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Abstract

Since 2014 Poland is the country with the highest share of temporary workers in the EU. Civil law contracts, a type of temporary contracts, allow payment of lower retirement pension contributions than implied by employment contracts. We use a cohort pension model to quantify the impact of civil law contract use on revenue from contributions and spending on pensions in Poland. Between 2005 and 2015, the rising incidence of civil law contracts reduced the revenue from contributions in the general pension system by PLN 2.4 billion per year on average. This widened the pension fund deficit by approx. 5%. In the future (2016-2050), the impact of civil law contracts on the revenue from contributions will wane because of demographic changes and rising educational attainment of the workforce. However, its impact on pension spending will increase with time, although it will be weaker than the effect on revenue from contributions. Hence, labour market segmentation will deteriorate the pension system balance. The obligation to pay contributions on all contracts of mandate from at least the minimum wage level, introduced in 2016, is not sufficient to balance out the impact of segmentation on the pension system balance.

Key words: labour market segmentation, defined-contribution pension system, public finance, fiscal policy

JEL: J26, J41, J42, H55, H60

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Introduction

Nowadays, pension spending is the most expansive category of public spending in most developed countries. In 2014, in Poland they accounted for 22% of the general government spending, and amounted to 9.2% of GDP (which was equal to the mean pension spending among the EU countries, Eurostat data). Ensuring an efficient financing of retirement benefits is therefore an essential challenge for fiscal policy. After the Polish pension reform of 1999, the pension fund created within the Social Insurance Fund (FUS) became the main component of the pension system architecture in Poland. Since the onset of FUS, its fundamental issues have been (i) the lack of self-financing and (ii) the resultant necessity of subsidies from the state budget to ensure state-guaranteed pension payments. The main reason for shortages in FUS is the deficit in the pension fund.

At the same time, the number of people working on the basis of civil law contracts in Poland has increased. The features of this form of work, such as lower average wage, irregular employment cycle and lower pension contributions, translate into both decreasing numbers and amounts of contributions paid by workers (when compared to employment contracts with full contributions). The impact of the labour market segmentation on the contribution-based pension system is indeed emphasised in literature. Boeri et al. (2013) indicate that this impact is greater in the defined-contribution system than in the defined-benefit system. Takayami et al. (2012) based on a sample of almost 4 thousand members of the Japanese pension system aged 30-49, come to the conclusion that segmentation might significantly increase poverty among pensioners in the future. Lewandowski et al. (2016) estimate that the labour market segmentation in the defined-contribution Polish pension system reduces pension benefits, especially for women and people with lower levels of education. Hinrichs et al. (2012) notice that it may result in an increase in the number of people receiving a minimum pension benefit and in the number of pensioners in risk of poverty.

An irregular employment cycle and lower contributions lead to the situation where growing popularity of civil law contracts is also conducive to decreasing revenues of the public finance, notably of the pension fund. However, in the contribution-based system this translates into lower pension system liabilities in the future. In this paper we assess how the growing popularity of civil law contracts impacted the balance of the FUS pension fund in the past (2005-2015) and how it would impact it in the future (2016-2050). To this end, we apply the cohort demographic and pension model developed in the Institute for Structural Research.

The paper is divided into five sections. The first section presents the pension fund situation over the 1999-2015 period, in particular the evolution of the fund's deficit. The basic facts on growing popularity of civil law contracts and a theoretical take on this situation's impact on revenue and spending of the FUS pension fund are presented in section two. The third section discusses methodological assumptions of the applied model and the two simulated scenarios, i.e. the baseline scenario of growing popularity of civil law contracts, and the alternative one assuming that civil law contracts do not exist and employment contracts prevail. The results are analysed in section four. Its first subsection presents a historical analysis of the 2005-2015 period, while the second subsection discusses the projected impact of civil law contracts' use on the situation of the pension system in the period 2016-2050. Policy conclusions are presented in the final section.

1. The situation of the Polish pension fund in 1999-2015

In 1999-2010 the pension fund deficit, i.e. the difference between spending on benefits and revenues from contributions, grew rapidly (Figure 1). In current prices, that deficit increased more than fivefold – from PLN 10.0 billion in 1999 to PLN 50.3 billion in 2010. In parallel, there was a decline in the share of contributions as a source of financing for pension benefits paid by the fund (Figure 2). In the first years after the 1999 pension reform, contributions covered almost ¾ of the pension fund spending on benefits. By 2010, their share in the fund pension spending fell to 51%. This means that in 2010 almost half of spending was covered by other funding sources (mainly by subsidies from the state budget). This growing imbalance of the pension fund had a negative impact on public finances. In 2010, the general government deficit reached its record high of PLN 108.8 billion (7.5% of GDP). Almost half of that deficit resulted from the pension fund gap. In order to reduce those imbalances, systemic changes were introduced in 2011 and 2014. At first, contributions transferred to the funded pillar of the system (Open Pension Funds – OPF) were reduced from 7.3% to 2.3% of the contribution basis (gross wage). Then, voluntary participation in OPF and a mechanism of gradual transfer of funds from OPF to FUS (the so-called pension fund release) were introduced. Those changes contributed to downsizing the pension system deficit, which in 2011-2015 oscillated between PLN 37 and 43 billion. The benefit-contribution coverage ratio also increased – up to nearly 70% in 2015.

Figure 1. Pension fund deficit in 1999-2015, in PLN billion.*

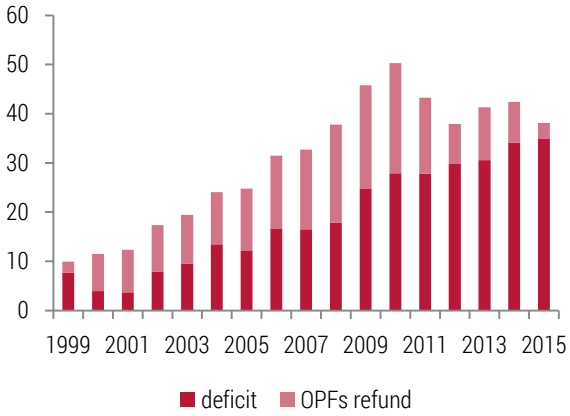
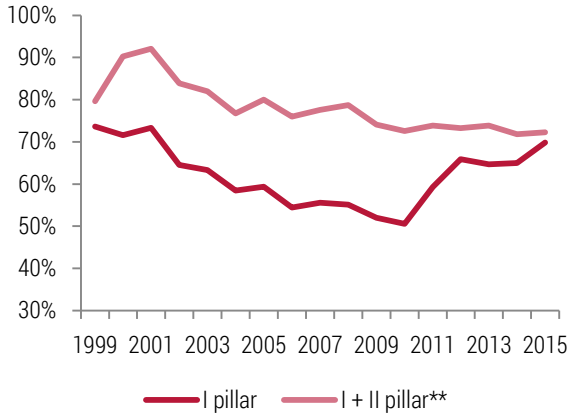


Figure 2. Ratio between revenues from contributions and pension fund spending on benefits in 1999-2015.



** difference between spending on benefits and revenue from contributions*
*** contributions refunded to OPF are recognised as the pension fund revenue from contributions*
Source: own study based on FUS reports and the 1999-2002 yearbook of social security statistics.

The pension fund deficit in Poland can be divided into two components: the deficit resulting from the creation of the funded pillar in 1999, and remaining deficit. After the creation of the funded pillar, a fraction of total pension contributions was transferred to OPF. This lowered the contribution revenue of the FUS pension fund (in comparison to the no funded pillar case) but in the short term it didn't impact on FUS pension spending. Hence, a part of FUS deficit can be attributed to the creation of the funded pillar – in 1999-2000 it accounted for around half of the pension fund deficit (see Figure 1). Systemic changes that took place in 2011 and 2014 reduced that part of the deficit, but the increase of the remaining part of the deficit was not inhibited (see Figure 1). The problem of insufficient self-financing of the pension fund was not permanently resolved, but only ceased to intensify (due to a decrease in contributions transferred to the funded pillar of the system). Nevertheless, in 2015

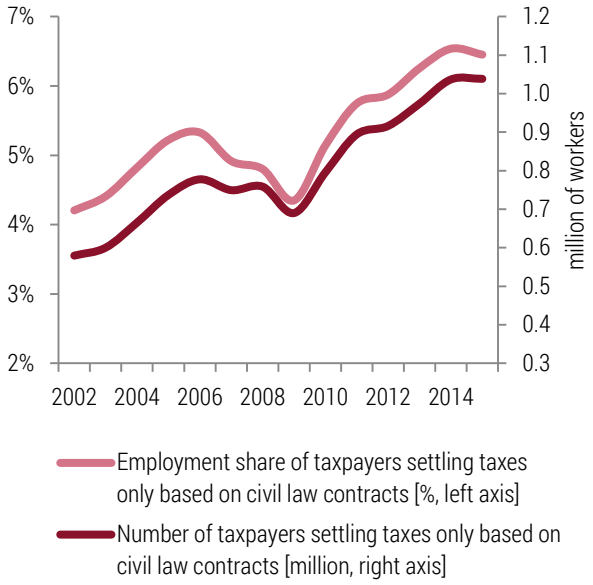
approx. 1/3 of total pension spending had to be covered from sources other than contributions (Figure 2). It should also be pointed out that even if the funded pillar had not been introduced in 1999 and all contributions had been transferred to first (notional) pillar, the ratio between revenues from contributions and the pension fund spending on benefits would have gradually decreased – from 92% in 2001 to 72% in 2015 (see Figure 2). Therefore, a pension fund deficit is a systemic issue of fundamental importance to public finances. The cumulative value of the pension fund deficit between 1999 and 2015 stands at PLN 588.1 billion (in 2015 prices), i.e. 67% of the public debt figure as at the end of 2015 (out of this amount, PLN 234.6 billion can be attributed to the contributions transferred to OPF, and PLN 353.5 billion to the remaining part of the pension fund deficit).

2. The widespread use of civil law contracts in Poland

Since the early 2000s, a significant increase in temporary employment has been observed in Poland. In 2000, the number of individuals working under temporary contracts was 0.61 million, while in 2015 it stood at 3.51 million, an almost six-fold increase (Figure 3). Besides fixed-term employment contracts, civil law contracts have also become a popular way to contract workers. There are two types of these contracts: contracts of mandate or contracts for a specific task. Civil law contract are not based on the labour code and differ from employment contracts in several regulatory aspects (for details, see Arak et al., 2014, Lewandowski et al., 2016). In particular, they allow payment of lower social security contributions that employment contracts.

Figure 3. Persons employed under open-ended and fixed-term contracts in 2002-2015, in millions.

Figure 4. PIT payers who earn income solely from civil law contracts



Source: own calculation based on data provided by the Ministry of Finance and GUS.

In the absence of necessary data, it is difficult to estimate precisely the change in the number of workers contracted under civil law contracts. According to the Ministry of Finance data, the number of persons who settled their personal income tax (PIT) solely under civil law contracts increased from 0.58 million in 2002 to 1.04 million in 2015. In 2015, such taxpayers constituted 6.5% of the total employment (Figure 4). On the basis of the survey of companies employing at least 9 workers, Polish Statistical Office (GUS) reported that the number of persons working under civil law contracts increased from 0.55 million in 2010 to 1.17 million in 2014. Contracts of mandate (a focus on this paper) were more often used than contracts for a specific tasks – in 2014, 0.97 million people worked under contracts of mandate, whereas 0.20 million people worked under contracts for a specific

task (GUS 2012; GUS 2015). The statistics provided by GUS and the Ministry of Finance are not fully consistent, yet both point to a significant growth in the use of civil law contracts on the Polish labour market.

There are three distinct channels through which the use of civil law contracts affects the level of revenues from social security contributions, in particular from pension contributions. Firstly, empirical evidence shows that in general temporary contract workers are paid less than workers employed under open-ended contracts, even after factoring out the influence of individual characteristics, such as sex, education level or work tenure (Boeri 2011; Magda and Potoczna 2014; Lewandowski et al. 2016). Secondly, civil law contracts are connected with irregular employment cycles and, as a consequence, with irregular payment of contributions. ZUS data show that in 2013 the annual average number of months worked among individuals who worked exclusively under a contract of mandate was approximately 8 months (Lewandowski et al. 2016). Thirdly, in accordance with Polish regulations concerning contracts of mandate, the contribution assessment basis may be significantly lower than in the case of employment contract. It is reflected in the data. ZUS data for 2013 show that the average contribution assessment basis among individuals working under contracts of mandate constituted approximately 1/3 of the average contribution assessment basis among individuals working under employment contracts (Figure 5 and 6). Until the end of 2015, an individual working exclusively under contracts of mandate who entered into more than one such contract, was subject to a compulsory social insurance only with respect to the first contract this individual had signed. From 2016, there is an obligation to apply social insurance contributions to all contracts of mandate; but the contributions are calculated on the basis of the minimum wage. Furthermore, persons working under contracts for a specific task, and students under 26 years of age who are employed under contracts of mandate are not subject to universal social insurance, and thus pay no contributions.

Figure 5. Average pension contribution base for women in 2013.

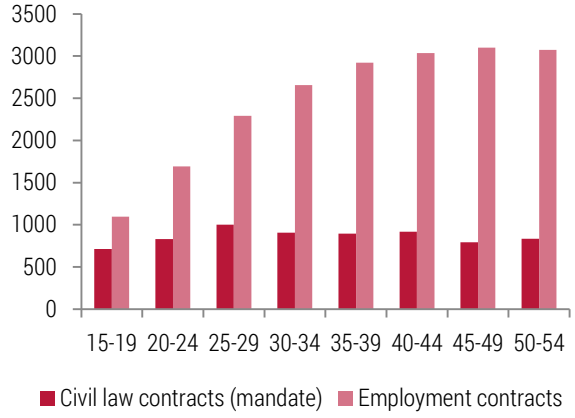
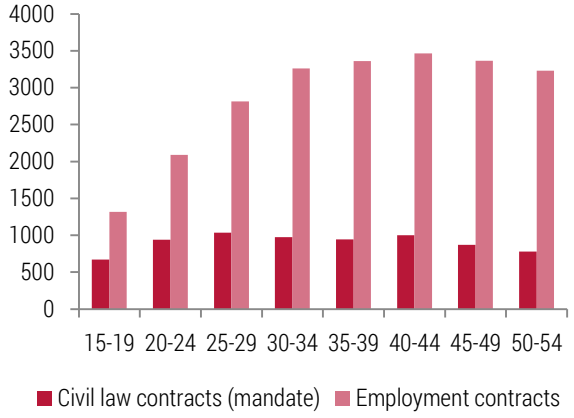


Figure 6. Average pension contribution base for men in 2013.



Source: Lewandowski et al. 2016.

3. Model and projection assumptions

3.1 The demographic and pension model

In order to assess the impact of the widespread popularity of civil law contracts on the pension system, we apply the cohort demographic and pension model developed in the Institute for Structural Research. It's a yearly model and in this paper we use it for the 2000-2050 period. The demographic part of the model is composed of historical data and assumptions about fertility, mortality rates and migration balance by sex and one-year age

groups until 2050. Appendix 1 contains basic demographic assumptions of the model. In the pension part of the model, subgroups, which we call "profiles", are distinguished by sex and education level (at least tertiary education, post-secondary/vocational secondary education, upper secondary education, basic vocational education, lower secondary education or below) for each birth cohort. The expected employment probabilities and wages over the life cycle are calculated for each cohort born in the period 1948-1983 (men) and in the period 1950-1985 (women). Appendices 2–5 contain assumptions about the shares of individuals working under employment contracts and civil law contracts (which we call "segments") as well as assumptions about pension contribution bases for both segments. The next step is to calculate, for each cohort in any projection stage, the expected number of employment years, the accumulated pension capital and the pension contribution, divided into the Social Insurance Fund (FUS), the Open Pension Fund (OPF) and the so called sub-account.[1] We assume that every individual retires after reaching the statutory retirement age and that the retirement benefit is calculated as an annuity based on the life expectancy in the relevant population at the retirement age. We assume the path of statutory retirement age as provided for in the Act of 11 May 2012 amending the Act on Pensions and Benefits from the Social Insurance Fund and Certain Other Acts (reference of the Polish Journal of Laws: Dz. U. of 6 June 2012, item 637), i.e. a gradual increase in the retirement age for both men and women to 67 years. The outcome of the pension model is the expected pension for a person of a given sex, born in a given year and completing education at one of the distinguished education levels.

Moreover, by using both demographic and pension modules, the model provides aggregate values of pension revenue and expenditure for particular years, divided into the Social Insurance Fund, the Open Pension Fund and the sub-account. The total amount of pension contributions paid in a given year is obtained as the expected pension contribution in a given profile multiplied by the number of individuals in a given profile, and summed across profiles and across all one-year age groups between 15 years of age and the statutory retirement age. The aggregate pension spending is the sum of amounts is obtained as the expected pension received by a given profile multiplied by the number of individuals in a given profile, and summed across all the one-year age groups that have reached the statutory retirement age.

In a defined-contribution pension scheme, lower contributions translate into lower pensions in the future. However, this principle is disrupted by the minimum pension guarantee (which his conditional on accumulating a threshold work tenure). In order to calculate the number of individuals receiving minimum pensions, we assume that for each profile the distribution of pensions granted in a given year is uniform, with the expected value equal to the outcome of the model for a given profile (relevant annuity), over a distance equal to 2/3 of the model outcome for a given profile (relevant annuity). Such a simplified assumption is needed due to the unavailability of data on aggregate distributions of job tenure and wages (contribution bases) by sex and education level, or at least the distributions of pensions granted by sex and education level, which are essential for any precise parametrisation of pension inequality within the profiles included in our model.[2] Nevertheless, this simplified assumption, together with 10 distinct profiles per cohort by sex and education level, provides an insight into the differentiation of pensions granted: the variation coefficient of pensions granted in the model is 32% in 2015 and

[1] The sub-account is a notional account run by FUS that accumulates the contributions moved from OPF to the first pillar.

[2] ZUS publishes only the general break-down of pensioners who are granted benefits in a given year, by amount of benefit (see ZUS, 2015).

grows to reach 46% after 2030. To compare, based on ZUS data (2015) we estimate that the coefficient of variation of pensions granted in 2014 is 48%. We also assume that the future minimum pension will be indexed at the pace of inflation, plus 20% of the average real wage growth.

For 2000-2015, the model is based on the actual values of macroeconomic variables, whereas for 2016-2050 we apply a macroeconomic scenario in line with the *Guidelines for applying uniform macroeconomic indicators as a basis for estimating the financial impact of bills* of November 2013, used by the Ministry of Finance. Table 1 summarises the macroeconomic assumptions used in the model, with the means of annual average growth rates for selected variables over the period 2016-2050. It is assumed that the annual average inflation will amount to 2.1%, yet it will systematically decrease from 2016 on and stabilise at the level of 2% in 2027. The forecast for the annual average real Gross Domestic Product growth rate is 2.8% and the real labour productivity gains are at the level of 3.5%. It is also assumed that the real wage growth will be slightly lower than the labour productivity gains, reaching 3.2%. The expected rates of return on assets are relatively high, reaching 2.7% for treasury bills, 4.9% for assets traded on the Warsaw Stock Exchange, and 3.8% for other assets of Open Pension Funds. It should also be pointed out that despite the fact that the macroeconomic assumptions are of crucial importance for forecast amounts of pensions, contribution revenues and pension expenditures within the pension system, they do not matter for our findings in this paper because they do not influence the differences between outcomes for various labour market scenarios, distinguished on the basis structure of employment by type of contract.

Table 1. Summary assumptions of the macroeconomic scenario until 2050

Macroeconomic variable	Annual average change (in %)
Inflation	2.1
GDP change (real)	2.8
Real wage growth	3.2
Rate of return on treasury bills	2.7
Rate of return on the Warsaw Stock Exchange	4.9
Rate of return on other assets in Open Pension Funds	3.8

Source: own elaboration.

3.2 Employment and wage scenarios

The model implements employment and wage scenarios for every profile (intersection of the education level, sex and five-year age groups) in each projection year. In order to map values of the profiles to their counterparts in one-year age groups by sex and education level, we apply a disaggregation algorithm prepared at the Institute for Structural Research and implemented in R. The algorithm takes a variable, a, described over a grid of ordered values with a specified frequency, a_j where $j \in J$ is a set of five-year age groups (15-19, 20-24, …., 60-64), and recalculates them over a grid with a higher frequency , a_{ji} where $i = 1, \dots, 5$, identifies consecutive years within each five-year age group. The algorithm minimises distances between every two consecutive disaggregated values, a_{ji}, with a criterion $min \sum_{j \in J} \sum_{i=1}^{5} \left(a_{ji} - a_{j(i-1)}\right)^2$ (where $a_{j(0)} = a_{(j-1)5}$), under the condition that, for every j, $a_j = \frac{1}{\max\{i\}} \left(\sum_i a_{ji}\right)$ if a variable a is an indicator (e.g. employment rate or average wage), or under the condition that, for every j, $a_j = \sum_i a_{ji}$ if a variable a is a population total (e.g. population or employment).

For each profile, two employment and wage scenarios are drawn up. The first scenario assumes no civil law contracts on the labour market, whereas the other – a widespread use of such contracts in line with the observed patterns. As in Lewandowski et al. (2016), the 2012-2013 Labour Force Survey data, the 2012 Structure of

Earnings Survey data and ZUS 2013 data are used to draw up the employment and wage scenarios. Unfortunately, the exact distribution of the probability of working under civil law contracts by age, education and sex in 2000-2015 is unknown (ZUS data provide only information about the distribution by age and sex). Therefore, the probabilities of working under civil law contracts are estimated for particular education groups based on two datasets – 2012 Labour Force Survey and 2012 Structure of Earnings Survey. LFS data cover all workers, while SES only individuals working under (open-ended or fixed-term) employment contracts. By calculating differences in the number of individuals employed on temporary contracts in the LFS data and on fixed-term contracts in the SES data, we find the distribution for civil law contracts employment shares by profile (by sex, age and education level). Since individuals with spells of work under civil law contracts show a higher risk of frictional unemployment (Lewandowski 2015), it is also assumed that the employment rate in the civil law contract segment is lower than in the employment contract segment, *caeteris paribus* with respect to differences in age, sex and education level.

Moreover, for the purpose of employment forecast for 2016-2050 we assume that marginal distributions are fixed over time, i.e. we assume that the probability distribution for being employed under a specific contract type for individual profiles is constant over time. This is due to the fact that there is no relevant panel data which could be used to estimate the probability of transfer between the individual classes within the period [t,t+1].

Following Lewandowski (2015), we assume a certain proportion between the contribution bases for individuals working under employment contracts and those working under contracts of mandate, by sex and age. Since the ZUS data used by Lewandowski (2015) do not account for the education level, we assume that the difference is identical (in relative terms) for every education level. The average income by profile (sex, age, education level) in the employment contract segment is estimated based on the SES data (2012), in relation to the average wage. By combining these two distributions, it is possible to express wages (contribution base) for both segments in relation to the average wage. Similarly to the probability of working under a specific type of contract, it is assumed that marginal distributions are fixed over time. As a result, the base of pension contribution is calculated for each profile, in proportion to the average base of pension contribution in a given year.

4. The impact of labour market segmentation on the pension fund

4.1 Revenue from pension security contributions in the period 2005-2015

Table 1 presents the results of the model regarding the revenues from contributions, to the first and the second pillar separately, in 2005-2015. Two scenarios are considered: the reference scenario that includes a growing popularity of civil law contracts, and the alternative scenario that assumes the non-existence of civil law contracts and prevailing employment contracts (or, equivalently, full contributions paid under civil law contracts and the same employment probabilities and wages as in the case of employment contracts). All values are expressed in constant 2015 prices. Our results show that the average revenue losses resulting from the growing incidence of civil law contracts amounted to PLN 2.4 billion per year between 2005 and 2015. In the reference scenario, revenues from contributions were by at least 2.2% (in 2009) and by as much as 3.1% (in 2015) lower than they would have been in the alternative scenario. In monetary terms, the difference between the reference and alternative scenarios was increasing in time: it amounted to PLN 1.8-2.1 billion per year in 2005-2009, to PLN 2.2 billion in 2010 a maximum of PLN 3.3 billion in 2015. The main factor behind it was the increase in the number of people working under the civil law contracts, as observed especially since 2010 (see Figure 4).

The accumulated value of pension system revenue losses resulting from the use of civil law contracts is estimated to have reached PLN 26.2 billion in 2005-2015, out of which PLN 21.4 billion were revenue losses in the first pillar (PLN 1.9 billion per year on average) and PLN 4.9 billion were revenue losses second pillar (OPF) revenue (PLN 0.4 billion per year on average). If the incidence of civil law contracts had not grown, the total OPF contribution revenue in 2005-2015 would have been 3% higher than the actual revenue in that period (PLN 175.4 billion in comparison to PLN 170.6 billion, in 2015 prices). The OPF revenue losses were higher in 2005-2010 (PLN 0.6 billion on average) than in 2011-2015 (PLN 0.3 billion on average), because the contribution rate paid to OPF was reduced in May 2011. In contrast to the second pillar, the revenue losses in the first pillar were lower in the period 2005-2010 (PLN 1.4 billion on average) than in 2011-2015 (PLN 2.6 billion on average). It resulted both from a higher incidence of the civil law contracts in 2011-2015 and the rate paid to the first pillar was increased in May 2011. In the alternative scenario, the revenue brought into the first pillar of the pension system would have amounted to PLN 706.9 billion, which is 3% above the actual revenue (PLN 685.5 billion, in 2015 prices).

Table 2. Revenue from contributions paid to the first and second pillar of the pension system – difference between the reference labour market scenario and the alternative scenario (no civil law contracts) (in PLN billion, 2015 prices)

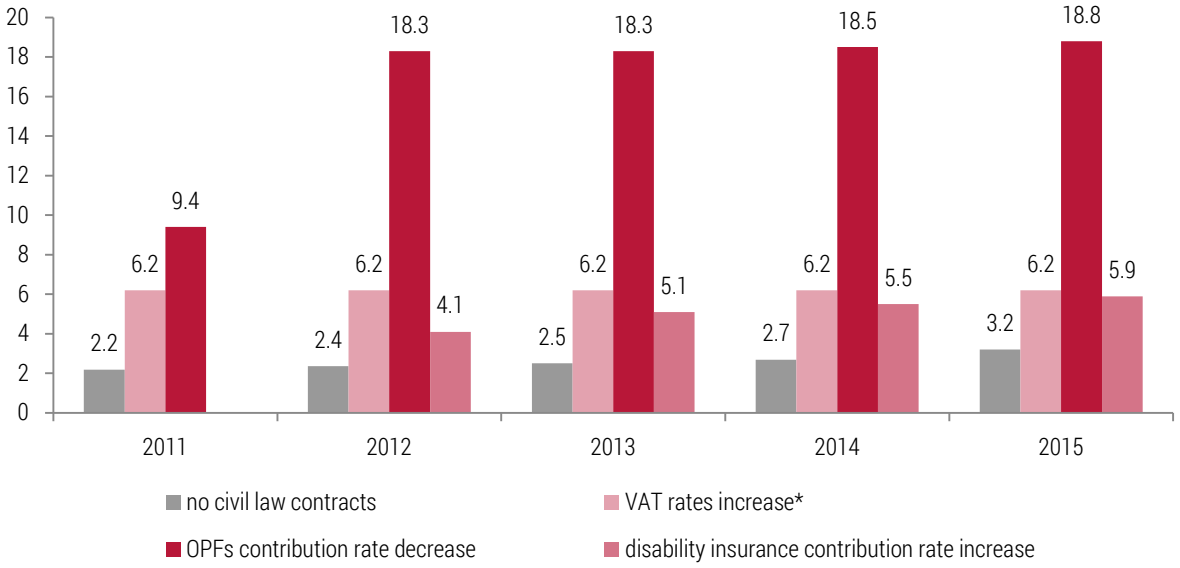
Year	First + Second Pillar			First Pillar		
	in PLN billion (2015 prices)	in PLN billion (accumulated, 2015 prices)	in %	in PLN billion (2015 prices)	in PLN billion (accumulated, 2015 prices)	in %
2005	-1.8	-1.8	-2.7%	-1.3	-1.3	-2.6%
2006	-2.0	-3.8	-2.8%	-1.4	-2.7	-2.6%
2007	-2.1	-5.9	-2.6%	-1.5	-4.1	-2.5%
2008	-2.0	-7.8	-2.5%	-1.4	-5.5	-2.4%
2009	-1.8	-9.6	-2.2%	-1.3	-6.8	-2.2%
2010	-2.2	-11.8	-2.6%	-1.5	-8.3	-2.5%
2011	-2.5	-14.3	-2.8%	-2.3	-10.5	-2.8%
2012	-2.6	-17.0	-2.9%	-2.4	-12.9	-2.8%
2013	-2.8	-19.8	-3.0%	-2.5	-15.4	-3.0%
2014	-3.1	-22.9	-3.0%	-2.8	-18.2	-3.0%
2015	-3.3	-26.2	-3.1%	-3.2	-21.4	-3.1%

Source: own calculations.

The revenue losses resulting from civil law contracts' use have also a noticeable impact on the pension system balance between 2005 and 2015. Had not civil law contracts grown in popularity, the accumulated pension fund deficit (the difference between revenue from contributions and spending on benefits) in the period 2005-2015 would have been by 5% lower (PLN 439.5 billion instead of the actual PLN 460.9 billion deficit, in 2015 prices). The average benefit-contribution coverage ratio would have increased from 58% to 61%. Lower incidence of civil law contracts would therefore not have solved the issue of deficient self-financing in the pension system's first pillar. Limiting the pension fund deficit requires systemic changes. Yet, the growing incidence of civil law contracts exerted a noticeable effect on public finances. Significant difficulties in maintaining the stability of public finances in Poland occurred mostly after the outbreak of the global financial crisis. The exceptionally high deficits in the government and local government sector in 2009 and 2010 (7.3% and 7.5% GDP respectively) forced the government to take measures to address the fiscal imbalance. These included: increase of VAT rates by 1pp. from January 2011, decrease of the contribution rate paid to OPF from 7.3% to 2.3% from May 2011, and

increase of disability insurance contribution by 2 pp. (from 6% to 8%) from February 2012. Figure 7 compares the estimated impact of these changes on the public finance revenues with the impact of civil law contracts' use on the first pillar of the pension system. We think that preventing civil law contracts from gaining widespread popularity would have had no effect on the decision to reduce the contribution paid to OPF in 2011, since the 2011 change increased the contribution revenues to the first pillar significantly more than would have been gained by eliminating the use of civil law contracts (still, it cannot be ruled out that the OPF contribution rate reduction could have been lower). However, in comparison to two other fiscal changes implemented by the government in 2011-2012, the contribution revenue loss in first pillar, resulting from the civil law contracts' use, was noticeable. We estimate that it amounted to 52% of the public finance revenue increase due the disability insurance contribution rate increase (in 2012-2015), and to 42% of the public finance revenue increase due to the increase in the VAT rates (in 2011-2015).

Figure 7. The estimated public finance revenue increase resulting from the selected measures taken in 2011 and 2012 as compared to the impact of civil law contracts' use on the pension fund balance (in PLN billion, in current prices).



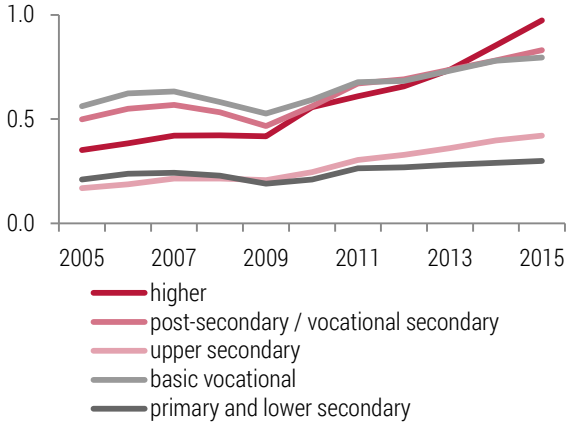
** calculated for the period 2011-2013; the same value has been applied to 2014 and 2015*
Source: own calculations based on the impact assessment of relevant legislative acts.

We also find that the lower contribution revenues of the FUS pension fund were driven to a larger extent by losses on contributions paid by men than by losses on contributions paid by women (Figure 7). This reflects higher average wages of men (also among those working under civil law contracts).[3] The growing popularity of civil law contracts affected mainly individuals with vocational or post-secondary education, hence the loss on contributions paid to the pension fund by these groups of workers is the highest (Figure 9). However, the share of individuals with tertiary education among the civil law contracts workers was gradually increasing (from 13% in 2005 to 22% in 2015). Tertiary educated workers also enjoyed higher wages than other groups. As a result, the share of tertiary educated workers in the contribution revenue loss was increasing, and it reached 29% in 2015.

[3] The share of men among workers with civil law contracts was on average 49.8% in 2005-2015, ranging between 47.7% in 2013 and 53.1% in 2006.

Figure 8. The impact of civil law contracts on the pension fund balance in 2005-2015, by sex (in PLN billion, in 2015 prices).

Figure 9. The impact of civil law contracts on the pension fund balance in 2005-2015, by education level (in PLN billion, in 2015 prices).



Source: own calculations.

4.2 Projection of the situation of the pension fund in 2016-2050

In this subsection we discuss the projection of pension fund revenues and expenditures for the period 2016-2050. As opposed to subsection 4.1, we consider the pension system as a whole and we don't distinguish between the Social Insurance Fund, the Open Pension Fund and the so-called sub-accounts. This decision results from the difficulties in implementing the 2013 legislative changes that introduced voluntary participation in (and contributing to) the OPF. In particular, no data are available that would allow estimating the conditional distribution of the probability of participation in the second pillar (or joining the second pillar by individuals who enter the labour market during the projection period) by age, sex and education level. Furthermore, we compare three scenarios. The first one assumes the segmentation of the labour market as per Section 3 assumptions and the principles of applying contributions valid before 2015 (in other words, we apply the conditions preceding the amendment of the Act on Social Security System of 23 October 2014). This is our benchmark scenario. The second scenario assumes the labour market segmentation and the application of contributions to all civil law contracts (in particular, contracts of mandate) at least in the amount corresponding to the minimum wage level, as per the amendment of the Act on Social Security System of 23 October 2014, which introduced such obligation regarding the pension contributions as of 1 January 2016. The third scenario assumes that the civil law contracts are replaced by employment contracts (or, equivalently, full contributions on civil law contracts and the same employment and wage paths for each profile as in the case of employment contracts). The results are expressed in constant prices of 2015.

As our results show the labour market segmentation exerts a twofold impact on the defined-contribution pension system based in Poland. Firstly, it lowers the pension system revenues through reducing pension contributions and limiting the number of contributing workers. Secondly, it reduces the accrued capital and pension benefits due to lower number and value of contributions paid by workers (as compared to a scenario where contracts are employment contracts with full contributions being paid). This in turn reduces the pension system expenditures in the future. However, the impact of the labour market segmentation on pension system revenues is differently distributed over time than its impact on the system expenditures: lower contributions are paid over the career spans, while payments of corresponding lower pensions are deferred in time.

The pension fund revenue gap that stems from the rising incidence of civil law contracts – expressed as the difference in revenues between the scenarios with employment contracts, and civil law contracts and rules of applying contributions valid before 2015 – will be increasing steadily (see Table 3). According to our results, it will amount to PLN 5.0 billion in 2020, PLN 5.8 billion in 2030 and PLN 9.0 billion in 2050. The relative gap, expressed as a proportion of the revenues from contributions which would ensue in the benchmark labour market segmentation scenario, will equal 4.2% in 2020, and approx. 3.5% after 2030. Although in absolute terms the revenue gap will grow, in relative terms it will wane over the projection period. This patterns results from two factors and respective assumptions adopted in our projections. Firstly, the gradual increase in the share of tertiary educated workers, in particular among women, will reduce the employment shares of workers contracted under civil law contracts. Secondly, demographic developments will increase the employment share of older age groups. This in turn will lead to a relative decrease in the share of workers contracted under civil law contracts. In other words, the ageing and better educated workforce will be characterised by less pronounced segmentation, i.e. lower average probability of working under civil law contracts.

Our results also indicate (Table 3) that the obligation to pay pension contribution, in the amount at least corresponding to the minimum wage level, helps to reduce the adverse impact of labour market segmentation on the pension fund contribution revenues. However, the longer the projection period, the lower the impact of this obligation. It will allow closing of nearly half of the contribution gap caused by the rising incidence of civil law contracts (PLN 2.3 billion out of PLN 5 billion) in 2020, but it will reduce the only 9.5% of the contribution gap in 2040 (PLN 0.7 billion out of PLN 7.4 billion). Lewandowski et al. (2016) showed that this obligation affects mainly the least educated groups of workers (who are most likely to earn less than the minimum wage if working under the civil law contract). As the employment share of poorly educated groups decreases over the projection period, the impact of this obligation on revenues from pension contributions also declines over time.

Table 3. Pension contributions revenues – alternative labour market scenarios compared to the benchmark labour market segmentation scenario, 2020-2050 (in PLN billion, in 2015 constant prices, and in relative terms)

Revenues	Labour market segmentation, contracts of mandate with contributions paid on a minimum wage level basis		Employment contracts	
	in PLN billion (2015 prices)	in %	in PLN billion (2015 prices)	in %
2020	2.3	1.9%	5.0	4.2%
2025	1.8	1.3%	5.2	3.8%
2030	1.5	0.9%	5.8	3.6%
2035	1.1	0.6%	6.5	3.5%
2040	0.7	0.3%	7.4	3.4%
2045	0.3	0.1%	8.3	3.5%
2050	0.3	0.1%	9.1	3.5%

Source: own calculations.

The pension fund expenditures in the both segmentation scenarios are lower than expenditures in the employment contract scenario (Table 4). Until 2020 the differences are small, and until 2030 they do not exceed PLN 1 billion per year (in 2015 prices) which is less than 0.5% of the expenditures in the benchmark segmentation scenario. However, they increase significantly as the projection span extends – the difference in expenditures will amount to PLN 2 billion in 2040 (1% of expenditures in the benchmark segmentation scenario) and PLN 5 billion in 2050 (2% of expenditures in the benchmark segmentation scenario). Such differences may be interpreted as

future "lost" pensions due to the rising incidence of civil law contracts. The change in rules on applying contributions, effective since 2016, will increase future expenditure on pensions, in particular after 2030. However, the impact of this change will not be as far-reaching as that of eliminating of the labour market segmentation, since its impact amounts to approximately ¼ of the impact of replacing all civil law contracts with employment contracts (Table 4).

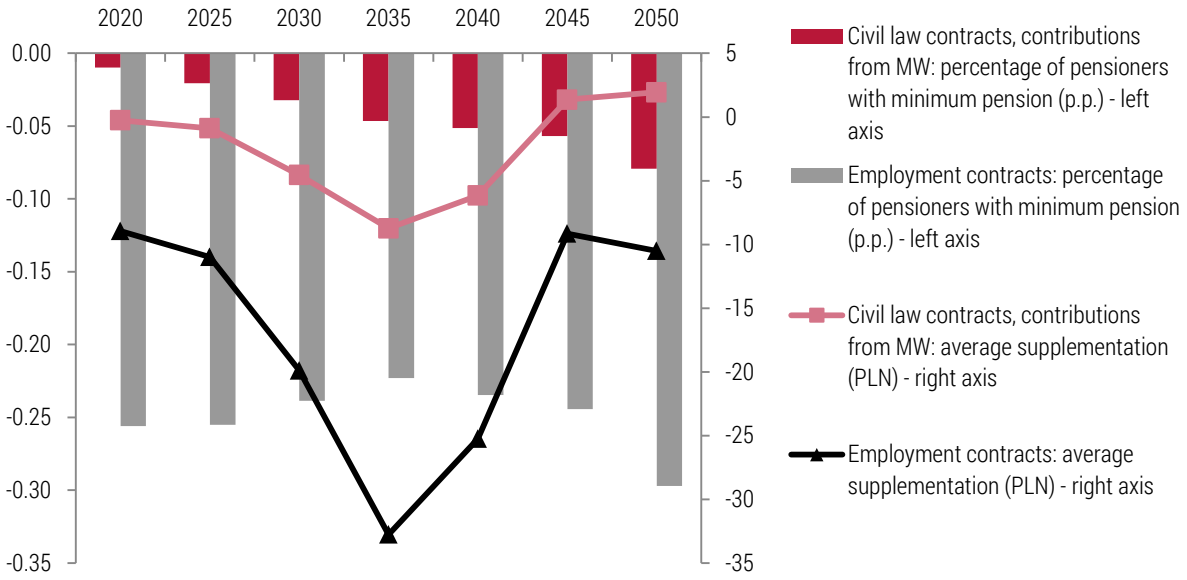
Table 4. Pension fund expenditures – alternative labour market scenarios compared to the benchmark labour market segmentation scenario, 2020-2050 (in PLN billion, in 2015 constant prices, and in relative terms)

Expenditure	Labour market segmentation, contracts of mandate with contributions paid on a minimum wage level basis			Employment contracts		
	in PLN billion (2015 prices)	including minimum pension expenditure	in %	in PLN billion (2015 prices)	including minimum pension expenditure	in %
2020	0.0	0.0	0.0%	0.2	0.0	0.1%
2025	0.1	0.0	0.0%	0.4	0.0	0.3%
2030	0.2	0.0	0.1%	0.8	0.0	0.5%
2035	0.4	0.0	0.2%	1.3	0.0	0.7%
2040	0.6	0.0	0.3%	2.1	-0.1	1.1%
2045	1.0	-0.1	0.5%	3.4	-0.2	1.6%
2050	1.1	-0.2	0.4%	5.2	-0.3	2.1%

Source: own calculations.

Therefore, the impact of the labour market segmentation on the pension fund expenditures is lower than the impact of segmentation on the revenues from contributions. The minimum pension guarantee also contributes to that. Although it is expected that the share of individuals receiving a minimum pension will increase regardless of the labour market segmentation (Chłoń-Domińczak, Strzelecki, 2013), the rising incidence of civil law contracts extends the scope of this increase. This results from (i) lower contributions and (ii) the fact that the young people are more often employed under civil law contracts (20-24 and 25-29 age groups). Due to the capitalisation of interest (in the funded pillar), and indexation (in the notional pillar) of accrued contributions, spells of employment under civil law contracts in the early career stage have stronger impact on future pensions than such spells late in the late stage of career (Lewandowski et al. 2016). Our results show that the lowest expenditure on minimum pensions would occur in the employment contract (no segmentation) scenario, while the highest – in the benchmark labour market segmentation scenario (rules of pension contributions applying to contracts of mandate that were valid before 2016). The obligation to pay contributions for contracts of mandate at least on a minimum wage basis leads to slightly lower future expenditure on minimum pension subsidies (by PLN 9 million in 2030, PLN 70 million in 2040 and PLN 278 million in 2050, in 2015 prices), since this obligation reduces both the share of pensioners who receive the minimum pension, and the average minimum pension subsidy (Figure 10). This means that even though the total spending on pensions in this scenario is higher than in the benchmark segmentation scenario, the spending on the minimum pension subsidies is lower. However, savings made on the minimum pension subsidies would be twice as high if employment contracts (with full contributions) were used instead of contracts of mandate (Table 4). Figure 10 shows that both the number of pensioners who receive the minimum pension, and the average subsidy would also be the lowest in the employment contract scenario.

Figure 10. Percentage of pensioners who receive the minimum pension, and the average top-up to the minimum pension – alternative labour market scenarios compared to the benchmark labour market segmentation scenario, 2020-2050 (in PLN, in 2015 constant prices, and in relative terms).



Source: own calculations.

The labour market segmentation deteriorates the pension fund balance (see Table 5). The differences between the employment contract scenario and both segmentation scenarios are distinctly larger (approximately PLN 5 billion per year, in 2015 prices) than differences between two scenarios of segmentation (which differ only in the rules regulating pension contributions that apply to contracts of mandate). Thanks to the obligation to pay contributions for contracts of mandate at least on a minimum wage basis, the pension system balance improves, but mainly in the short run. According to the projection, the impact of this change will decrease over time and after 2040 the pension system balance will be even worse than in the benchmark segmentation scenario. That's because the employment share of workers contracted under civil law contracts declines over the projection period, so the impact of relatively higher contributions applicable to civil law contracts on pension fund revenues becomes gradually lower. On the other hand, the effect of these relatively higher contributions on expected pensions and pension spending is deferred and increases with time.

Table 5. Pension fund balance – alternative labour market scenarios compared to the benchmark labour market segmentation scenario, 2020-2050 (in PLN billion, in 2015 constant prices)

Balance	Labour market segmentation, contracts of mandate with contributions paid on a minimum wage level basis		Employment contracts	
	Without minimum pension	With minimum pension	Without minimum pension	With minimum pension
2020	2.2	2.2	4.8	4.8
2025	1.8	1.8	4.8	4.8
2030	1.3	1.3	5.0	5.0
2035	0.7	0.7	5.2	5.2
2040	0.0	0.1	5.2	5.3
2045	-0.8	-0.7	4.7	4.9
2050	-1.1	-1.0	3.6	3.9

Source: own calculations.

Summary and policy implications

Since its inception (as the part of the 1999 pension system reform), the pension fund established under the Social Insurance Fund runs a deficit, understood as the difference between the revenue from contributions and the value of benefits paid out. Despite the changes introduced by the government in 2011 and 2014, which reduced the role of the funded pillar of the pension system, approximately 1/3 of pension fund benefits are still financed from sources other than contributions. It is a systemic problem and it is of fundamental importance to Polish public finance as the FUS subsidies account for a high share of the state budget spending. The problem is further exacerbated by the ever more widespread use of civil law contracts on the labour market, characterised by lower average remuneration of workers employed under such contracts, irregular employment cycles and lower contributions than those paid under employment contracts.

In this paper we quantify the impact of the growing prevalence of civil law contracts on the pension fund balance from a historical and a prospective perspective – in the years 2005-2015 and 2016-2050 respectively. Our findings indicate that if civil law contracts had not became widespread on the labour market, the accumulated deficit of the FUS in 2005-2015 would have been 5% lower (PLN 21.4 billion in 2015 prices) and the average benefit-contribution coverage ratio would have risen from 58% to 61%. The contribution revenues of the funded pillar would have been higher by PLN 4.9 billion (in 2015 prices). We assess that the future impact of labour market segmentation on revenues from pension contributions will be noticeable, but will be relatively smaller than in the previous decade. This results from both the expected decrease in the share of workers employed under civil law contracts (due to demographic changes and the rising share of tertiary educated workers) and the obligation to pay contributions on at least a minimum wage basis (from 2016). In 2020, the impact of segmentation is estimated to account for 4.2% of the contribution revenue gap and after 2030 – approximately 3.5%. Thanks to the obligation to pay contributions at least on a minimum wage basis, it is possible to close nearly half of the revenue gap (PLN 2.3 billion out of PLN 5 billion) by 2020, but less than 1/10 of the revenue gap after 2040. The relative impact of this obligation declines over time because the share of least-educated workers, who are the most likely to be covered by this rule, declines over time.

Contrary to revenues, the longer the projection period, the higher the difference of pension fund spending between the scenarios. Until 2030, the differences do not exceed PLN 1 billion (in 2015 prices). However, in 2040 they reach PLN 2.1 billion (1.1% of spending in the benchmark segmentation scenario) and in 2050 – 5.2% (1.9% of spending). These are deferred consequences of the lower contributions paid in the past and in the years to come. However, the minimum pension guarantee is another contributing factor. The growing prevalence of civil law contracts leads to a higher percentage of individuals who will receive the minimum pension in the future. This is due both to the lower contributions paid and to the fact that the highest shares of workers employed under civil law contracts occur amongst the young. As a result, the labour market segmentation has an adverse impact on the pension fund balance both in the short- and in the long-term. According to our estimates, its impact over the entire forecast period amounts to approximately PLN 5 billion annually (in 2015 prices).

The obligation to pay social insurance contributions at least on a minimum wage basis reduces the adverse impact of segmentation both on the pension system and on individual pensions (Lewandowski et al., 2016); but it does not offer a sustainable solution to the problem. Another possible measure is to apply full contributions to civil law contracts – under terms similar to those applicable to employment contracts. However, it may be expected that due to more irregular employment cycles under civil law contracts and, hence, more irregular

contribution payments, applying full contributions would not totally eliminate the impact of segmentation on the pension system. Eichhorst et al. (2016) suggest that the costs associated with a higher turnover of workers employed under fixed-term contracts should be borne by employers and take the form of additional unemployment insurance for such contracts. In 2013, Slovenia introduced five-fold higher contribution rate for unemployment insurance in duration of two years for hires under fixed-term contract, as one of the instruments aimed at tackling labour market segmentation. The Slovenian reform was successful as it increased the probability of accessing of transitions to permanent jobs from both fixed-term jobs and unemployment, and it improved the accessibility of permanent jobs for both young and old workers (Vodopivec et al., 2016). However, in Poland civil law contracts allow lower pension contributions and no unemployment insurance contributions. International experience suggests that contribution rates on civil law contracts should be at least levelled with contribution rates on open-ended employment contracts, in order to reduce the inclination to their excessive use.

However, increasing the rate of pension contributions and potentially also of other contributions would mean an increase of the overall tax wedge imposed on workers employed under civil law contracts. This would cause a risk of shifting them to so-called bogus self-employment (which carries a lower total tax wedge) or to the shadow economy. This in turn would have an adverse impact on both individual pensions and on the entire pension system. An alternative solution put forward by Arak et al. (2014) is the replacement of all forms of employment with the so-called single employment contract. Under this solution, the employment protection would depend exclusively on workers' tenure in a firm. Moreover, taxation of low earners should be reduced by increasing the tax-deductible expenses under the PIT tax (and adequately increasing taxation of high earners in order to maintain fiscal neutrality of the PIT change).

Although the widespread use of civil law contracts on the labour market is a specific characteristic of the Polish labour market, other countries with defined contribution pension systems also face lower than expected revenues from pension contributions. Bosch (2016) points out that this is a general phenomenon in South America and identifies four underlying drivers: relatively low work productivity and consequently low wages; workers' scepticism regarding future pensions and the rationale for paying contributions; employers' inclination to avoid payment of contributions and low effectiveness of the contribution debt collection system; the popularity of self-employment, where the contribution payment rules are different from those applicable to employees. Bosch (2016) suggests that such challenges may necessitate the introduction of a pension insurance component that is not based on contributions, but financed from general taxes. In Poland, this would also help address problems related to the use of civil law contracts. However, due to the structural imbalance within the pension fund, the fiscal space for the introduction of such reforms is limited. It seems that such a space would emerge only if the retirement age was raised to 67 years, because only in the early years after returning to the lower retirement age, the cost of this change is estimated at approximately PLN 10 billion annually (Chancellery of the President, 2015).

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Appendices

Appendix 1. Average age of the population in Poland, 2020-2050

Average age	2020	2030	2040	2050
Women	44	47	49	51
Men	39	42	44	45
Population	42	44	47	48

Source: own elaboration.

Appendix 2. Share of the population working under civil law contracts (contracts of mandate) in 2020-2050, by sex and age groups (in %)

Women	2020	2030	2040	2050
15-19	0.9	1.0	1.0	1.0
20-24	9.4	10.1	10.4	10.3
25-29	9.5	10.2	10.5	10.4
30-34	5.3	5.8	6.0	5.9
35-39	4.2	4.5	4.7	4.7
40-44	4.2	3.3	3.6	3.5
45-49	3.9	2.6	2.5	2.5
50-54	3.5	2.7	2.0	2.1
55-59	2.9	2.7	2.0	1.8
60-64	1.8	1.9	1.6	1.3
65-69	0.6	0.8	0.9	1.0
70+	0.2	0.2	0.2	0.3
Men	2020	2030	2040	2050
15-19	1.8	1.9	2.0	2.0
20-24	11.1	11.8	12.2	12.1
25-29	10.1	10.8	11.0	11.0
30-34	7.0	7.2	7.3	7.3
35-39	5.3	5.2	5.3	5.3
40-44	4.7	4.5	4.4	4.4
45-49	4.8	4.3	4.1	4.1
50-54	5.0	4.4	4.0	3.8
55-59	4.3	4.2	3.8	3.7
60-64	3.5	3.4	3.0	2.7
65-69	1.6	2.0	1.7	1.4
70+	0.4	0.4	0.4	0.4

Source: own elaboration.

Appendix 3. Share of the population working under employment contracts in 2020-2050, by sex and age groups (in %)

Women	2020	2030	2040	2050
15-19	1.3	1.4	1.4	1.4
20-24	22.3	23.8	24.5	24.2
25-29	58.6	62.7	64.5	63.9
30-34	69.0	73.1	75.3	74.6
35-39	72.6	78.6	81.1	80.3
40-44	73.7	82.1	84.3	83.4
45-49	73.9	81.2	84.0	83.3
50-54	70.3	77.6	83.2	82.0
55-59	64.3	69.2	75.2	73.1
60-64	21.1	24.0	25.8	26.7
65-69	6.3	7.8	9.1	10.5
70+	1.7	2.0	2.2	2.9
Men	2020	2030	2040	2050
15-19	2.1	2.2	2.3	2.3
20-24	33.4	35.6	36.7	36.3
25-29	70.7	76.0	76.8	76.6
30-34	80.9	83.3	84.1	83.9
35-39	83.9	86.5	87.1	87.0
40-44	83.9	87.3	89.1	88.9
45-49	80.3	87.6	88.6	88.2
50-54	74.7	83.3	86.8	86.6
55-59	70.7	77.2	81.2	80.7
60-64	47.9	51.1	56.7	54.6
65-69	14.9	18.4	19.4	19.3
70+	3.9	3.7	3.9	5.5

Source: own elaboration.

Appendix 4. Average pension contribution bases for workers employed under employment contracts – men by profile, 2020-2050 (in PLN, 2015 constant prices)

	2020	2030	2040	2050
men 15-19; tertiary education	-	-	-	-
men 20-24; tertiary education	2 424	3 001	3 899	5 417
men 25-29; tertiary education	3 528	4 368	5 677	7 886
men 30-34; tertiary education	5 165	6 395	8 311	11 544
men 35-39; tertiary education	6 304	7 805	10 143	14 089
men 40-44; tertiary education	6 525	8 078	10 498	14 583
men 45-49; tertiary education	6 543	8 101	10 528	14 624
men 50-54; tertiary education	6 545	8 004	10 273	14 091
men 55-59; tertiary education	6 472	7 874	10 052	13 712
men 60-64; tertiary education	6 640	7 983	10 065	13 550
men 65-69; tertiary education	7 086	8 535	10 782	14 547
men 70+; tertiary education	6 722	8 184	10 455	14 271
men 15-19; post-secondary/vocational secondary education	1 857	2 398	3 246	4 688
men 20-24; post-secondary/vocational secondary education	2 224	2 853	3 837	5 508
men 25-29; post-secondary/vocational secondary education	2 770	3 528	4 714	6 728
men 30-34; post-secondary/vocational secondary education	3 325	4 216	5 608	7 968
men 35-39; post-secondary/vocational secondary education	3 606	4 564	6 060	8 597
men 40-44; post-secondary/vocational secondary education	3 702	4 683	6 215	8 812
men 45-49; post-secondary/vocational secondary education	3 731	4 718	6 261	8 876
men 50-54; post-secondary/vocational secondary education	3 759	4 753	6 306	8 939
men 55-59; post-secondary/vocational secondary education	3 875	4 897	6 493	9 199
men 60-64; post-secondary/vocational secondary education	4 059	5 125	6 789	9 609
men 65-69; post-secondary/vocational secondary education	3 619	4 580	6 081	8 627
men 70+; post-secondary/vocational secondary education	2 800	3 565	4 763	6 795
men 15-19; general upper secondary education	1 717	2 125	2 762	3 837
men 20-24; general upper secondary education	2 227	2 757	3 583	4 977
men 25-29; general upper secondary education	2 740	3 392	4 408	6 123
men 30-34; general upper secondary education	3 337	4 131	5 369	7 458
men 35-39; general upper secondary education	3 647	4 516	5 869	8 152
men 40-44; general upper secondary education	3 591	4 445	5 777	8 025
men 45-49; general upper secondary education	3 464	4 288	5 573	7 741
men 50-54; general upper secondary education	3 446	4 266	5 544	7 701
men 55-59; general upper secondary education	3 496	4 328	5 624	7 812
men 60-64; general upper secondary education	3 435	4 253	5 528	7 678
men 65-69; general upper secondary education	3 600	4 458	5 793	8 047
men 70+; general upper secondary education	2 860	3 541	4 602	6 393
men 15-19; basic vocational education	1 623	2 068	2 765	3 949
men 20-24; basic vocational education	2 013	2 572	3 446	4 930
men 25-29; basic vocational education	2 386	3 034	4 046	5 763
men 30-34; basic vocational education	2 697	3 419	4 546	6 458
men 35-39; basic vocational education	2 922	3 696	4 907	6 960

men 40-44; basic vocational education	2 984	3 773	5 007	7 098
men 45-49; basic vocational education	2 925	3 700	4 912	6 967
men 50-54; basic vocational education	2 880	3 625	4 789	6 760
men 55-59; basic vocational education	2 870	3 612	4 772	6 736
men 60-64; basic vocational education	2 597	3 275	4 334	6 127
men 65-69; basic vocational education	1 995	2 470	3 210	4 459
men 70+; basic vocational education	1 737	2 151	2 795	3 882
men 15-19; primary, lower secondary education or below	1 640	2 031	2 639	3 666
men 20-24; primary, lower secondary education or below	1 879	2 326	3 023	4 200
men 25-29; primary, lower secondary education or below	2 141	2 651	3 445	4 785
men 30-34; primary, lower secondary education or below	2 443	3 024	3 930	5 459
men 35-39; primary, lower secondary education or below	2 689	3 329	4 326	6 009
men 40-44; primary, lower secondary education or below	2 786	3 450	4 483	6 228
men 45-49; primary, lower secondary education or below	2 719	3 366	4 375	6 077
men 50-54; primary, lower secondary education or below	2 655	3 287	4 271	5 933
men 55-59; primary, lower secondary education or below	2 659	3 293	4 279	5 944
men 60-64; primary, lower secondary education or below	2 426	3 003	3 903	5 421
men 65-69; primary, lower secondary education or below	1 965	2 432	3 161	4 391
men 70+; primary, lower secondary education or below	1 665	2 062	2 679	3 722

Source: own elaboration.

Appendix 5. Average pension contribution bases for workers employed under employment contracts – women by profile, 2020-2050 (in PLN, 2015 constant prices)

	2020	2030	2040	2050
women 15-19; tertiary education	-	-	-	-
women 20-24; tertiary education	2 209	2 834	3 812	5 474
women 25-29; tertiary education	2 973	3 780	5 041	7 181
women 30-34; tertiary education	3 843	4 956	6 699	9 664
women 35-39; tertiary education	4 163	5 353	7 214	10 380
women 40-44; tertiary education	4 436	5 790	7 911	11 527
women 45-49; tertiary education	4 687	6 100	8 315	12 088
women 50-54; tertiary education	4 831	6 180	8 289	11 873
women 55-59; tertiary education	5 115	6 433	8 489	11 971
women 60-64; tertiary education	5 512	6 824	8 868	12 318
women 65-69; tertiary education	5 640	6 982	9 074	12 604
women 70+; tertiary education	4 978	6 362	8 525	12 201
women 15-19; post-secondary/vocational secondary education	1 295	1 604	2 084	2 895
women 20-24; post-secondary/vocational secondary education	1 873	2 399	3 221	4 617
women 25-29; post-secondary/vocational secondary education	2 232	2 842	3 797	5 418
women 30-34; post-secondary/vocational secondary education	2 546	3 291	4 458	6 443
women 35-39; post-secondary/vocational secondary education	2 685	3 463	4 681	6 753
women 40-44; post-secondary/vocational secondary education	2 823	3 634	4 904	7 063
women 45-49; post-secondary/vocational secondary education	2 959	3 803	5 123	7 367
women 50-54; post-secondary/vocational secondary education	3 189	4 087	5 492	7 880
women 55-59; post-secondary/vocational secondary education	3 532	4 472	5 940	8 431
women 60-64; post-secondary/vocational secondary education	3 720	4 645	6 088	8 529
women 65-69; post-secondary/vocational secondary education	3 361	4 161	5 408	7 512
women 70+; post-secondary/vocational secondary education	2 975	3 684	4 787	6 650
women 15-19; general upper secondary education	1 830	2 266	2 945	4 090
women 20-24; general upper secondary education	1 961	2 428	3 156	4 383
women 25-29; general upper secondary education	2 388	2 957	3 843	5 338
women 30-34; general upper secondary education	2 621	3 245	4 217	5 857
women 35-39; general upper secondary education	2 687	3 326	4 323	6 005
women 40-44; general upper secondary education	2 767	3 426	4 452	6 184
women 45-49; general upper secondary education	2 844	3 521	4 575	6 355
women 50-54; general upper secondary education	3 087	3 822	4 966	6 899
women 55-59; general upper secondary education	3 508	4 344	5 645	7 841
women 60-64; general upper secondary education	3 365	4 166	5 415	7 521
women 65-69; general upper secondary education	3 619	4 481	5 823	8 089
women 70+; general upper secondary education	2 868	3 550	4 614	6 409
women 15-19; basic vocational education	1 403	1 737	2 258	3 136
women 20-24; basic vocational education	1 569	1 943	2 525	3 507
women 25-29; basic vocational education	1 733	2 186	2 892	4 089
women 30-34; basic vocational education	1 868	2 392	3 212	4 605
women 35-39; basic vocational education	1 950	2 513	3 395	4 896

women 40-44; basic vocational education	1 972	2 540	3 430	4 944
women 45-49; basic vocational education	2 015	2 594	3 500	5 041
women 50-54; basic vocational education	2 062	2 632	3 524	5 038
women 55-59; basic vocational education	2 103	2 644	3 488	4 916
women 60-64; basic vocational education	2 015	2 535	3 346	4 719
women 65-69; basic vocational education	1 842	2 320	3 067	4 332
women 70+; basic vocational education	1 670	2 067	2 687	3 732
women 15-19; primary, lower secondary education or below	1 385	1 714	2 228	3 095
women 20-24; primary, lower secondary education or below	1 601	1 983	2 577	3 579
women 25-29; primary, lower secondary education or below	1 727	2 138	2 778	3 859
women 30-34; primary, lower secondary education or below	1 785	2 209	2 871	3 989
women 35-39; primary, lower secondary education or below	1 829	2 264	2 942	4 087
women 40-44; primary, lower secondary education or below	1 859	2 302	2 991	4 155
women 45-49; primary, lower secondary education or below	1 887	2 336	3 036	4 217
women 50-54; primary, lower secondary education or below	1 922	2 380	3 093	4 296
women 55-59; primary, lower secondary education or below	1 935	2 396	3 113	4 325
women 60-64; primary, lower secondary education or below	1 873	2 318	3 013	4 185
women 65-69; primary, lower secondary education or below	1 804	2 234	2 903	4 033
women 70+; primary, lower secondary education or below	1 723	2 134	2 773	3 852

Source: own elaboration.

Appendix 6. Average pension contribution bases for workers employed under civil law contracts (contracts of mandate) – men by profile, 2020-2050 (in PLN, 2015 constant prices)

Profile	2020	2030	2040	2050
men 15-19; tertiary education	-	-	-	-
men 20-24; tertiary education	800	990	1 569	1 787
men 25-29; tertiary education	1 164	1 442	2 284	2 602
men 30-34; tertiary education	1 705	2 110	3 343	3 810
men 35-39; tertiary education	2 080	2 576	4 080	4 650
men 40-44; tertiary education	2 153	2 666	4 223	4 812
men 45-49; tertiary education	2 159	2 673	4 235	4 826
men 50-54; tertiary education	2 160	2 641	4 133	4 650
men 55-59; tertiary education	2 136	2 598	4 044	4 525
men 60-64; tertiary education	2 191	2 634	4 049	4 472
men 65-69; tertiary education	2 338	2 817	4 337	4 801
men 70+; tertiary education	2 218	2 701	4 206	4 710
men 15-19; post-secondary/vocational secondary education	613	791	1 306	1 547
men 20-24; post-secondary/vocational secondary education	734	941	1 543	1 818
men 25-29; post-secondary/vocational secondary education	914	1 164	1 896	2 220
men 30-34; post-secondary/vocational secondary education	1 097	1 391	2 256	2 630
men 35-39; post-secondary/vocational secondary education	1 190	1 506	2 438	2 837
men 40-44; post-secondary/vocational secondary education	1 222	1 545	2 500	2 908
men 45-49; post-secondary/vocational secondary education	1 231	1 557	2 518	2 929
men 50-54; post-secondary/vocational secondary education	1 240	1 569	2 537	2 950
men 55-59; post-secondary/vocational secondary education	1 279	1 616	2 612	3 036
men 60-64; post-secondary/vocational secondary education	1 339	1 691	2 731	3 171
men 65-69; post-secondary/vocational secondary education	1 194	1 511	2 446	2 847
men 70+; post-secondary/vocational secondary education	924	1 177	1 916	2 242
men 15-19; general upper secondary education	567	701	1 111	1 266
men 20-24; general upper secondary education	735	910	1 441	1 642
men 25-29; general upper secondary education	904	1 119	1 773	2 021
men 30-34; general upper secondary education	1 101	1 363	2 160	2 461
men 35-39; general upper secondary education	1 204	1 490	2 361	2 690
men 40-44; general upper secondary education	1 185	1 467	2 324	2 648
men 45-49; general upper secondary education	1 143	1 415	2 242	2 555
men 50-54; general upper secondary education	1 137	1 408	2 230	2 541
men 55-59; general upper secondary education	1 154	1 428	2 262	2 578
men 60-64; general upper secondary education	1 134	1 404	2 224	2 534
men 65-69; general upper secondary education	1 188	1 471	2 330	2 655
men 70+; general upper secondary education	944	1 169	1 851	2 110
men 15-19; basic vocational education	535	683	1 112	1 303
men 20-24; basic vocational education	664	849	1 386	1 627
men 25-29; basic vocational education	787	1 001	1 627	1 902
men 30-34; basic vocational education	890	1 128	1 829	2 131
men 35-39; basic vocational education	964	1 220	1 974	2 297

men 40-44; basic vocational education	985	1 245	2 014	2 342
men 45-49; basic vocational education	965	1 221	1 976	2 299
men 50-54; basic vocational education	950	1 196	1 926	2 231
men 55-59; basic vocational education	947	1 192	1 920	2 223
men 60-64; basic vocational education	857	1 081	1 743	2 022
men 65-69; basic vocational education	658	815	1 291	1 471
men 70+; basic vocational education	573	710	1 124	1 281
men 15-19; primary, lower secondary education or below	541	670	1 062	1 210
men 20-24; primary, lower secondary education or below	620	768	1 216	1 386
men 25-29; primary, lower secondary education or below	707	875	1 386	1 579
men 30-34; primary, lower secondary education or below	806	998	1 581	1 802
men 35-39; primary, lower secondary education or below	887	1 099	1 740	1 983
men 40-44; primary, lower secondary education or below	920	1 138	1 804	2 055
men 45-49; primary, lower secondary education or below	897	1 111	1 760	2 005
men 50-54; primary, lower secondary education or below	876	1 085	1 718	1 958
men 55-59; primary, lower secondary education or below	878	1 087	1 721	1 961
men 60-64; primary, lower secondary education or below	800	991	1 570	1 789
men 65-69; primary, lower secondary education or below	648	803	1 272	1 449
men 70+; primary, lower secondary education or below	550	680	1 078	1 228

Source: own elaboration.

Appendix 7. Average pension contribution bases for workers employed under civil law contracts (contracts of mandate) – women by profile, 2020-2050 (in PLN, 2015 constant prices)

	2020	2030	2040	2050
women 15-19; tertiary education	-	-	-	-
women 20-24; tertiary education	729	935	1 258	1 807
women 25-29; tertiary education	981	1 247	1 664	2 370
women 30-34; tertiary education	1 268	1 636	2 211	3 189
women 35-39; tertiary education	1 374	1 766	2 381	3 425
women 40-44; tertiary education	1 464	1 911	2 611	3 804
women 45-49; tertiary education	1 547	2 013	2 744	3 989
women 50-54; tertiary education	1 594	2 039	2 736	3 918
women 55-59; tertiary education	1 688	2 123	2 801	3 950
women 60-64; tertiary education	1 819	2 252	2 926	4 065
women 65-69; tertiary education	1 861	2 304	2 994	4 159
women 70+; tertiary education	1 643	2 099	2 813	4 026
women 15-19; post-secondary/vocational secondary education	428	529	688	955
women 20-24; post-secondary/vocational secondary education	618	792	1 063	1 524
women 25-29; post-secondary/vocational secondary education	736	938	1 253	1 788
women 30-34; post-secondary/vocational secondary education	840	1 086	1 471	2 126
women 35-39; post-secondary/vocational secondary education	886	1 143	1 545	2 229
women 40-44; post-secondary/vocational secondary education	932	1 199	1 618	2 331
women 45-49; post-secondary/vocational secondary education	977	1 255	1 690	2 431
women 50-54; post-secondary/vocational secondary education	1 052	1 349	1 812	2 600
women 55-59; post-secondary/vocational secondary education	1 165	1 476	1 960	2 782
women 60-64; post-secondary/vocational secondary education	1 228	1 533	2 009	2 814
women 65-69; post-secondary/vocational secondary education	1 109	1 373	1 785	2 479
women 70+; post-secondary/vocational secondary education	982	1 216	1 580	2 195
women 15-19; general upper secondary education	604	748	972	1 350
women 20-24; general upper secondary education	647	801	1 041	1 447
women 25-29; general upper secondary education	788	976	1 268	1 762
women 30-34; general upper secondary education	865	1 071	1 392	1 933
women 35-39; general upper secondary education	887	1 098	1 427	1 982
women 40-44; general upper secondary education	913	1 130	1 469	2 041
women 45-49; general upper secondary education	938	1 162	1 510	2 097
women 50-54; general upper secondary education	1 019	1 261	1 639	2 277
women 55-59; general upper secondary education	1 158	1 433	1 863	2 588
women 60-64; general upper secondary education	1 111	1 375	1 787	2 482
women 65-69; general upper secondary education	1 194	1 479	1 922	2 669
women 70+; general upper secondary education	946	1 172	1 523	2 115
women 15-19; basic vocational education	463	573	745	1 035
women 20-24; basic vocational education	518	641	833	1 157
women 25-29; basic vocational education	572	721	954	1 349
women 30-34; basic vocational education	616	789	1 060	1 520
women 35-39; basic vocational education	643	829	1 121	1 616

women 40-44; basic vocational education	651	838	1 132	1 632
women 45-49; basic vocational education	665	856	1 155	1 663
women 50-54; basic vocational education	680	869	1 163	1 663
women 55-59; basic vocational education	694	873	1 151	1 622
women 60-64; basic vocational education	665	836	1 104	1 557
women 65-69; basic vocational education	608	766	1 012	1 430
women 70+; basic vocational education	551	682	887	1 231
women 15-19; primary, lower secondary education or below	457	566	735	1 021
women 20-24; primary, lower secondary education or below	528	654	850	1 181
women 25-29; primary, lower secondary education or below	570	705	917	1 273
women 30-34; primary, lower secondary education or below	589	729	948	1 316
women 35-39; primary, lower secondary education or below	603	747	971	1 349
women 40-44; primary, lower secondary education or below	614	760	987	1 371
women 45-49; primary, lower secondary education or below	623	771	1 002	1 392
women 50-54; primary, lower secondary education or below	634	785	1 021	1 418
women 55-59; primary, lower secondary education or below	639	791	1 027	1 427
women 60-64; primary, lower secondary education or below	618	765	994	1 381
women 65-69; primary, lower secondary education or below	595	737	958	1 331
women 70+; primary, lower secondary education or below	569	704	915	1 271

Source: own elaboration.

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