 6) tumors. Altogether, they amounted to over 80% of all disability benefit expenditures in 2010. As the duration in disability varies between diseases, e.g. between mental diseases and tumors, an alteration of the composition of the illnesses may change the number of beneficiaries and the level of total expenditures. In most OECD countries a trend of a higher share of mentally disabled has been observed in recent years. For policy makers it may be of interest to which extent a similar development in Poland would affect public finances. Therefore, we provide such a scenario in our calculations in chapter 6.

Generally, one may expect that the healthier the population, the lower is the probability to become disabled. We outlined, however, in chapter 3.4 that it is relatively difficult to measure this general health status and its change over time. For the case of Poland the standard indicators 1) life expectancy at birth, 2) healthy life years and 3) surveys provide ambiguous results. As a consequence, we do not consider any changes of the overall health status in this study.

Also gender determines the probability to become and stay in disability. The probability to suffer from a certain disease type is often highly gender-specific. In Poland significantly more men than women receive disability benefits. To reflect these differences we differentiate our calculations by gender (as well as age, disease type and benefit category) - see section 5.
4. Methodology and Indicators

To assess the long-term performance of the disability pension system a number of indicators are applied in this study. Our indicators of the long-term fiscal stability base on the methodology of Generational Accounting which is outlined in section 4.1. The applied indicators of fiscal sustainability and intergenerational redistribution are described in section 4.2. Thereafter, adequacy indicators are presented in section 4.3.

4.1. Long-term fiscal stability - the methodology of the Generational Accounting

To measure the sustainability of a country’s public sector we use the method of Generational Accounting developed by Auerbach, Gokhale and Kotlikoff (1991, 1992 and 1994)38. In contrast to traditional budget indicators which are based on annual cash flow budgets, Generational Accounting is founded on the intertemporal budget constraint and therefore the long-term implications of a current policy can be computed.

The intertemporal budget constraint of the public sector, expressed in present value terms of a base-year \( b \) is:

\[
B_b = \sum_{k=0}^{D} N_{b,k} + \sum_{k=b+1}^{\infty} N_{b,k}
\]

Let \( D \) denote agents’ maximum age and \( N_{b,k} \) the present value of year \( b \)'s net tax payments, i.e. taxes paid net of transfers received, made by all members of a generation born in year \( k \) over the remaining lifecycle. Then, the first right-hand term of equation (13) represents the aggregate net taxes of all generations alive in the base-year \( b \). The second term aggregates the net tax payments made by future generations born in year \( b+1 \) or later.

Together this is equal to the left-hand side of equation (13), \( B_b \), which stands for the net debt in year \( b \). That means if the sum of all living generations’ net taxes, \( \sum_{k=0}^{D} N_{b,k} \), is negative (i.e. if they receive a net transfer) and the net debt, \( B_b \), positive, the sum of future generations’ net taxes has to be positive to balance

the government's intertemporal budget i.e. in a long-term perspective net transfers received by living generations plus the net debt of the base-year have to be financed by net taxes paid by future generations.

To calculate generations' aggregated lifecycle net tax payments, the net payment terms in equation (13) are decomposed into:

$$ N_{b,k} = \sum_{s=\max(0,k)}^{k+D} T_{s,k} P_{s,k} (1+r)^{b-s} $$

In equation (14), $T_{s,k}$ denotes the average net tax paid in year $s$ by a representative member of the generation born in year $k$, whereas $P_{s,k}$ stands for the number of members of a generation born in year $k$ who survive until year $s$. To compute the remaining lifetime net payments of living generations, the future demographic structure is specified conducting long-term population forecasts.

Typically, generational accountants disaggregate equation (14) even further. To incorporate gender-specific differences in average tax payments and transfer receipts by age, separate aggregation of the average net taxes paid by male and female cohort members is required. The products aggregated in equation (14) represent the net taxes paid by all members of generation $k$ in year $s$.

For generations born prior to the base-year the summation starts from year $b$, while for future born cohorts, the summation starts in year $k > b$. Irrespective of the year of birth, all payments are discounted back to the base-year $b$ by application of a real interest rate $r$.

The age-specific net tax payment in year $s$ of agents born in year $k$ can be decomposed as

$$ T_{s,k} = \sum_{i} h_{s,k,i} $$

$h_{s,k,i}$ stands for the average tax or transfer of type $i$ paid or received in year $s$ by agents born in year $k$, thus of age $s - k$.\(^{39}\) In equation (15), $h > 0$ indicates a tax payment, whereas $h < 0$ defines a transfer.

Applying the method of Generational Accounting it is conventionally assumed that the initial fiscal policy and economic behaviour are constant over time. Under this condition it is possible to project future average tax payments and transfer receipts per capita from the base-year age profile of payments according to:

$$ h_{s,k,i} = h_{b, b -(s-k)} (1 + g)^{s-b} $$

\(^{39}\) In the case of analysis of the isolated subsystems of public finances, like health care or pension as conducted in the following chapters, $i$ is just chosen so that all relevant payment streams are included in the analysis.
where $g$ represents the annual rate of productivity growth. Equation (16) assigns to each agent of age $s - k$ in year $s$ the tax and transfer payment observed for agents of the same age in base year $b$, uprated for gains in productivity. The base-year cross section of age-specific tax and transfer payments per capita is generally determined in two steps. First, the relative position of age cohorts in the tax and transfer system is estimated from micro-data profiles. In a second step the relative age profiles are re-evaluated proportionally to fit the aggregated expenditure and tax revenues of the base-year.

For living and future generations, the division of the aggregate remaining lifetime net tax payments by the number of cohort members alive in year $s$ defines the cohort’s Generational Account in year $s$:

\[ GA_{s,k} = \frac{N_{s,k}}{P_{s,k}} \]  

Generational Accounts are constructed in a purely forward-looking manner, only the taxes paid and the transfers received in or after the base-year are considered. As a consequence, Generational Accounts cannot be compared across living generations because they incorporate effects of differential lifetime. One may compare, however, the Generational Accounts of base-year and future born agents, who are observed over their entire lifecycle.

### 4.2. Long-term fiscal stability and intergenerational redistribution indicators

#### The Sustainability Gap

To illustrate the fiscal burden of current fiscal policy we use seven sustainability indicators.\(^{40}\) The starting points for the first indicators are the intertemporal public liabilities which can be computed by the assumption that the intertemporal budget constraint of the public sector (13) is violated:

\[ iPL_b = B_0 - \sum_{k \geq 0} N_{b,k} \]  

The amount of intertemporal public liabilities measures aggregate unfunded claims on future budgets, assuming that the present policy will hold for the future. The first sustainability indicator, the sustainability gap ($SG_b$), can be derived if the intertemporal public liabilities are set in relation to base-year’s GDP ($GDP_b$). This indicator is akin to the debt quota well known since the Maastricht Treaty but it addresses the debt which will occur in the future and in the past:

\[ SG_b = \frac{iPL_b}{GDP_b} \]

\(^{40}\) For a discussion of measuring fiscal sustainability and the development of sustainability indicators, see Raffelhüschen (1999) and Benz and Fetzer (2006).
**Future Generations’ Burden**

How the policy adjustment required to redeem intertemporal public liabilities will affect generations’ fiscal burdens depends on the policies addressing this burden. For illustrative purposes, Generational Accounting typically assigns the entire adjustment to future generations which is equivalent to $k > b$. All tax payments made by members of future born cohorts are adjusted proportionally with the help of a uniform scaling factor $\delta$. The factor $\delta$ is set to ensure balance of the intertemporal public budget defined in equation (13):

$$h_{b,t} = \delta \times h_{b,p,t} \times (1+g)^p$$  \hspace{1cm} (20)

for and instead of equation (16). In computing the average age-specific net taxes paid by representative future born agents, the burden for future generations can be illustrated as an absolute difference between the Generational Account of the base-year agent and the Generational Account of the agent born one year after the base-year. This is our second sustainability indicator, the future generations’ burden:

$$FGB = GA_{b,b} - GA_{b,b+1}$$  \hspace{1cm} (21)

**Revenue and Transfer Gap**

The third indicator that illustrates the burden of current fiscal policy is the revenue gap. In this case the scaling factor $\delta = \delta_{rev}$ reflects the enhancement of age-specific revenues in % for all generations which is necessary to close the intertemporal public budget constraint. It can also be interpreted as the ratio of the intertemporal public liabilities to the present value of all age-specific revenues of the fiscal system:

$$\delta_{rev} = \frac{\sum_{s=1}^{\infty} Rev_s \cdot \frac{1}{(1-r)^{(s-b)}}}{Rev_s}$$  \hspace{1cm} (22)

with $Rev_s$ referring to the sum of revenues in year $s$ by all living generations in year $s$. Analogous to the revenue gap, we compute also the so-called transfer gap. In this case the scaling factor $\delta = \delta_{trf}$ reflects the necessary decrement of age-specific public transfers ($Trf$) like health benefits in per cent for all generations that is necessary to close the intertemporal public budget constraint. Constructing the revenue and transfer gap, we implicitly assume that the government is able to enforce an immediate adjustment of all taxes and contributions or transfers respectively.

As Benz and Fetzer (2006) have shown all the indicators described above are computed with an infinite time horizon. In the practical calculation all relevant variables like population or cohorts’ tax payments are projected for 300 years from the base-year on. Afterwards a geometrical serial is used to determine
the remaining net tax payments. The choice of 300 periods is nearly completely arbitrary and just reflects a good approximation point for our analysis.\footnote{Due to the higher level of discount in relation to the growth rate fiscal flows in the very far future do not play a large role for our present value calculation since they are highly discounted. Therefore, it has only a marginal effect if one ends the projection after 300 years instead of 300 + x years.}

**Annual Cash Flows of revenues and expenditures**

The above presented indicators measure sustainability by one single number. This approach is valuable as it provides a comprehensive indicator of sustainability. 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 provide the standard indicator of annual cash flows, too. On this basis we demonstrate the development of aggregate expenditures $\text{Exp}$ and revenues $\text{Rev}$ in future years $s$. Additionally, cash flows are valuable as they outline “timing effects”. In other words, one may illustrate the extent of deficits and surpluses of a fiscal system for a given future year. They are simply estimated by a multiplication of age average contributions $\text{Con}$ and $\text{Ben}$ (per capita of the population) with the respective cohort sizes $P$ of the population in year $s$.\footnote{We further differentiate the estimation by gender. For reasons of simplicity this aspect is left out in the equations above.}

\begin{equation}
\text{Rev}_s = \sum_{j=0}^{b-1} \text{Con}_{s:j} \cdot P_{s:j}
\end{equation}

\begin{equation}
\text{Exp}_s = \sum_{j=b}^{2b} \text{Ben}_{s:j} \cdot P_{s:j}
\end{equation}

### 4.3 Adequacy Indicators

**Adequacy ratios**

The standard figure for adequacy analysis is the adequacy ratio (AR). The AR puts the pension level in relation to earnings. Usually, pensions – in the case of old age pensions – are compared to the pre-retirement income of the pensioner. The idea is that the individual aims to (at least partly) replace the former earnings. In other words a pensioner wants to have a certain proportion of his former earnings. This is feasible approach when it comes to old-age pensions because here pensioners have relatively homogeneous retirement ages, all retire around the age of 60-65. For disability pensioners, however, this is not the case. Though most retire
around the age of 50-60 into disability, there is a significant amount which become
disabled at the age of 30-50. A comparison of pension levels to pre-retirement
earnings for each of these age groups would be quite intransparent. Therefore,
we opt for the average wage in the economy as a benchmark for pension levels.
Formally, RR is estimated for a year \( s \), age \( x \) and gender \( g \) by dividing the new
pension benefit in year \( s \) by the average wage in the economy wage in year \( s \).

\[
AR_{s,x,g} = \frac{Ben_{s,x,g}}{wage_s}
\]

(25)
5. Data and assumptions

Having presented the observations on drivers of disability in the chapter 3, we follow here with their simplified representation in the input data of our simulation model. The proper numerical reflection of the inflows and outflows of disability and of the rejected reform of the disability system is a challenge for modelers. For the simulation of the status quo of the disability system we extend our previous fiscal simulation model. The main difference lies in the reflection of incidence and exit probabilities from the disability pension system. In our former calculations we neglected these flows and kept prevalence rates constant. We will show in the following section 6 that the endogenization and alteration of incidence rates affect the results significantly. For the evaluation of the 2010 reform, namely the introduction of NDC accounts in the disability benefit formula, we can also base on our previous simulations - for old age pensions.

Firstly, it’s important to be able to distinguish between categories of disabled persons: for the purpose of this study to assess the disability system and its possible reform we aim only at beneficiaries of the disability benefit paid from the DF, who have any status of the disability (total or partial). At the same time we exclude the categories of beneficiaries, who receive other types of the benefits or those who are qualified as the disability beneficiaries but are financed from the different sources. Among these excluded categories we distinguish:

- survivors, who receive the payments from the disability fund;
- any old-age pensioners financed from the disability fund;
- disabled as a result of an accident at work, because they are financed from the other fund of FUS;
- beneficiaries who receive a rehabilitation benefit, pregnancy leave benefit and nursing supplement benefit.

As stated in chapter 3, the number of the disabled persons registered and analysed in an international comparisons in 2010 amounted to 1.3mn. When we limit that figure to the very precise category of the disabled persons due to healthcare reasons, not related to an accident at work, and not having a survivor’ benefit, then the number of disability beneficiaries that are covered in our modelling in the base year amounts to around 940,000, of which: 372,000 with the status of total inability to work (or work and autonomously exist) and 570,000 partly incapable of work. The reform covered all 3 statuses of the disability, however, only the beneficiaries partly unable to work would benefit from the removed income ceilings.

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43 See Jablonowski et al. (2011).
44 See also Jablonowski et al. (2011).
In terms of the amounts of the general government expenditures involved in the social spendings, the disability fund is the second largest fund, right behind the pension fund of the Social Insurance Fund. It serves as a financing vehicle for disability benefits and survivors’ benefits. As is outlined below in Table 1 about 38 per cent or 14.9bn. PLN of total expenditures are paid out for disability pensions.

**Table 1. Aggregate revenues and expenditures of the disability fund, mn PLN**

<table>
<thead>
<tr>
<th>Disability Fund</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>contributions</td>
<td>22 204</td>
<td>23 061</td>
<td>23 996</td>
<td>31 971</td>
</tr>
<tr>
<td>tax inflow</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>other revenues</td>
<td>149</td>
<td>80</td>
<td>87</td>
<td>84</td>
</tr>
<tr>
<td><strong>total revenues</strong></td>
<td><strong>22 354</strong></td>
<td><strong>23 142</strong></td>
<td><strong>24 083</strong></td>
<td><strong>32 056</strong></td>
</tr>
<tr>
<td>disability pensions (incl. survivors)</td>
<td>30 331</td>
<td>31 732</td>
<td>32 735</td>
<td>34 337</td>
</tr>
<tr>
<td>other expenditures</td>
<td>7 612</td>
<td>7 978</td>
<td>7 664</td>
<td>7 922</td>
</tr>
<tr>
<td><strong>total expenditures</strong></td>
<td><strong>37 943</strong></td>
<td><strong>39 711</strong></td>
<td><strong>40 399</strong></td>
<td><strong>42 258</strong></td>
</tr>
<tr>
<td>net lending/borrowing</td>
<td>-15 590</td>
<td>-16 569</td>
<td>-16 315</td>
<td>-10 202</td>
</tr>
</tbody>
</table>

Estimated disability benefits cost: 14 742 14 901 15 428 16 138
Estimated survivors' benefits cost: 15 589 16 831 17 308 18 199

Source: own calculations based on ZUS, 2012.

The main disease types described in the preceding section 3.5 will be confronted with the actual expenditures, to verify if there are specifically cost-spurring diseases. The total expenditures paid for each disease type follows the findings of the study by ZUS\(^{45}\) and is shown in Table 2. The study analyses the magnitude of particular diseases on the amounts of disability benefits costs in 2010 by gender.

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\(^{45}\) Social security system expenditures related to inability to work in 2010, (ZUS, 2012).
### Table 2. Aggregated expenditures by disease type 2010\(^{46}\)

<table>
<thead>
<tr>
<th>Disease Type</th>
<th>2010</th>
<th>Cost per disease type, in PLN mn</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>disease code, ICD-10</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Certain infectious and parasitic diseases</td>
<td></td>
<td>A00 - B99</td>
</tr>
<tr>
<td>Neoplasms</td>
<td></td>
<td>C00 - D48</td>
</tr>
<tr>
<td>Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism</td>
<td></td>
<td>D50 - D89</td>
</tr>
<tr>
<td>Endocrine, nutritional and metabolic diseases</td>
<td></td>
<td>E00 - E90</td>
</tr>
<tr>
<td>Mental and behavioural disorders</td>
<td></td>
<td>F00 - F99</td>
</tr>
<tr>
<td>Diseases of the nervous system</td>
<td></td>
<td>G00 - G99</td>
</tr>
<tr>
<td>Diseases of the eye and adnexa</td>
<td></td>
<td>H00 - H59</td>
</tr>
<tr>
<td>Diseases of the ear and mastoid process</td>
<td></td>
<td>H60 - H95</td>
</tr>
<tr>
<td>Diseases of the circulatory system</td>
<td></td>
<td>I00 - I99</td>
</tr>
<tr>
<td>Diseases of the respiratory system</td>
<td></td>
<td>J00 - J99</td>
</tr>
<tr>
<td>Diseases of the digestive system</td>
<td></td>
<td>K00 - K93</td>
</tr>
<tr>
<td>Diseases of the skin and subcutaneous tissue</td>
<td></td>
<td>L00 - L99</td>
</tr>
<tr>
<td>Diseases of the musculoskeletal system and connective tissue</td>
<td></td>
<td>M00 - M99</td>
</tr>
<tr>
<td>Diseases of the genitourinary system</td>
<td></td>
<td>N00 - N99</td>
</tr>
<tr>
<td>Congenital malformations, deformations and chromosomal abnormalities</td>
<td></td>
<td>Q00 - Q99</td>
</tr>
<tr>
<td>Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified</td>
<td></td>
<td>R00 - R99</td>
</tr>
<tr>
<td>Injury, poisoning and certain other consequences of external causes</td>
<td></td>
<td>S00-T98</td>
</tr>
<tr>
<td>External causes of morbidity and mortality</td>
<td></td>
<td>V01 - Y98</td>
</tr>
<tr>
<td>Factors influencing health status and contact with health services</td>
<td></td>
<td>Z00 - Z99</td>
</tr>
</tbody>
</table>


\(^{46}\) The fixed pattern in the forecast could be theoretically corrected with the existing NIZP-PZH forecasts for other diseases, e.g. tumors, but the existing forecasts cover only malicious tumors, which cover around 20% of all new tumors, see Didkowska, J., et al. (2011).
As pensions levels, incidence rates and exit probabilities (see further below) vary with the severity of disability we differentiate our analysis further by the following benefit categories of:

1. Total inability to work and autonomously exist.
2. Total inability to work.
3. Partial inability to work.

The table below examines the cost in division into these particular, administrative disability statuses:

### Table 3. Aggregated expenditures by disability category

<table>
<thead>
<tr>
<th>Expenditures by type of ability to exist and work (mn PLN)</th>
<th>men</th>
<th>women</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total inability to work and autonomously exist</td>
<td>1 191</td>
<td>596</td>
<td>1 786</td>
</tr>
<tr>
<td>Total inability to work</td>
<td>3 111</td>
<td>1 449</td>
<td>4 560</td>
</tr>
<tr>
<td>Partial inability to work</td>
<td>6 031</td>
<td>2 523</td>
<td>8 554</td>
</tr>
</tbody>
</table>

Source: own calculations based on ZUS, 2012.

The part of the reform directed towards the partially disabled persons, who could start or continue the employment without income ceilings, would engage the group of disability beneficiaries, who altogether receive the benefits amounting to 8.5bn in 2010.

The following table presents the final set of the aggregates used as an input in the model in the base year (2010, thousand PLN).

### Table 4. Aggregated expenditures by disability category, disease type and gender

<table>
<thead>
<tr>
<th>Cost per disease type, in 2010, in mn PLN</th>
<th>disease code, ICD-10</th>
<th>Total inability to work and autonomously exist</th>
<th>Total inability to work</th>
<th>Partial inability to work</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>men</td>
<td>women</td>
<td>men</td>
<td>women</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1 191</td>
<td>596</td>
<td>3 111</td>
<td>1 449</td>
</tr>
<tr>
<td>Certain infectious and parasitic diseases</td>
<td>A00 - B99</td>
<td>5</td>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>Neoplasms</td>
<td>C00 - D48</td>
<td>133</td>
<td>67</td>
<td>358</td>
</tr>
<tr>
<td>Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism</td>
<td>D50 - D89</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Endocrine, nutritional and metabolic diseases</td>
<td>E00 - E90</td>
<td>20</td>
<td>10</td>
<td>72</td>
</tr>
<tr>
<td>Mental and behavioural disorders</td>
<td>F00 - F99</td>
<td>225</td>
<td>113</td>
<td>809</td>
</tr>
</tbody>
</table>
Out of the above estimated aggregates of the expenditures, the 6 highest were chosen to be reflected more precisely in our computations, namely:

1. Cardiovascular diseases (I00 - I99),
2. Mental and behavioural disorders (F00 - F99),
3. Diseases of the nervous system (G00 - G99),
4. Tumors (C00 - D48),
5. Diseases of the musculoskeletal system and connective tissue (M00 - M99),
6. Injury, poisoning and certain other consequences of external causes (S00-T98).
5.1. General overview on factors influencing the number of disability pensioners

The aim of this study is to assess the fiscal long-term stability of the disability fund by confronting the revenue with the expenditure side. The later, future expenditures are determined by the average pension benefit (per beneficiary) \( P_{\text{en}} \) and the number of beneficiaries \( N \) in a future year \( s \) (see equation (26) below). In section 2 we discussed in detail the calculation of the variable \( P_{\text{en}} \).

\[
\text{Exp}_s = \sum_{j=0}^{b+D} \text{Disab}_{s,j} \cdot N_{s,j} \tag{26}
\]

In the next section we shall discuss in detail the factors of our simulation influencing the number of beneficiaries over time, one of the key variables of our calculations. This modeling description bases on the detailed and more general description of chapter 3 (on the key drivers of disability).

A starting point to explain the trend of disability recipients marks equation (27). Accordingly, the stock of beneficiaries \( N \) at the end of year \( s \) equals the number of beneficiaries of the previous year \( s-1 \) minus individuals who left the scheme during year \( s-1 \) plus new entrants to the system during year \( s \). The initial stock of beneficiaries has been provided by ZUS age- and gender-specific. The number of exits is determined by the stock of the previous year and the age specific probability \( p_{\text{exit}} \) to leave the scheme during the year \( s \) (due to reasons such as death, loss of eligibility, etc.). The estimation of exit probabilities is outlined further below. The number of new entrants depends on the age-specific entrance probability \( p_{\text{disability}} \), also known as the disability incidence rate, and the respective cohort sizes \( P \) of the population in these age groups. The respective population sizes have been estimated by our population projection model based on Eurostat data and Europop2010 demographic assumptions (described in annex 2)\(^{47}\). The incidence rates which have a main impact on the future number of disability beneficiaries (see also section 6) are described in detail in following sub-section.

\[
N_{s,\text{total}} = \sum_{s=0}^{D} N_{s+1,x} - \sum_{s=0}^{D} N_{s-1,x} \cdot p_{s,x}^{\text{exit}} + \sum_{s=0}^{D} P_{s,x} \cdot p_{s,x}^{\text{disability}} \tag{27}
\]

---

\(^{47}\) For a description of the population projection model, exceeding also year 2060, see Bonin (2001).
5.2. Incidence rates

We distinguish two types of incidence rates for our estimations at this stage of the study. The first one, the eligibility incidence rate, indicates the probability to be classified as eligible to disability pensions. The second one, the disability incidence rate, outlines the probability to actually receive a disability benefit. The differentiation into these two incidence rates is valuable to isolate the impact of alternative retirement channels such as early retirement possibilities on the probability to actually receive a disability pension. The illustration of these two incidence rates will be useful not only to better understand the drivers of disability but also to forecast changing incidence rates for an increase in retirement ages in chapter 6. In the following passages we first describe generally the two different incidence rates. Thereafter, we show actual data for the example of cardiovascular diseases.

5.2.1. Two types of incidence rates - a definition

The first incidence rate represents the probability to become ill AND to apply AND to be judged eligible for a disability benefit (per capita of the population). Therefore, we refer to this incidence rate as the eligibility incidence rate $p_{\text{eligible}}$. The latter incidence rate is estimated by dividing the number of ZUS primary disability decisions $PD_{x,g}$ by the population size $P_{x,g}$. The incidence rate $p_{\text{eligible}}$ depends on 1) the probability to become ill and disabled, 2) the probability to apply for a disability grant – which may be influenced by alternative income sources (see sub section 3.7) and 3) the probability to be classified and accepted as a disability pensioner – which (inter alia) depends on the rigidity of the health status verification policy applied by the ZUS assessment doctors.

\[ p_{\text{eligible}} = \frac{PD_{x,g}}{P_{x,g}} \]  

(28)

Second, we base our calculation on the disability incidence rate $p_{\text{disability}}$. It reflects the probability to become actually a new disability pensioner (per capita of the population) which sums up the probability to be eligible to a disability benefit AND to actually make use of a disability pension. We will outline further below that not all cohorts likewise make use of their eligibility to receive a disability pension benefit. In fact, only a certain proportion $\beta$ of all eligible individuals receives newly such a benefit in a given year. The factor $\beta$ depends on alternative income sources for potential disability pensioners. For example, early retirement benefits (ERB) may be substitute for disability benefits. Individuals may therefore claim ERB instead of DB.

\[ p_{\text{disability}} = \beta \cdot p_{\text{eligible}} \]  

(29)
5.2.2. Two types of incidence rates – an exemplarily application

The eligibility incidence rate $p_{\text{eligible}}$ is outlined in Figure 20 below for the example of cardiovascular diseases. There it becomes apparent that, generally, the probability to apply and to be eligible to a disability benefit increases until the age of about 55 years. Then the eligibility incidence rate drops which may be explained by the fact that individuals from special employee groups such as miners and teachers apply for more generous early retirement benefits instead of disability pensions. Additionally, Figure 20 is a good example for the generally, higher incidence rates of males in comparison to females.

**Figure 20. Eligibility incidence rate - the example of cardiovascular diseases**

Sources: own calculations based on ZUS primary decisions.

Besides the illustrated example of cardiovascular diseases (CVD or cardio), we differentiate incidence rates by total and partial disability as well as by five further main diseases types: tumors, diseases of bones, joints and muscles (musco), nervous system disorders (nervous), mental and mental disorders (psycho) and injuries (injur).

To ensure that we match for each age group $x$ and gender $g$ the respective total disability incidence rate we add the probability $p_{\text{other}}$ to become disabled due to other diseases (than the above mentioned 6 disease types). This probability $p_{\text{other}}$ is estimated as follows:

$$p_{\text{disability}}^x_g = \sum_{i \in \text{disease}} p_{i,x,g} + p_{\text{other}}^x_g$$

(30)
The resulting eligibility incidence rates are outlined in Figure 21 below for the example of male total disability. As shown, the highest incidence rates occur for tumors and cardiovascular diseases.

Figure 21. Eligibility incidence rates by disease type – example of male completely disabled

Source: own calculations based on ZUS primary decisions.

Until the age of about 55, generally, all individuals who are eligible to a disability benefit also receive a disability benefit. In other words, the disability incidence rates equals the eligibility incidence rate – see also Figure 22 for the example of male completely disabled. Interesting is the fact that at higher ages not all persons eligible for a disability benefit actually opt for such a pension. Large differences between eligibility and disability incidence rates occur from the age of 59 (54) for men (women) – see Figure 22 for male totally disabled. Disability incidence rates drop more rapidly than the eligibility incidence rate. Again this can be explained by alternative and more generous income sources, namely early retirement benefits granted for special professions at these ages.
5.2.3. The impact of higher retirement ages & cuts of early retirement channels on disability incidence rates

In section 6 the impact of the currently legislated increase in statutory retirement ages is discussed. An interesting question is, to which extent this reform will lead to a change of disability incidence rates. We assume that such changes will only occur if early retirement channels are abolished. Other ways, the drop of incidence rates from age 55+ onwards observed in recent years would most likely be prolonged also in future years.

An abolishment of generous ER benefits is very likely and envisaged from 2014 onwards. As discussed in chapter 3.7 such a cut of ER may lead to feedback loops on the disability system. Instead of ER benefits individuals may opt for disability benefits. Following we therefore discuss the possible impact and the modelling of the abolishment of generous ER benefits on the disability system.

As one scenario we may assume that the cut of ER possibilities would lead to a constant incidence rate from the age of about 55 onwards. This would imply that the probability to become disabled and apply for a disability benefit is constant from these age groups onwards. This is however, a rather conservative hypothesis because hospitalization data indicates that the health/disability status is worsening with age. In the following section we, therefore, describe a more likely scenario of an increase in disability incidence rates due to the cut of ER - which we also apply in our calculations presented in section 6.4.1.
To outline the possible increase in incidence rates from age 55 onwards we introduce a third incidence rate – besides $p_{\text{eligible}}$ and $p_{\text{disability}}$ – named illness incidence rate $p_{\text{illness}}$. It represents the incidence rate to become ill and incapable of work. $p_{\text{illness}}$ does, however, not provide any information on the probability to be eligible for a disability benefit (indicated by $p_{\text{eligible}}$) or to actually receive a disability benefit (indicated by $p_{\text{disability}}$).

Prevalence rates are, generally, steadily increasing with age – as outlined exemplarily for cardiovascular diseases in Figure 23 below. Unfortunately, no data on actual hospitalization incidence rates to become ill and incapable of work is obtainable, only prevalence rates are accessible. One may, however, proxy incidence rates based on prevalence rates. Generally one may assume that $p_{\text{illness}}$ is reflected by the differential $(n_{x} - n_{x-1})$ of prevalence rates $n$ of two consecutive age groups $x-1$ and $x$. In other words, we assume that an increase in prevalence rates from age group $x-1$ to $x$ reflects inflows into the system, i.e. the incidence rate. The prevalence rate represents the number of disability cases $N$ divided by the population size $P$. All values which are shown in terms of the population $P$ are from now on denoted in small letters.

$$p_{x}^{\text{illness}} = n_{x} - n_{x-1} \cdot (1 - p_{x}^{\text{exh}})$$

Additionally, an approximation of $p_{\text{illness}}$ should take into account the probability to “leave” the status of illness due to recovery. In our estimation this probability is reflected by the probability to leave the scheme $p_{x}^{\text{exh}}$ (due to other reasons than average mortality).

**Figure 23. Hospitalisation rates – the example of cardiovascular diseases**

Now it is interesting to see, how many hospitalized persons there are compared to the number of persons currently eligible for a disability benefit. This ratio is derived on the basis of the $\alpha$ indicator:
The table below shows an exemplary $\alpha$ for CVD:

### Table 5. Alpha values in the status quo

<table>
<thead>
<tr>
<th>Age range</th>
<th>male with total disability</th>
<th>female with total disability</th>
<th>male with partial disability</th>
<th>female with partial disability</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-34</td>
<td>200</td>
<td>454</td>
<td>224</td>
<td>355</td>
</tr>
<tr>
<td>35-44</td>
<td>64</td>
<td>141</td>
<td>62</td>
<td>105</td>
</tr>
<tr>
<td>45-54</td>
<td>48</td>
<td>102</td>
<td>30</td>
<td>46</td>
</tr>
<tr>
<td>55-64</td>
<td>56</td>
<td>344</td>
<td>32</td>
<td>162</td>
</tr>
<tr>
<td>65+</td>
<td>4,233</td>
<td>36,440</td>
<td>7,119</td>
<td>63,770</td>
</tr>
</tbody>
</table>

Source: own calculations based on ZUS primary decisions and NIZP-PZH statistics, 2010.

The table above shows relatively stable values of $\alpha$ for the working age population: see male cohorts aged 35-64, and female cohorts aged 35-54. Exemplarily, 1 individual out of 46 female hospitalised cases with a CVD-diagnosis (aged e.g. 45-54), would obtain the partial disability status. In other words, only a very small proportion of hospitalized cases with a CVD-diagnosis apply for a ZUS disability benefit and are examined by ZUS as eligible. This proportion drops even further at age groups 55+ - as alternative channels to leave the labour market are (still) available.

The next question is, how may future incidence rates change if retirement ages are increased and ER are abolished.

We assume that the ratio of $\alpha$ in the higher retirement age scenario (named $\alpha'$) at ages 55+, these are the ages which are “spoilt” due to retirement rules, follows the alpha values observed in the status quo (named $\alpha$) of the working age population close(r) to retirement, namely cohorts aged 45-54 (see also equations below).

$$\alpha_{age(45;54)} = \alpha'_{age(55+)}$$ (33)

The outcome would transform the CVD $\alpha$ to the following ($\alpha'$ marked grey):

### Table 6. Corrected alpha values in higher retirement scenario

<table>
<thead>
<tr>
<th>Age range</th>
<th>male with total disability</th>
<th>female with total disability</th>
<th>male with partial disability</th>
<th>female with partial disability</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-34</td>
<td>200</td>
<td>454</td>
<td>224</td>
<td>355</td>
</tr>
<tr>
<td>35-44</td>
<td>64</td>
<td>141</td>
<td>62</td>
<td>105</td>
</tr>
<tr>
<td>45-54</td>
<td>48</td>
<td>102</td>
<td>30</td>
<td>46</td>
</tr>
<tr>
<td>55-64</td>
<td>48</td>
<td>102</td>
<td>30</td>
<td>46</td>
</tr>
<tr>
<td>65+</td>
<td>48</td>
<td>102</td>
<td>30</td>
<td>46</td>
</tr>
</tbody>
</table>

Source: own calculations based on ZUS primary decisions and NIZP-PZH statistics, 2010.
Under these assumptions the eligibility incidence rate may change in the higher 
retirement age scenario (considering an abolishment of ER) in line with the 
increasing incidence rates as follows:

\[(34) \quad q_{\text{age}(45:54)} = q_{\text{age}(55+)}\]

\[(35) \quad p_{\text{eligible,age}(55+)} = \frac{p_{\text{illness,age}(55+)}}{q_{\text{age}(55+)}}\]

As we assume that all ER rules are abolished, we may assume that all individuals 
which are eligible to disability pension also take use of it as the main alternative 
income sources, namely early retirement has been cut. Formally, this would imply 
that \(p_{\text{disability}} = p_{\text{eligible}}\), or \(\beta = 1\):

\[(36) \quad p_{\text{disability}} = p_{\text{eligible}}\]

As shown in Figure 24 below, disability incidence rates (here for the example 
of CVD, total disability) would increase considerably also after the age of 55+ 
if we consider increases in illness incidence rates - as discussed above. For this 
illustration we consider a linear increase in incidence rates from the age 57-75\(^{48}\) 
applying constant values \(\alpha\) and a \(\beta\) value of 1 for these cohorts.

**Figure 24. Disability incidence rates of cardiovascular diseases - Higher 
retirement and abolishment of ER scenario**

Source: own calculations based on ZUS primary decisions and NIZP-PZH statistics, 2010.

\(^{48}\) At the age of 75 the average \(p_{\text{disability}} (= p_{\text{eligible}})\) of the age group 65+ (for which we have 
PZH data) is reached. For diseases for which we have no PZH data we apply a flat \(p_{\text{disability}}\) 
profile from age 57 onwards.
In section 6.4.1. we outline the impact of an abolishment of early retirement channels on the disability fund finances. For this scenario we apply change of disability incidence rates – outlined above – differentiated by age, gender, benefit and disease type.

5.3. Exit probabilities - deriving probabilities to leave the disability system

Old age pensions are received by definition until the death of the beneficiary. For disability pensions this is, generally, not the case. Some – though not many – beneficiaries may e.g. recover from their disability and, therefore, stop to receive a disability benefit at some point in time. This so called exit probability is taken into account in our calculations. Similar to the probability to enter a pension scheme we estimate the probability to leave the scheme – for any reason except for the death of a beneficiary. Unfortunately, this exit data has not been provided by ZUS. Therefore, we estimated exit probabilities based on stock and flow figures of disability pension beneficiaries as well as based on mortality data in recent years. For the calculation of exit probabilities we follow the formula:

\[
e_{x,g,t} = \frac{E_{x,g,t}}{B_{x-1,g,t-1}}
\]  

\[
E_{x,g,t} = B_{x-1,g,t-1} + N_{x,g,t} - D_{x,g,t} - B_{x,g,t}
\]  

\[
D_{x,g,t} = B_{x-1,g,t-1} \cdot p^\text{mort}_{x,g,t}
\]

The probability \( e_{x,g,t} \) to leave the disability scheme (for any reasons except death) of an individual of age \( x \) and gender \( g \) in year \( t \) is reflected by the ratio of exits \( E_{x,g,t} \) (for any reasons except for death) at age \( x \), gender \( g \), in year \( t \) and the number of beneficiaries at age \( x-1 \), gender \( g \), in the previous year \( t-1 \). The number of exits \( E_{x,g,t} \) in year \( t \) is estimated as residual of the stock of beneficiaries in year \( t-1 \) plus the flow of new beneficiaries in year \( t \) minus the number of beneficiaries dying during year \( t \) and the stock of beneficiaries in year \( t \). Unfortunately, we have no data on disability specific mortality rates. Therefore, we estimate the number of beneficiaries dying during year \( t \) on the basis of average gender- and age-specific mortality probabilities of the overall population. We are aware of the fact that this approach may lead to an overestimation of exit probabilities for disability beneficiaries as mortality rates of disabled can be expected to be higher than the average in the overall population. Let us denote for the further discussion the positive residual between mortality rates of disabled and the average mortality in the population by the variable \( \text{resid mort} \). This constraint of \( \text{resid mort} \) is balanced by the fact that we apply average mortality rates of the population for the projection of future disability beneficiaries. In other words while exit probabilities are overestimated (due to \( \text{resid mort} \)), the future mortality rates of disability beneficiaries are underestimated (due to \( \text{resid mort} \)).
The resulting exit probabilities (due to other reasons than average mortality) are displayed in Figure 25 below for the age groups 30-59. They are in a range of 2-14%. Apparent is the decrease in exit probabilities over age. Younger beneficiaries aged 30-49 with a partial (total) disability show higher exit probabilities generally well above a level of 8% (5%). For older cohorts, on the contrary, the probability to leave the disability scheme (due to other reasons than average mortality) is steeply decreasing to a level of about 5% (3%) at the age around 55. As disability pensioners generally enter this scheme after the age of 50, the low exit probabilities at the ages 50-60 play an important role for our calculations.

Figure 25. Exit probabilities (due to other reasons than average mortality) of disability pensioners by age and gender and degree of disability

At legal retirement ages, i.e. at the age of 60 for women and 65 for men, the probability to leave the disability scheme amounts to nearly 100%. At these ages disability beneficiaries shift to the old-age or early retirement pension schemes.

5.3.1. The impact of higher retirement ages on exit probabilities

An increase in statutory retirement ages (higher RA), as currently discussed, would lead to a significant change of exit probabilities. For the calculation of the higher RA scenario we assume that exit probabilities increase in line with the rise of RA. Consequently, the high exit probabilities observed currently for male (female) beneficiaries at age 65 (60) would shift step by step to the age of 67 in 2020 (2040) – see also Figure 26. For the age groups between the current and the new

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49 The data reflects the average of the years 2009 and 2010.
RA we assume that exit probabilities are equal to the ones observed for cohorts one year before the RA, i.e. male (female) cohorts aged 64 (59).

**Figure 26. Shift of exit probabilities due to the increase in retirement ages**

Source: own estimation based on data provided by ZUS.
6. Results

6.1. Introductory remarks

The aim of the following chapter is to evaluate the long-term performance of the public disability pension system in Poland. The assessment is based on three criteria. Firstly, we take the macro-viewpoint and evaluate the long-term fiscal stability based on the indicator of cash balances. Secondly, we show the intergenerational redistribution inherent in the disability system on the basis of generational accounts. Thirdly, we take an individual perspective and assess the adequacy of future pension benefits in relation to earning levels.\(^{50}\)

We start with an assessment of recent reforms affecting the disability system. In this course we evaluate the performance of the disability system before the legislated increase in legal retirement ages to 67 (section 6.2) and thereafter (section 6.4).\(^{51}\) Second, the long-term impact of rejected 2010 reform proposal is assessed. The aim of this reform proposal was mainly to make the benefit calculation of the disability benefit system consistent with the old age NDC pension scheme. Third, we consider an increase in mental illness disorders as observed in most OECD countries.

6.2. Evaluation of the legal status before the increase in retirement ages

6.2.1. Long-term cash balance without increase in retirement ages

Poor starting point: current deficit of the disability fund

The annual development of expenditures and revenues represents a major indicator for the fiscal long-term stability of the disability system. The starting point of our fiscal projection is the current high budget deficit of the disability fund. It amounted to 42% of overall expenditures in 2010. In terms of pure disability benefits, 6.2bn PLN of the overall expenditures (14.9bn PLN) are not covered by contributions.\(^{52}\)

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\(^{50}\) For a thorough discussion of the long-term indicators used in this section see chapter 4.

\(^{51}\) According to the reform act adopted in May 2012 legal retirement ages will be increased to 67 both for men (until 2020) and women (until 2040). For a further description of the legal status quo and of the NDC reform scenario see chapter 2.

\(^{52}\) Here it may be underlined once again that in the study at hand we focus only on pure disability benefits. All survivors benefits also covered in the disability fund are disregarded. For our analysis we assume that the same relation of pure disability
One may argue that this current mismatch of expenditures and contributions cannot be fiscally sustainable in the long run. Such an argumentation is, however, short-sighted. In fact, not only the current budget deficit but also a number of other factors determine the long-term stability of the disability system. For a proper evaluation of the disability system, therefore, a long-term projection is valuable. Such a fiscal outlook is provided in Figure 27, which reflects the legal status of the disability system before the legislated increase in retirement ages to 67.

Factors leading to a future surplus in the pure disability system

A first factor which affects the long-term fiscal performance can be found on the revenue side. The increase in contribution rates from 6% to 8% of gross earnings introduced in 2012 significantly improves the long-term stability of the pure disability system. As shown in Figure 27 this reform step increases the revenue side considerably from 2012 onwards by about 0.2 % of GDP.

Figure 27. Development of disability expenditures/revenues – before the increase in retirement ages (g=AWG, r=0)

Source: own calculations.

But the improvement of the long-term stability of the disability system is also related to the changes on the expenditure side. According to our estimations total disability expenditures will decrease remarkably until 2025. This drop can be explained by two factors:

expenditures (14.9 bn PLN) to overall expenditures of the disability fund (39.7 bn PLN) also holds for the revenue side. In other words, 38% of contributions are dedicated to finance pure disability expenditures. Consequently, the budget deficit observed for the overall disability fund also exits for our pure disability pension system. It amounts likewise to 42% of expenditures.
**Determinant 1 of decreasing expenditures until 2025: outflow = 2x inflow**

1) First, the probability to become a new disability pensioner has significantly decreased in the past 15 years. While in 1997 about 155,000 new disability beneficiaries have been recorded, this group shrank to only 47,000 in our base year 2010. As a consequence, the number of inflows into disability is significantly lower than the number of outflows from disability (due reasons of death, healing or reaching the statutory retirement age). Alone in 2010 outflows almost doubled the number of total inflows into disability leading to a net-outflow of 40,500 in this year. In our projection we keep these base year inflow-outflow ratio constant in future years.

To outline the impact of the applied incidence rates on overall expenditures we calculate two alternative inflow scenarios. The first scenario assumes a zero net-inflow into disability. In other words, here we assume that the total number of inflows matches the number of outflows in the base year. In this scenario, the disability pension system would run a deficit in most of future years - see Figure 27. The second scenario presumes the same relatively high inflow in total numbers as observed in 1997 (1997 inflow scenario). Namely, we assume that the total number of inflows more than triples and increases to 155,000. Under these assumptions expenditures would increase considerably in the coming decades and the deficit would increase to 0.8 % of GDP in 2045. These alternative scenarios underline that the taken assumption on the disability incidence rates is a main determining factor for the development of expenditures. If we hold in our standard scenario the currently observed low incidence rates constant into the future, disability expenditures will shrink significantly.

**Determinant 2 of decreasing expenditures until 2025: increasing outflow**

2) Second, the changing age structure of the population will lead to a further increase in the net-outflow of the disability scheme until 2025. A significant share of outflows occurs around the age of 60 - see Figure 28 - when disability beneficiaries leave into old age and early retirement pension schemes. In next decade the large baby-boomer generations aged 50-60 today will reach the age limit of 60 - see green vs. purple line in Figure 28. A large share of disability beneficiaries belonging to these sizeable birth years will therefore leave the disability system soon. This will lead to an increasing outflow out of the disability pension scheme until 2025. Additionally, relatively less retirees will enter into disability until the year 2025 as future cohorts reaching the high-risk age group, i.e. the cohorts aged 50-64, are less numerous - see also purple line in Figure

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53 See chapter 3.
54 More precisely we assume in this scenario that all incidence rates are increased from 2011 onwards for each disease type, gender and age likewise by 85 % to match the outflows.
The effect of the changing age structure is, however, significantly smaller than the impact of the chosen incidence rates. To illustrate the age structure effect we show an alternative scenario in Figure 27 with a constant population structure. If the population of 2010 remained constant over the future, expenditures would be slightly higher in 2025. Only in the very long term, after 2050, a constant age structure would have a significant effect on expenditures. This represents an interesting policy message: disability expenditures are driven only to a very minor degree by demographics. Other factors discussed in chapter 3 - such as legal reforms - are determining future disability expenditures.

In conclusion, the relatively low inflow into disability observed in recent years leads to a decreasing stock of total disability pensioners and consequently to a significant drop of disability expenditures until 2025. Thereafter, expenditures are slightly increasing as the second baby-boomer group aged around 1985 is reaching the high-risk group. We will outline in the following section 6.3 that expenditures will be higher if we consider additionally the legislated increase in retirement ages to 67.

6.2.2. Intergenerational redistribution and sustainability - without increase in retirement ages

The starting point for our assessment of the intergenerational redistribution represent generational accounts - shown in Figure 29. They indicate the cumulated net-payment of each generation over their remaining life cycle (in present value

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55 For a further description of the ageing development see also section 3.3.
of 2010). The sinus-shaped pattern of Figure 29 is rather common in pay-as-you-go systems based on a generational contract. The younger cohorts, generally, finance the benefits of older generations, their net-lifecycle payments are therefore higher than of older cohorts. Figure 29 illustrates that all male cohorts until the age of 35 in 2010 are net-payers to the disability system, i.e. they contribute more than they receive over their remaining life cycle. Females are net-payers until a higher age of 43 which can be explained by the lower female probability to receive a disability benefit. Interesting is, in general, that women show remarkably higher net-payments over their remaining life-cycle than men which can be explained by the relatively low female incidence rates. Additionally, women receive the disability benefit for a shorter period, generally, only until the statutory retirement age of 60. From age 60 onwards their GAs, therefore, amount to almost zero.

Figure 29. Generational Accounts (r=3%, g=AWG) - legal status before increase in retirement ages

Our first sustainability indicator is the fiscal gap. It measures the sum of the Generational Accounts for living and future generations weighted with their (expected) cohort size, set in relation to base-year's GDP. As shown in Table 7, the value of the fiscal gap for the disability system in our standard scenario (g=AWG, r=3.0%) amounts to -11%. This implies that the current fiscal policy of the disability system can be regarded as fiscally sustainable. In fact, the pure disability system shows an implicit wealth amounting to 11% of GDP in 2010. This value can be interpreted as the discounted sum of future surpluses minus deficits of the disability system. This analysis matches with our results in the previous section 6.2.2 showing projected surpluses of the pure disability system after the year 2015 (see Figure 27).
Table 7. Indicators of sustainability and intergenerational redistribution – status quo

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability gap</td>
<td>-11%</td>
</tr>
<tr>
<td>Future generations' burden (in PLN)</td>
<td>-1054</td>
</tr>
<tr>
<td>Revenue gap</td>
<td>-27%</td>
</tr>
<tr>
<td>Transfer gap</td>
<td>-38%</td>
</tr>
</tbody>
</table>

Source: own calculations.

A standard indicator to measure the intergenerational redistribution represents the future generations' burden. This indicator bases on the thought experiment that all arising debts of the disability system are closed by future born generations. As the name implies, usually, it is observed that future generations have to bear a significant burden to finance future deficits. In the case of the disability system, however, this is not the case. In fact, net-payments of a future new born could be lower by 1054 PLN in comparison to a current new born. This is also reflected by the last two sustainability indicators, the revenue and transfer gap. According to the transfer gap shown in Table 7 one could increase disability transfers by 38% over the long-term and the system would still be sustainable. Such improved generosity of the disability system may, however, lead to a (even) higher discrepancy with old age benefit levels – which are expected to drop in future years. Alternatively, one may lower contributions/contribution rates by 27% on a permanent basis – as indicated by the revenue gap in Table 7.

6.2.3. Adequacy - 2010 legal status

The adequacy of disability pensions is measured by adequacy ratios. They show the disability pension levels in relation to the average wage in the economy. As illustrated in Figure 30 adequacy ratios are increasing with age in the status quo scenario. This observation holds for both genders and for total as well as for partial disability. In accordance with the benefit formula (see section 3), total disability pensioners are, generally, 25 percent higher than partially disability benefits to reflect the different needs of these benefit categories.
Apparent is the gender spread of benefit levels increasing with age. In the cohorts aged 20-34 males and females receive more or less the same average benefit level. In these age groups the overwhelming majority (60-100 percent) of beneficiaries receive the flat minimum pension. After the age of 35 differences of benefit levels increase considerably between genders. Here less individuals fall under the threshold of the minimum pension. The average probability to be eligible only to a minimum pension shrinks from 64 percent at age 35 to 5 percent at age 60. As a consequence, benefit levels reflect increasingly (with age) the individual contribution history. For example, male contributors show higher average earnings than their female counterparts. Male benefit levels are, therefore, significantly higher from the age of 35.

In future years adequacy ratios should not change remarkably from the levels shown in Figure 30. As both, the nominator, i.e. the accrued pension rights, as well as the denominator of the adequacy ratio, i.e. average earnings, increase with the general wage growth in the economy. The currently very low indexation of minimum pensions (MP) may, however, lead to a drop of adequacy ratios in the future. This particular MP indexation effect is not taken into account in our calculations. A further discussion of the role of MP for the disability pension system and its consideration in our estimations is provided in Box 1 below. The shown adequacy ratios of Figure 30 will be an important benchmark of our evaluation of the NDC reform proposal. We will, therefore, come back to this analysis in the following section 6.3.

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56 A detailed outline is provided in Box 2
Box 1. The significance of minimum pensions for current and future disability benefit levels

Pension levels are greatly determined by minimum pension levels (MPL) as they represent the lower boundary of benefits. This statement holds especially for disability pensions. For these benefit type the proportion of minimum pension beneficiaries as per cent of total beneficiaries is significantly higher than of old age and survivors’ pension benefits (Chlon-Dominczak and Strzelecki (2010)). About 20% of beneficiaries receive this social assistance benefit. For total (partial) disability the MPL amounted to 706 PLN (530 PLN) in 2010. The probability to receive a minimum pension benefit is highly age-specific and drops with increasing age. Currently, the median benefit of male (female) partial disability pensioners equals the MPL until the age of roughly 39 (43) years. In other words, 50 or more per cent of male (female) disability pensioners until the age of 39 (43) receive the MPL. An overview of the age-specific probabilities to receive the MPL is provided in Figure 31 for the example of partial disability benefits. They differ not greatly to total disability benefits.

Figure 31. Age- and gender-specific probabilities to receive a minimum benefit – partial disability benefits

Source: own illustration based on ZUS data.

In future years, however, the probabilities to receive a minimum pension and with it the average benefit levels may change. The reason lies in the indexation of MPL. Currently, MPL are only adjusted by 20 per cent of wage growth. Consequently, with positive wage growth the ratio of the MPL to the average wage in the economy falls over time. In fact, under current indexation rules the MP guarantee would shrink from about 22 per cent of the average wage in 2010 to roughly 9 per cent in 2060. Other calculations predict an even more extensive drop of MPL to about 7 per cent - see ZUS (2010)57.

57 Available in extended version on www.zus.pl/seminariaprognozy (requires login, as of June 2012).
The continuance of the current indexation rules, however, would not only lead to a reduction of the MPL but also to a gradual phase out of the number of minimum disability beneficiaries. As already observed in past years less and less initially calculated benefits would fall under the very low future MPL. We conclude that the genuine aim of the MP to protect against poverty is highly at risk over the long term and may not anymore be guaranteed under the current rules. We, therefore, regard a continuance of the current MP indexation rules as politically and socially not realistic and consider a pre-retirement indexation with the general wage growth in our estimations. Only after the first year the MP is granted, we index these benefits with the general post-retirement indexation of 20% of wage growth – i.e. in line with the general indexation of disability benefits. In other

58 The pre-retirement indexation refers to the annual adjustment of accrued pension rights - here represented by the minimum pension level - until the point of retirement.

59 Our decision not to project the current low MP indexation rules but to consider an annual adjustment of MPL by the general wage growth is additionally driven by data limitations. As outlined current indexation rules will not only lower the MPL in relation to average wages but also reduce the number of individuals eligible to a MP. In order to correctly forecast the changing probability to receive a MP, a number of data inputs are required.
First, for such an analysis the current probability to receive a MP not only of current beneficiaries (which is shown in Figure 31), but also of current new retirees is needed.
Second, the past (and future projected) distribution of insurable earnings needs to be taken into account to estimate how many individuals fall under the threshold of the shrinking MP. Both these two data source are (currently) not available.

60 The post-retirement refers to the annual adjustment of pension benefits after the point of retirement until the (expected) point of exit from the pension scheme, generally marked...
words, we assume that the current MPL (in per cent of the average wage) and the proportion of MP beneficiaries to total disability beneficiaries (shown in Figure 31) stay constant over time. Our projected expenditures should, therefore, be higher than considering the lower current MP indexation rules.

6.3. Increase in legal retirement ages to 67

According to the legal changes adopted in May 2012\(^61\), the statutory retirement ages shall be increased to 67, both for women and men. The new retirement age will gradually increase from January 2013 until 2020 for men, and 2040 for women. Moreover, early retirement will not be possible from 2014 onwards for the majority of ZUS pension scheme members. How these two measures, namely the rise in legal retirement ages to 67 (RA67) and the cut of early retirement channels (ERcut), will affect the long-term performance of the disability system is outlined in the following section. The scenario which considers these two reforms is named from here onwards “RA67 scenario” and can be regarded as the status quo of the disability system.

6.3.1. Long-term cash balance – retirement age 67

Both the revenue and the expenditure side of the disability system are affected by changing retirement ages. On the one hand, revenues are increased as contributors work longer and, therefore, pay for a longer period into the disability pension system. In 2020 revenues are higher by about 5% and in 2050 by about 11% compared to a scenario without RA67 (see Figure 33). The average contribution period for males rises roughly from 40 years to 46 (in 2016) and 47 (in 2020 and thereafter).\(^62\) For females contribution periods rise, of course, more as the increase in retirement ages is more pronounced. On the other hand, expenditures are affected quite significantly by the increase in retirement ages, too. Under the RA67 scenario expenditures are higher than in a pre-reform scenario by 28% in 2020 and by 58% in 2050. A number of reasons explain this increase in expenditures. First, the possible duration in retirement is prolonged considerably. Under a pre-reform scenario most male (female) disability pensioners by the point of death or in case of disability pensions by the point of old age (early) retirement.

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\(^61\) The changes refer also to other pension systems: uniformed services, judges, prosecutors, farmers, etc., who are not tackled by this paper.

\(^62\) Here it is assumed that first contributions are paid at the age of 20. With the RA67 & ERcut reform the new statutory retirement age represents the new end point of the contribution career and not anymore the early retirement ages as observed in recent years. This is a simplified assumption. In our calculations we actually apply an age- and gender-specific contribution profile which reflects the probability to contribute and the level of contributions for each cohort.
leave the scheme at the age of 65 (60). Under the RA67 scenario male (female) beneficiaries can be expected to exit the scheme not until the age of 67 in the year 2020 (2040). In other words, the majority of disability pensioners can receive disability benefits 2 (7) years longer than in the status quo. For the average male (female) partial disability pensioner who enters into disability at the age of 51 (47), the duration in disability increases by roughly 7 (25)%.

The dotted line in Figure 36 shows the impact of this later outflow from disability on expenditures in isolation.

Figure 33. Development of disability expenditures/revenues - higher RA (g=AWG, r=0)

Second, expenditures will rise due to a higher inflow into disability. This is caused by a worsening of the health status with age. Consequently, if people have to retire later, they are more likely to be eligible for a disability benefit during the prolonged working period. Moreover, the higher inflow into disability is caused by missing alternative income sources. In fact, due to the cut in early retirement channels more eligible individuals will actually opt for a disability benefit, as observed in other countries (see section 3.7). The impact on expenditures of the higher inflow into disability is reflected by the dashed line in Figure 33. It reflects both 1) a later outflow from disability as well as 2) a higher and longer inflow into disability due to the rising legal and early retirement ages. Please note that further modelling details of these reforms are provided in section 5.2.3 and 5.3.1.

Source: own calculations.

63 See also Figure 25
64 The average male (female) entrance age of 51 (47) years is based on the current incidence probabilities. According to our calculations the average duration in disability at these entrance ages increases from 9.1 (8.7) to 9.7 (10.9) years for males (females). This corresponds to a relative increase in the average duration in disability by 7 (25)%.
For this estimation we base on the exit probabilities shown in Figure 25 as well as average mortality probabilities provided by Eurostat.
In conclusion, the increase in retirement ages to 67 and the abolishment of early retirement channels shows a significant impact on disability finances. The increase on the revenue side until 2050 (+ 11%) is far less pronounced than on the expenditure side (+58%). As a consequence of these recent legal changes, future surpluses of the disability system will be significantly smaller in future decades. The system remains, however, stable in fiscal terms.

6.3.2. Intergenerational redistribution and sustainability – retirement age 67

We have shown in the previous subsection 6.3.1 that with a rise in retirement ages to 67, expenditures would increase more significantly than revenues. Consequently, the sustainability wealth estimated for the status quo of 11% of GDP in 2010 would shrink to 4% under the higher RA scenario. In other words the sum of future surpluses is lower under this scenario. Also the other indicators would change respectively. The future generations’ burden would amount to 314 PLN compared to -1054 PLN in a scenario without RA67. In other words, the net-payments of a future newborn could be lower by 740 PLN in comparison to a current newborn. Also the revenue gap and transfer gap would fall under the higher RA scenario - see also below.

| Table 8. Indicators of sustainability and intergenerational redistribution – RA67 |
|---------------------------------|-----------------|-----------------|
|                                | Without RA67    | With RA67       |
| Sustainability gap             | -11%            | -4%             |
| Future generations’ burden (in PLN) | -1054         | -314            |
| Revenue gap                    | -27%            | -9%             |
| Transfer gap                   | -38%            | -10%            |

Source: own calculations.

| Table 9. Indicators of sustainability and intergenerational redistribution – RA67 & cutER |
|---------------------------------|-----------------|-----------------|
|                                | Without RA67    | With RA67       |
| Sustainability gap             | -4.6%           |                 |
| Future generations’ burden (in PLN) | -1091         |                 |
| Revenue gap                    | -9.9%           |                 |
| Transfer gap                   | -11%            |                 |

Source: own calculations.

In conclusion, all sustainability and intergenerational redistribution indicators show negative values. We may, therefore, state that the disability system can still be considered as sustainable in RA67 scenario – despite the considerable increase in expenditures.
6.3.3. Adequacy – retirement age 67

The adequacy of the disability system is unchanged under the higher RA scenario. The benefit level is not touched by the reform of retirement ages as retirement ages are not included in the current disability benefit formula. Only the possible duration in the disability system is altered with an increase in legal retirement ages.

6.4. Evaluation of NDC reform

The first significant pension system reform, introduced in 1999, left the disability benefit system unchanged. In consequence, a growing inconsistency occurred between the notional defined contribution scheme (NDC) combined with the compulsory funded pillar (FDC), and the old disability benefit scheme. As a result, disability beneficiaries who reach the statutory retirement age may expect in future years higher old-age pension levels than individuals retiring under the new NDC/FDC system. For a further discussion see Box 2. Therefore, in 2010 the government introduced a reform proposal that would, among others, link the disability benefit formula with the NDC (old age pension) account. In the following section we assess the impact of this reform on the long-term stability of the pure disability pension scheme and on the adequacy of future benefits. For this analysis we presume that the NDC reform is introduced from 2015 onwards.

6.4.1. Long-term cash balance – NDC reform scenario

The introduction of the NDC reform scenario will lead to considerable future reduction of disability pension expenditures. Shrinking benefit levels, as will be outlined in the following section 6.3.3, are the reason for this drop of expenditures. Starting from 2015 the impact of the NDC reform is gradually increasing as more and more new beneficiaries with a lower pension benefit are entering this system. In the long term, the proposed implementation of the NDC reform would result in a partial phase out of the disability expenditure side - as most retirees would receive only a minimum pension.  

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65 Again as in the status quo, we assume a pre-retirement indexation of the minimum pension with the general wage growth. For a further discussion see Box 2.
Figure 34. Development of disability expenditures/revenues – status quo scenario (g=AWG, r=0)

Source: own calculations.

6.4.2. Intergenerational redistribution and sustainability - NDC reform

Similar to the results of cash balances the sustainability gap improves under the NDC reform scenario. Instead of 4% the implicit assets of the system would widen to 21% of GDP in 2010. The other sustainability indicators would improve likewise as shown in Table 8 below.

Table 10. Indicators of sustainability and intergenerational redistribution – NDC reform

<table>
<thead>
<tr>
<th></th>
<th>Status quo</th>
<th>NDC reform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability gap</td>
<td>-4%</td>
<td>-21%</td>
</tr>
<tr>
<td>Future generations' burden (in PLN)</td>
<td>-314</td>
<td>-3640</td>
</tr>
<tr>
<td>Revenue gap</td>
<td>-9%</td>
<td>-48%</td>
</tr>
</tbody>
</table>

Source: own calculations.

6.4.3. Adequacy - NDC reform

Adequacy ratios would shrink considerably under the NDC reform proposal in comparison to the status quo. As shown in Figure 35 exemplarily for average male total disabled the benefit of all age groups would drop significantly. For a large proportion of new disability beneficiaries initial pensions based on NDC accounts
and a hypothetical career path would be lower than the minimum pension. In case of male (female) total disability beneficiaries, cohorts from age 20 to roughly age 41 (51) would receive the flat minimum pension level. To better understand the results of our NDC pension simulation, we discuss limitations of our estimation approach in Box 3.

In further years, even older cohorts can be expected to receive the flat minimum pension. This development can be explained by three factors:

1) Future increases in the life expectancy will lead - via the NDC benefit formula - to a gradual reduction of pension benefits. According to our assumptions pensions will be cut by 0.6% each year until 2030. Thereafter, the reduction is less as the life expectancy is presumed to increase at a slower pace.

2) Younger cohorts show relatively little NDC accounts - also after the consideration of the hypothetical career path. Consequently, their future NDC pension benefits are low, too. This can be explained by lower average wage until the point of disability retirement, longer periods of unemployment and self-employment of these age groups. The latter group, generally, paid and collected fewer contributions than an average contributor in Poland.

3) The internal rate of return of the NDC entitlements, i.e. wage bill growth, is growing at slower pace than the general wage growth in the economy - due to a shrinking working population.

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66 Readers may notice in Figure 35 that the ratio of the MP to the average wage is constant over time. The reason lies in the indexation. As in the status quo scenario, we consider an indexation of the MP with average wages. We regard the current indexation rules of the minimum pension as politically and socially not realistic over the long-term (see discussion box 2).

67 In line with the 2010 reform proposal we applied the future (unisex) life expectancy at age 60 as denominator of the newly introduced NDC benefit formula. Under these rules every new disability beneficiary is treated as if he/she would retire at age 60. Further below we discuss a modification of this crucial parameter.

68 After the year 2060 we assume a constant life expectancy.
Figure 35. Adequacy ratio, NDC reform scenario (pension relative to average wage)

Box 2: Comparison of future old age and disability pension levels

Until today the benefit formula of the old age and the disability system vary widely (as outlined in section 2). Disability pension levels follow a classical defined benefit formula and depend (mainly) on pre-retirement earnings and the contribution length. Old age pensions, on the contrary, are based on pension rights accrued on NDC and FDC accounts. The new old age NDC benefit formula is applied for the persons born after 1948 which retired not until the recent years. In general, average old age pension levels are expected to drop in future years mainly due to changing contribution careers and a less generous NDC benefit formula. As a consequence of this expected drop in old age pensions, entrants into the disability scheme may receive higher benefit levels than new old age retirees. Already in 2010 initial female old age benefits are slightly lower than the average entrance benefit of new female disability retiree at age 55 (with total disability) – see Table 11. The adequacy ratio – measuring the initial pension level relative to average earnings in the economy - amounts to 47% for female old age entrants and to 48% for their counterparts receiving an initial disability benefit in 2010. As shown in Table 11, this discrepancy for females will widen in the next years. For this analysis we assume that current disability adequacy ratios will remain constant in future years which we see as a reasonable assumption. Around the year of 2025 also

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69 For more details see Jablonowski and Müller (2013).
70 We keep disability pension levels constant under current rules as we have no access to micro data on contributory and non-contributory service years. We believe that this approach is feasible for a number of reasons. First, contrary to old age pensions, the disability benefit formula considers no demographic factors which change over time. Second, disability benefits depend (mainly) on the contribution career of the last
male new disability pensioners may be better off than the old age counterparts. In this year the adequacy ratios for male new disability pensioners (entering the system at age 55) amounts to 57% compared to 50% for new old age pensioners. This expected rising discrepancy between disability and old age pensions may not be politically desired. In fact the relatively less generous old age pension system may lead to higher inflows into disability. Such substitution effects have been observed in a number of countries (see also section 3.7).

Table 11. Adequacy Ratios – Old age vs. Disability

<table>
<thead>
<tr>
<th></th>
<th>Adequacy Ratio (=initial pension relative to average earnings)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2010</td>
</tr>
<tr>
<td><strong>Old Age</strong></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>0.81</td>
</tr>
<tr>
<td>Females</td>
<td>0.47</td>
</tr>
<tr>
<td><strong>Disability</strong></td>
<td></td>
</tr>
<tr>
<td>Males (under current formula)</td>
<td>0.57</td>
</tr>
<tr>
<td>Females (under current formula)</td>
<td>0.48</td>
</tr>
<tr>
<td>Males (NDC disability formula)</td>
<td>-</td>
</tr>
<tr>
<td>Females (NDC disability formula)</td>
<td>-</td>
</tr>
<tr>
<td>Males (Modified NDC disability formula)</td>
<td>-</td>
</tr>
<tr>
<td>Females (Modified NDC disability formula)</td>
<td>-</td>
</tr>
</tbody>
</table>

Red shaded cells highlight disability adequacy ratio being higher than old age equivalents.

a New average old age pensioner retiring at legal retirement age of a given year. Both NDC and FDC pension entitlements are taken into account.

b New average disability pensioner with a entrance age 55 in a given year.

Source: ZUS data and own estimations based on 1% Contributors’ Sample Data.

An introduction of a NDC disability formula would overcome these discrepancies between old age and disability.71 Disability adequacy ratios would be significantly lower with a link of disability pensions to NDC accounts. As depicted in Table 11 the average adequacy ratio of new male (female) disability pensioners would amount to 32% (26%) in 2015 with the NDC reform. Such low pension levels may not be politically desired. Therefore, under a modified NDC formula proposed by this study (applying a unisex life expectancy of 65 and a hypothetical career path of 35 years) the drop of adequacy ratios would be less pronounced and therefore may be more acceptable on the political scene. Adequacy ratios would amount to 40% (33%) for male (female) new disability retirees in 2015. Until 2030 adequacy ratios would, however, drop to minimum pension levels (22%) – also under a modified NDC benefit formula. Further modifications of the NDC benefit formula may therefore

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10 to 20 years – contrary to old age pensions. If we assume that future contribution careers are similar to these last years then the assumption of constant adequacy ratios seems feasible.

71 A description of the NDC reform is provided in section 2.2. Further details on the computation of this reform are provided in the Appendix.
be required until 2030, e.g. a further increase in the life expectancy parameter of the benefit formula or a longer hypothetical career path.

Box 3. Limitations of our NDC pension simulation

In our model we look at an average disability pensioner. In the status quo, the pension level of this average new disability pensioner is based on actual data provided by ZUS. The status quo pension, therefore, reflects the distribution of current pension levels and with it the proportion of minimum pensions in relation to total pensions. In the NDC reform scenario, we simulate the pension level of an average new beneficiary. He pays an average contribution which reflects that he is to some extent employed, unemployed or self-employed. With this simulation we are not able to show the distribution of pension levels. In our simulation an average contribution would translate to a pension level equal to the minimum pension (MP) until the age of 41 for males (see Figure 35). If we would, however, estimate the average future pension not based on an average career but on the distribution of careers, it may be higher for cohorts until age of 41. The distribution may show that some individuals until the age of 43 receive a pension level higher than the MP. These individuals would increase the average pension. In other words, we most likely underestimate average NDC pensions with our simulation.

Additionally, it should be noted that the age until which the average beneficiary receives a minimum benefit is sensitive to the assumptions on the entrance age into the labour market. Currently, we assume an entrance age of 22 years as well as a continuous contribution career. As a consequence, the hypothetical career of the NDC reform (see chapter 2) is considered (added) in the benefit calculation for of all new pensioners until the age of 52. If we assume a later (earlier) entrance age, the age until which the average beneficiary receives a minimum benefit would, of course, increase (decrease).

In conclusion, the NDC reform would lead to a significant drop of pension levels which is most likely politically not feasible. In fact, it represented the main reason for the rejection of this disability reform in 2008 and 2010. Nevertheless, a link of disability benefits to NDC accounts may be favorable because it would provide a consistent calculation of disability and old-age pensions. Against this background, an alteration of the 2010 NDC reform proposal is discussed in this study below.

Finding a “better” political solution: modification of the 2010 NDC reform proposal

There are different options to increase pension levels under the NDC reform scenario. First, the denominator of equation 8 (see chapter 2), i.e. the applied life expectancy LE may be altered. In the old reform scenario, this parameter LE amounted to the unisex life expectancy at the age of 60. Currently, the statutory retirement age amounts to 65 (60) for men (women) and will be rising to 67 for both genders. Against this background, we propose an increase in the
parameter LE in a future NDC disability formula e.g. to 65. It may be further increased to 67 in line with the rising statutory retirement age. In the same course, the consideration of the hypothetical career path may be changed. Under the 2010 reform additional pension rights - besides the ones collected on NDC accounts - are granted if less than 30 working years (whether of the type of contributory or non-contributory service time) have been accrued. As the working life increases with the planned rise of retirement ages also the parameter of working years may be augmented e.g. to 35 years. We apply such parameter changes in our calculations. The denominator of the NDC benefit formula (see equation 8) is increased from 60 to 65. Furthermore the hypothetical career path was extended from 30 to 35 years. In other words, if less than 35 working years (whether of the type of contributory or non-contributory service time) are accrued, then the existing NDC capital is augmented (to reflect a working career of 35 working years). These parameters are applied from 2015 onwards. The total effect of these NDC parameter changes on the adequacy of disability benefits is shown in Figure 36 below.

The graph shows first the status quo of adequacy ratios (blue line) exemplarily for male total disability beneficiaries. Additionally, two scenarios for the proposed NDC reform are illustrated (see both dotted lines). The first NDC scenario (see red dotted line) shows the adequacy ratios for a new beneficiary in 2015 under the initial 2010 reform proposal. The second NDC scenario (green dotted line) shows an alteration of the initial parameters. Both parameters 1) the LE as well as 2) the working years applied in the hypothetical career path are increased by 5 years - as outlined above. As shown under the second NDC scenario pension levels would be significantly higher than under the initial NDC reform proposal. In conclusion, a change of the parameters of the 2010 NDC reform proposal may improve considerably the chance for its political adoption.

**Figure 36. Impact of changing parameters of the 2010 NDC reform proposal**
(Male, total disability)

Source: own estimation.
6.5. Higher mental illness scenario

So far we keep in the probabilities to become ill constant over time. Only demographic changes, i.e. the expected general decline of mortality according to Eurostat assumptions, are taken into account. The experience from other OECD countries shows, however, that the structure and relevance of certain types of diseases may vary over time. Most OECD countries experienced an increase in mentally ill disability beneficiaries. As outlined in section 3.5, currently, 30-45% of all new disability benefits are granted due to reasons of mental disability across the OECD. In some countries such as Denmark or Switzerland the group of mentally disabled even represents 50% of new beneficiaries. In Poland, on the contrary, this group only represents about 9% of new beneficiaries in 2010 (i.e. in the status quo).

Against this background, we aim to show the impact of an increase in mental diseases following the European-wide process of growing incidence rate in mental disorders. For this analysis we will only focus on the first perspective, the long-term cash balance. We disregard intergenerational redistribution and adequacy indicators - the latter should be unaffected by this scenario.

6.5.1. Long-term cash balance – Higher mental illness scenario

For the analysis of mental illness increases we show two scenarios. In the “mental illness scenario 1” the group of new disability beneficiaries suffering from mental and behavioural disorders (F00 - F99) doubles from 2015 onwards, i.e. we apply an increase factor of 2. For all other diseases incidence rates stay constant. In the a further scenario “mental illness scenario 2” we assume that 50 percent of all new disability pensioners are mentally disabled - as currently observed in Denmark and Switzerland. In other words, the group of new disability beneficiaries suffering from mental disorders is about 10 times higher than under the status quo. The applied assumptions used in the two mental illness scenarios on inflows and outflows are summarized in Table 12 below. It shows the total number of new beneficiaries and the exits in the base year (2010) - which reflect the applied age and gender specific incidence rates as well as the population structure of the base year.

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72 For our simulation the incidence rates for mental and behavioral disorders are rescaled equally for all age groups and genders by the respective increase factors.

73 To be precise the increase factor amounts to 9.69.
Table 12. Assumptions – mental illness scenarios

<table>
<thead>
<tr>
<th></th>
<th>Status quo scenario</th>
<th>Mental illness scenario 1</th>
<th>Mental illness scenario 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total of new disability beneficiaries in 2010</td>
<td></td>
<td>47565</td>
<td>52015</td>
</tr>
<tr>
<td>Total of new disability beneficiaries suffering from mental disorders in 2010</td>
<td></td>
<td>4450</td>
<td>8900</td>
</tr>
<tr>
<td>Total of new disability beneficiaries suffering from other than mental disorders in 2010</td>
<td></td>
<td>43115</td>
<td>43115</td>
</tr>
<tr>
<td>Total of exits (due to death and other reasons) in 2010</td>
<td></td>
<td>87997</td>
<td>87997</td>
</tr>
</tbody>
</table>

Source: own calculations.

Our simulation shows that under the mental illness scenario 1 and 2 total expenditures rise significantly over the long run. In 2030 expenditures would be about 6 (56) percent higher under the mental illness scenario 1 (scenario 2) than under the status quo – see Figure 37. In other words, an increase in mental diseases as observed in a number western European countries could lead to a significant increase in future expenditures in Poland.

Figure 37. Higher mental illness scenarios (g=AWG, r=0)

Source: own calculations.

74 Possible changes of the revenue side due to a decreasing number of contributors are neglected here.
When analyzing the consequences of the higher mental disease incidence rate, one has to bear in mind that the immediate mental "breakdown", starting in our model sharply after the base year (2010) is a hypothetical scenario of a 'sudden shock'. Nevertheless, the results should trigger off the discussion in Poland on potential measures to prepare for a similar mental diseases development as observed in other OECD countries.
7. Summary and conclusions

The aim of this study was to evaluate the long-term performance of the current disability system in Poland and of its possible reform. We started in chapter 2 with a presentation of the current legal framework of the disability system and of the rejected reform proposal of 2010. Chapter 3 gave an overview of the main drivers of disability comparing the international trends of disability with the development in Poland. Thereafter, the applied indicators (chapter 4) as well as the data sources and assumptions (chapter 5) used for the computations were presented and discussed. The actual assessment of the long-term performance of the disability system followed in chapter 6. This evaluation was carried out from three perspectives:

1. The cash balance, well known to the public, easily understandable and of particular interest from the viewpoint of the politicians and decision makers.
2. The intergenerational redistribution based on generational accounts and broken down further into specific indicators: future generations’ burden (wealth), sustainability gap, revenue and transfer gaps. This perspective may be more convincing to academics and strategic decision makers, who are focused on the long term sustainability of the public finances, e.g. international institutions like the European Commission, the OECD or the IMF.
3. The adequacy ratios, which are a politically important factor, but, as a microeconomic indicator, are mostly important for the society, especially for the disabled persons.

First, the status quo scenario was evaluated from these three perspectives. We considered only pure disability expenditures. Other benefits paid out from the disability fund such as survivors’ pensions were disregarded. According to our calculations the disability finances should significantly improve in coming years. While the contributions stay relatively constant in terms of GDP, expenditures will drop considerably in the coming decades. Mainly, tighter eligibility criteria explain this decline of expenditures over time. As a result, the outflow of disability beneficiaries (due to death, recovery and reaching retirement) almost doubles the inflows into disability in our model starting year 2010. Over time this development will lead to a significant drop of total beneficiaries and expenditures until the year 2025. Thereafter, the inflow of large cohorts born in the period of 80’s only slightly increases aggregate expenditures. The impact of the recently legislated increase in legal retirement ages to 67 and the abolishment of early retirement (briefly called 67RA) on the disability system is twofold: on the one hand, revenues are increased as contributors (most likely) work longer and, therefore, pay for a longer period

75 For a further discussion of the benefit categories included and the data inputs see chapter 5.
into the disability pension system. In the 67RA scenario revenues are higher than in the status quo scenario by 5% in 2020 and by 11% in 2050. On the other hand, expenditures are affected quite significantly by the increase in retirement ages. In the 67RA scenario expenditures are higher than in the status quo scenario by 28% in 2020 and by 58% in 2050 as the possible duration in retirement is prolonged considerably. Additionally, this rise can be explained by a higher inflow into disability as with the abolishment of early retirement channels alternative paths to leave the labour market are cut. Overall disability finances remain, however, still relatively sustainable.

The generational accounts’ measures confirm this observation: all indicators show a positive intergenerational redistribution of public sources and a sustainable long-term performance of the pure disability system. The third perspective, the adequacy ratios indicate two aspects, a positive and a negative: the positive aspect refers to the expected stable relation of the average disability benefit to the average salary in the economy over the long term. The second observation, however, might be regarded as discussible. It refers to the relation between the average disability benefit and the following old-age pension benefit: in many cases the disability pension, on average, may be higher than the average NDC pension. In consequence, disability beneficiaries, despite not anymore contributing to the social security system, would record higher adequacy ratios than many pensioners, who were full-time employees or self-employed. This argument was one of the key points that justified the NDC reform proposal.

The NDC reform aimed at introducing a consistent benefit calculation of disability and old age pensions. Additionally, the (partly) disabled persons would be able to earn additional income without currently binding limitations. For our analysis we only assess the impact of the changing benefit formula. This reform regarded from the three perspectives shows a shift of the abovementioned equilibrium point towards an improvement of public finances. But as usually, there are no free lunches: the improvement of sustainability and cash balances is financed by future disability beneficiaries. Their benefits would shrink considerably compared to the status quo scenario. Upon introduction of the reform, the average newly male (female) disabled persons up to age of about 41 (51) could count only on the minimum pensions. Over time also older cohorts would fall under the threshold of the minimum pension. This drop of future pension levels was the main reason for the rejection of this disability reform in 2008 and 2010.

A link of disability benefits to NDC accounts may be, nevertheless, favorable because it would provide a consistent calculation of disability and old-age pensions. Additionally, it could be avoided that initial disability pensions may be higher in future years than initial old age benefits. Against this background, we assess a possible modification of the 2010 NDC reform proposal. We have shown, that a change of the parameters used in the NDC benefit formula may considerably increase future benefit levels and therewith the chance for a political adoption of the
2010 NDC reform. As an alternative reform option, one may consider to modify the parameters of the currently applied defined benefit formula. Such an approach would also be appropriate to lower the future gap between disability and NDC old age pension levels.

In our calculations we keep the probabilities to become ill by age, gender, disease type and disability category constant over time. Only the expected general decline of mortality – according to Eurostat assumptions - is taken into account. The experience from other OECD countries shows, however, that the structure and relevance of certain types of diseases may change over time. Most OECD countries experienced an increase in mentally ill disability beneficiaries. Currently, 30-45% of all new disability benefits are granted due to reasons of mental disability across the OECD. In some countries such as Denmark or Switzerland the group of mentally disabled even represents 50% of new beneficiaries. In Poland this group only represents 16% of new beneficiaries in 2010. Against this background, we illustrate the impact of an increase in mental diseases following the European-wide process of growing incidence rate in mental disorders. More precisely, we assume that 50 percent of future new disability beneficiaries will have the diagnosis of mental illness - keeping incidence rates of other illnesses constant. Our simulation shows that such a rise of mentally disabled would increase expenditures by about 60 percent.

To conclude, one may regard an equilibrium point acceptable for all interested sides: the politicians (lower deficits) and the beneficiaries (acceptable adequacy ratios). With the past NDC reform proposal this equilibrium point has not been reached. Consequently, this disability reform was not introduced. The need for a disability reforms is, however, still given as the difference between the adequacy of disability-related old-age pensions and NDC related pensions will grow over time. More individuals may, therefore, opt, if possible, for a disability benefit due to the relative generosity compared to reformed NDC/FDC old-age pensions. Additionally, the number of “fake” applicants may increase - as observed in other countries. Against this background, the need for a harmonization of the disability and old-age benefit formula will become increasingly apparent and we assume that the discussion on the NDC reform will come back to the political agenda. Our study shows that a slight modification of the 2010 NDC reform may lead to a smaller drop of benefits and may therefore increase the chance for its political adoption in future years.

76 See also section 3.5.
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[40] Potrykowska, A., Orzełek, E.: Rządowa Rada Ludnościowa, Biuletyn 53, Warsaw, 2008;


[48] Social Insurance Institution: Orzeczenia lekarzy orzeczników ZUS o niezdolności do pracy, Warsaw, years 2003-2010;


Annex 1: Possible effects of a consideration of NDC2 contributions

The disability reform was rejected before the introduction of the new regulations on the pensions in 2011 and most recently in 2013 which changed the pension contributions split between NDC and FDC. The original split that was binding in 2010, when the reform was introduced in 1999: NDC=12.22% and FDC=7.3%. In March 2011 the new split of contributions was introduced: the FDC part was lowered from initial 7.3% to 2.3% and the NDC part was split into two subaccounts: NDC 1 and NDC 2. Yet in 2013 a new law was adopted according to which FDC contribution rates were lowered to 2.92% from 2014 onwards. The table below explains the exact split options for the coming years between NDC 1, NDC 2 and FDC:

Table 13. Split options for the coming years between NDC 1, NDC 2 and FDC

<table>
<thead>
<tr>
<th>Years</th>
<th>NDC 1 in %</th>
<th>NDC 2 in %</th>
<th>FDC in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999-2010</td>
<td>12.22</td>
<td>0.0</td>
<td>7.3</td>
</tr>
<tr>
<td>2011-2012</td>
<td>12.22</td>
<td>5.0</td>
<td>2.3</td>
</tr>
<tr>
<td>2013</td>
<td>12.22</td>
<td>4.5</td>
<td>2.8</td>
</tr>
<tr>
<td>2014 onwards</td>
<td>12.22</td>
<td>4.38</td>
<td>2.92</td>
</tr>
</tbody>
</table>

Source: own calculations.

To reflect the expected changes in the NDC/FDC split, one may consider a correction coefficient $\omega$ for FDC members that varies every year in accordance with the table above. Such a hypothetical correction coefficient shows a relation between the overall contribution rate and the sum of the NDC accounts 1&2 in a given year:

Table 14. Correction coefficient

<table>
<thead>
<tr>
<th>Years</th>
<th>$\omega$ Actual $\omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999-2010</td>
<td>19.52 12.22 1.60</td>
</tr>
<tr>
<td>2011-2012</td>
<td>19.52 17.22 1.13</td>
</tr>
<tr>
<td>2013</td>
<td>19.52 16.72 1.17</td>
</tr>
<tr>
<td>2014 onwards</td>
<td>19.52 16.60 1.18</td>
</tr>
</tbody>
</table>

Source: own calculations.

The formula for the basis of the disability benefits for an FDC participant is then corrected as follows:

$$BCR_{i,FDC} = \omega_s \cdot NDC_s + \sum_{i=s+1}^{m} [(C_{i,NDC1} \cdot \omega_i) \cdot \frac{1}{n} \cdot \left(\frac{1+r_{n,NDC1}}{1} + \sum_{i=s+1}^{1} \left[C_{i,NDC2} \cdot \omega_i\right]\right) + I_{C_j}$$

(40)
The first term of the equation (40) represents pension entitlements accrued on NDC accounts until the end of period s (equal to year 2010). They are corrected by \( \omega_s \). The second and third part sum up all pension rights accumulated on NDC accounts, namely NDC1 account and NDC2 account, from year \( s+1 \) until the year before retirement \( l \). These pension entitlements consist of the annual contributions \( C \) made to NDC1 and NDC2 accounts corrected by \( \omega \). They are indexed by the interest rate \( r \), which differs slightly for NDC1 and NDC2 account, until the point of retirement \( l \). For the purposes of this study we simplify the abovementioned approach and we assume that all insured persons pay 12.22% of the contributions to the NDC1 account. Consequently, the correction coefficient is fixed at the level of 1.6. Such simplification should not affect significantly the results due to the fact that the NDC1 and NDC2 indexation rates do not differ significantly too - until the assumptions from the AWG are considered.

**Annex 2: Demographic assumptions**

Table 15. Applied demographic assumptions

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Standard scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female life expectancy at birth in 2010 in years</td>
<td>80.7</td>
</tr>
<tr>
<td>Male life expectancy at birth in 2010 in years</td>
<td>72.1</td>
</tr>
<tr>
<td>Female life expectancy at birth in 2060 in years</td>
<td>87.9</td>
</tr>
<tr>
<td>Male life expectancy at birth in 2060 in years</td>
<td>82.4</td>
</tr>
<tr>
<td>Fertility - 2007</td>
<td>1.38</td>
</tr>
<tr>
<td>Fertility - 2060</td>
<td>1.56</td>
</tr>
<tr>
<td>Net migration 2010</td>
<td>11,732</td>
</tr>
<tr>
<td>Net migration 2060</td>
<td>14,123</td>
</tr>
</tbody>
</table>

Source: Eurostat.

**Annex 3: Modelling assumptions, parameters and input data for the NDC reform**

The starting point for the modelling of the NDC reform represents total pension rights accrued until 2010. They consist of NDC accounts (NDC) accrued in the period 1999-2010 and the initial capital (IC) of 1999 revaluated to the year 2010. The data on these accounts has been estimated based on a 1% sample of ZUS contributors.

An interesting question is whether disability beneficiaries show similar contribution careers and pension entitlements as average ZUS members. One may assume that they are underperforming in terms of earnings and contributions due to their less
favourable health status. To answer this important question for our estimation we assessed the contribution careers of around 2000 disability beneficiaries (included in the 1% sample) who retired until 2010. This sample size is relatively broad though not very extensive. Therefore, our findings may provide only a rough indication of pre-disability contribution careers. Our results show that NDC and IC pension entitlements - which reflect past contribution careers - are generally lower for disability beneficiaries. The difference to average ZUS contributors is, however, not very extensive. The IC variable - which reflects contribution careers before 1999 - is on average 7% (11%) lower for disability beneficiaries compared to a standard ZUS member. NDC contributions paid since 1999 until two years before disability retirement - are more similar to average ZUS members. Female NDC contributions of disability beneficiaries are on average 9% lower than of their non-disabled counterparts. Male disability beneficiaries, on the contrary, show more or less the same NDC contributions after 1999 as non-disabled ZUS members of the same age group. Only in the year(s) before the disability retirement occurs a significant divergence of the two groups can be observed. Contributions one year before the disability benefit is granted are 29 (43) percent lower than average ZUS contributions. In our estimation of the NDC reform proposal we correct NDC and IC pension rights of an average ZUS member in line with these micro data findings. Future research should further investigate contribution careers of disability beneficiaries using a larger micro data sample to re-evaluate our findings.

Under the proposed 2010 NDC reform each contributor shall be treated as if he would have contributed his full old age contributions to the NDC system, i.e. 19.52% of gross wages. Therefore, a correction coefficient $\omega$ is introduced. This factor is applied for those ZUS members who participated in the mixed pillar system and have therefore contributed 12.22% of gross wages, only. The input data for our estimations consists of average NDC accounts (NDC_average) of mixed and single pillar members. As we know that the NDC account of a single pillar person in 2010 should be higher than a multi-pillar person by $\omega = 1.6 (=19.52/12.22)$ and as we know the FDC participation (FDC_part) rates by age ($x$) and gender ($g$), we can estimate the average NDC account in 2010 of a multi-pillar member (NDC_multi) based on the following formula:

$$NDC_{\text{multi}}_{x,g} = \frac{NDC_{\text{average}}_{x,g}}{1.6 \cdot (1 - \text{FDC}_\text{part}_{x,g}) + \text{FDC}_\text{part}_{x,g}}$$

We estimate the average difference by gender and birth year and weight it with the number of disability beneficiaries observed in each group.

Also in this estimation we control for the birth year.

Post-1999 contributions of disability beneficiaries are 1% higher than of average ZUS members.

For the FDC participation rates used in the calculations see Jablonowski et al. (2011), p. 30.
The NDC_multi by age and gender are then multiplied with the correction factor $\omega$ (amounting to 1.6) to calculate the corrected NDC account used in the new NDC disability formula. Likewise the average contributions in future years of a multipillar member are estimated (based on average contribution data provided by ZUS by age and gender). Also these average contributions are corrected by the correction factor $\omega$ amounting to 1.6 and revaluated by the expected general wage growth (based on AWG assumptions).

How the recent pension reforms enacted in 2011 and 2013 will effect a new NDC disability reform is not certain at this point as the past NDC disability reforms were rejected before the introduction of these new regulations. In March 2011 a new split of contributions was introduced: the FDC part was lowered from initial 7.3% to 2.3% and the NDC part was split into two subaccounts: NDC 1 and NDC 2. The indexation rules for the NDC 1 remained unchanged and equal to the nominal growth of the salary fund in the economy, whilst the new NDC 2 part, held also in the ZUS will be indexed in accordance with the average nominal growth of the GDP in 5 preceding years. Yet in 2013 a new law was adopted: according to which FDC contributions are no longer obligatory. FDC members were given the choice to switch back to the single pillar NDC system. Moreover, 51.5% of the FDC assets were shifted to NDC2 accounts and FDC contribution rates were lowered to 2.92%.

In our calculations of the NDC reform proposal we treat mixed pillar member as if they would have contributed their full old age contributions to the NDC system by correcting NDC1 accounts with a is time-invariant factor $\omega$ of 1.6. The advantage of this approach is that we can neglect NDC2 contributions (newly introduced in 2011) as well as shifted FDC capital (due to the 2013 reform). The results of our approach should not be significantly different to a consideration of NDC2 contributions as the interest rates for NDC1 and NDC2 do not vary considerably.81 A more detailed discussion of a consideration of NDC2 contributions is provided in Box 3 below. Also a consideration of shifted FDC accounts (after the 2013 reform) should not lead to considerably different results as interest rates of FDC and NDC were relatively comparable over the last years, see Jablonowski and Müller (2013), p. 39. Thus the increase in NDC accounts due to this shifted FDC assets would lead to similar results as a consideration of our correction factor $\omega$ amounting to 1.6.

Altogether, the corrected NDC accounts, the initial capital as well as future corrected contributions represent the fundament to estimate the development of future corrected total pension accounts by age, gender and future years.

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81 NDC1 accounts are indexed with the wage bill growth, while NDC2 accounts are adjusted with 5 year averages of GDP growth. One may assume that the wage bill growth should more or less be equal to the GDP growth. Therefore, interest rates of NDC1 and NDC2 accounts are similar.
In case of fewer than 30 contributory and non-contributory service periods accrued, a hypothetical career path is added. It depends on the missing periods to reach 30 service periods and on the past average accrual. For the estimation of hypothetical career path we assume an average entrance age into the labour market of 22 and a continuous service career.

Finally, the corrected total pension accounts by age, gender plus the value of the hypothetical career path equal the disability benefit basis (BCR). These total figure estimated by age, gender and for future years is then divided by the respective future unisex life expectancy at age 60 LE60 in a future year of retirement.

Annex 4: Comparison with the ZUS forecasts

The project of the reform act, together with the related explanations prepared upon request of the consulted organisations and ministries, covers results that could be confronted with the results of our study. We can distinguish two fields that can be compared: 1) the cash balance of the disability fund and, 2) adequacy indicators. However, firstly such comparison needs the initial disclaimers as the estimation approach of ZUS and of our model differ considerably in term of assumptions, benefit coverage and data inputs.

The results showed in the reform act were prepared by ZUS and the Ministry of Labour and Social Policy on basis of the ZUS09 actuarial model. Similarly to our estimations, the ZUS model bases on cohort data, age- and gender-specific. First, it has to be underlined that he ZUS model results cover a broader category of social benefits which are not considered in our estimations, namely survivors’ benefits, sickness leave benefits and rehabilitation benefits. In our calculations we focus solely on pure disability benefits (see description in chapter 5). But also a number of further differences of the modelling approach and of assumptions between the ZUS and RCG estimates can be identified. These differences are summarized in 16 and 17 below.

Table 16. Comparison of model approach and assumptions

<table>
<thead>
<tr>
<th>ZUS</th>
<th>RCG</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. estimations cover disability, survivors”, sickness and rehabilitation benefits</td>
<td>estimations focus on pure disability</td>
</tr>
<tr>
<td>2. all results are computed for a person completely unable to work (100%)</td>
<td>partly and completely</td>
</tr>
<tr>
<td>3. general pension indexation =20% g Minimum pension indexation = 20% g (see discussion Box 1)</td>
<td>the same 100% g pre-retirement indexation and 20% post-retirement indexation</td>
</tr>
<tr>
<td>4. results are computed for full calendar years, no division into months</td>
<td>the same</td>
</tr>
</tbody>
</table>
In terms of the general post-retirement indexation rules (post-ret-index) both models are alike and consider an annual adjustment of pension benefits with 20 per cent of wage growth. With regard to the minimum pension (MP) indexation, both models, however, differ. As discussed in box 2 we do not take into account the current very low minimum pension indexation rules amounting to 20% of average wage growth as we regard this adjustment rules as politically and socially not feasible and as it is not possible to model them adequately. As a consequence of these differences in the pre-retirement indexation (pre-ret-index), the level of MP varies between both models over time. In accordance with the lower pre-ret-index in the ZUS model, the level of the MP decreases from currently about 22 per cent of average wages to about 7 per cent for total disability pensioners (see Figure 38). If we apply the same indexation rules in the RCG model, we get a similar drop of MP levels to 9 per cent of wages until 2060. It is relatively straightforward to estimate

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**Table 17. Comparison of real wage growth applied**

<table>
<thead>
<tr>
<th>Rok</th>
<th>ZUS (g)</th>
<th>RCG (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>103.6</td>
<td>103.37</td>
</tr>
<tr>
<td>2020</td>
<td>103.7</td>
<td>102.33</td>
</tr>
<tr>
<td>2025</td>
<td>103.6</td>
<td>102.23</td>
</tr>
<tr>
<td>2030</td>
<td>103.2</td>
<td>102.13</td>
</tr>
<tr>
<td>2035</td>
<td>103.1</td>
<td>102.13</td>
</tr>
<tr>
<td>2040</td>
<td>103.3</td>
<td>102.13</td>
</tr>
<tr>
<td>2045</td>
<td>103.6</td>
<td>101.98</td>
</tr>
<tr>
<td>2050</td>
<td>103.6</td>
<td>101.84</td>
</tr>
<tr>
<td>2055</td>
<td>103.3</td>
<td>101.69</td>
</tr>
<tr>
<td>2060</td>
<td>102.9</td>
<td>101.54</td>
</tr>
</tbody>
</table>

Source: own elaboration.

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82 See the letter of the Undersecretary of State, Ministry of Labor and Social Policy, Mr. Marek Bucior on the request for clarifications by Ms. Irena Wójcicka, Undersecretary of State, Chancellery of the President of the Republic of Poland, dated 11 January 2011, Warsaw, 2011.

83 For a definition of the terms pre-retirement and post-retirement indexation see footnotes below of box 2
this decrease in MP levels. But it is not simple, and from our viewpoint not possible based on cohort data, to model the impact of this low pre-ret-index on aggregate expenditures. One cannot judge how many of new disability pensioners fall under this dropping threshold and therefore receive a MP. Such an estimation would require data on the past (and future projected) distribution of insurable earnings. Against this background, it would be interesting to know how ZUS overcame this modelling challenge. We stick to a pre-ret index of wage growth (g) – see green dotted line in Figure 39 below. Only thereafter the post-ret-index of 20% of wage growth leads to a drop of adequacy ratios (in terms of average wages) - see e.g. the example of retirement in 2020 and 2030 shown in Figure 39 below. The drop of MP levels is also remarkable when considering a pre-ret-index of g and a post-ret-index of 0.2 g - as outlined in Figure 39. For somebody retiring in 2020 the MPL would shrink from 22 per cent to 16 per cent after 20 years in disability.

Figure 38. ZUS model\textsuperscript{84} - Relation of the minimum pension to the average salary (dotted line for CD, solid for PD)

The lowest pension due to inability to work at the end of the year as a share of the average salary in a given year

\textsuperscript{84} Also available in extended version on www.zus.pl/seminariaprognozy (requires login, as of June 2012).
A comparison of cash balances also shows differences between ZUS and RCG model results. According to ZUS the deficit of the disability fund (DF) will further shrink in future years. As outlined, our estimations do not represent a perfect benchmark for ZUS cash balance results as we only focus on the pure disability system. Apparent is nevertheless that our results indicate into a completely different direction: At least the pure disability cash flows – which represents about 40 per cent of DF expenditures – will turn from a deficit in 2010 to a surplus from 2015 onwards.

**How can these differences in cash balance results under the legal status quo be explained?**

Unfortunately, we can only guess at this point as we lack detailed information on the ZUS model. The ZUS model is still to a large extent a black box. Nevertheless, we want to provide a number of possible explanations for these differences in cash balances:

1) The ZUS model may also estimate a future surplus for the pure disability system. The surplus may however be outweighed by an increasing deficit of the other benefits of the DF.

2) The ZUS model may not consider incidence rates. In fact, they may apply constant prevalence rates of disability, i.e. keeping the current probability to be a disability beneficiary constant over time. We have seen that such an approach is clearly too simplified. Alone in the last years age specific prevalence rates dropped remarkably – see Figure 5 – as the number of inflows into the disability system decreased due to stricter eligibility criteria. Our estimations have shown...
that the low inflow into disability in comparison to the outflow is the main trigger for the future sharp decrease in disability expenditures – see chapter 6.2.1. The assumption of constant prevalence rates and the neglecting of incidence rates is, therefore, not a proper approach to project future disability finances.

3) The lower pre-ret-index of the MP in ZUS estimations, on the contrary, cannot explain the differences between the ZUS and the RCG model results. In fact, a lower pre-ret-index of the MP should result in lower average pensions and therefore in lower expenditures in the ZUS model.

**Figure 40. ZUS model - Deficit projection of the entire disability fund**

Yearly disability fund balance - discounted to 2009 values using inflation rates. Decrease in contribution to Open Pension Funds and subaccount, current disability benefit regulation.

![Graph showing deficit projection of the entire disability fund](image)


**Figure 41. ZUS model - Deviation of the deficit projection of the entire disability fund to status quo for alternative political scenarios**

Differences in yearly disability fund balance in comparison to regulations with retirement ages 60/65 - discounted to 2009 values.

![Graph showing deviation](image)

In conclusion, the results of the ZUS model and the RCG model are not perfectly comparable as the former model considers not only pure disability benefits but also survivors', accident and rehabilitation benefits. Nevertheless, the shown differences of outcomes are quite astonishing. The ZUS model predicts an increasing deficit of the entire disability fund. Our RCG model indicates that at least the pure disability pension system - which represents about 40 per cent of the disability fund expenditures - will run considerable surpluses in future years. We assume that a possible disregarding of incidence probabilities may lead to imprecise forecasts of the ZUS model and may explain to a large degree the differences of model results. Against this background, we hope that our study triggers a discussion on the adequate projection of disability expenditures in Poland (and beyond).

**Annex 5: Accuracy of the primary decision by medical practitioners for the purposes of the disability status**

In this paper we use in computations the primary decisions issued by the ZUS assessment doctors in the process for application for the disability status, broken down by age and gender of an applicant. Therefore, it was important to verify if the primary decisions are not undermined by the second instance decisions, issued by the medical commissions. If it was so, then the accuracy of the estimations would be biased by the unknown error. Additionally, our findings may serve as a proof of the tighter eligibility criteria, introduced in 2005, that significantly reduces the possibility to become a fake disability pensioner.
In accordance with our following inspections, this is not the case: in 2010 the ZUS assessment doctors, for the purpose of the disability status, in 11.2% of the decisions rejected the request for the disability status. Out of total 45 thousand decisions that finally granted any disability status, 38 thousand were issued for the employees, and out of this figure 95% of cases were due to health status, 3% due to accident, and 1.3% due to profession related diseases. The medical commissions verify the first instance decision in 4 cases: 1) when a ‘disabled’ person is unhappy with the result, then within 14 days he/she should protest the decision (87% of all decisions issued by the commissions in 2010), 2) when the decision was erroneous from the procedural point of view (10%), 3) upon request of the general chief practitioner of ZUS, usually during sample control, 4) upon decision of the chief practitioner of given workplace of disabled person.

The ZUS assessment doctors issued altogether 780 thousand of any decisions (primary, secondary etc.), of which 90 thousand were questioned and verified by the commissions in 2010. Out of overall number of 145 thousand (within only 45 thousand of those precisely related to first-time granted disability status) of primary decisions for the disability purposes issued by the ZUS assessment doctors in first instance, 18 thousand were questioned, and, in consequence, analysed by the commissions. Within these 18 thousand, 75% sustained the decision by ZUS assessment doctors and 25% changed it. These changed 25% amounted to around 4.5 thousand, of which 2.8 thousand decisions changed the disability status: in case of the total disability status the commissions increased the disability status in 25% of questioned cases (from complete inability to work to complete inability to work and autonomously exist). Regarding the partial inability to work the commissions usually decreased the disability status, however, in statistically insignificant proportion. The interpretation of these facts from the point of view of our study is quite straightforward: roughly 6% (2.8 thousand out of 45 thousand) of the decisions issued by the ZUS assessment doctors were questioned in 2010, and re-analyzed by the medical commissions, of which increased status was granted in 25% for persons completely unable to work, and in 1% of cases the status was decreased in case of persons partly unable to work.

To conclude, for the purposes of our project we can assume that in 99.9% the ZUS assessment doctors’ primary decisions, issued for the purposes of any disability status are confirmed in actual status of a new beneficiary.
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