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Balázs Égert

UMR 7235

Université de Paris Ouest Nanterre La Défense
(bâtiment G)
200, Avenue de la République
92001 NANTERRE CEDEX

Tél et Fax : 33.(0)1.40.97.59.07
Email : nasam.zaroualete@u-paris10.fr

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ABSTRACT/ RÉSUMÉ

This paper studies the impact of recent changes in second pension pillars of three Central and Eastern European Countries on the deficit and implicit debt of their full pension systems. The paper seeks to answer the following questions: i) what is the impact on the sustainability of Poland's pension system of the decrease in the pension contribution going to the second pension pillar from 7.3% to 2.3% in 2011; ii) what are the implications of the recent changes on gross replacement rates; iii) does the weakening of the Polish second pension system have a different impact on pension system sustainability than a similar move in a Hungarian-style pension system with a defined-benefit first pillar and iv) how does Estonia's temporary decrease in pension contributions compensated by temporarily higher future rates affect pension sustainability in that country. The simulation results show that in our baseline scenario the Polish move would permanently lower future pension-system debt, chiefly as a result of a cut in replacement rates. But using a combination of pessimistic assumptions including strong population ageing, low real wage growth and a high indexation of existing pension benefits, coupled with bringing in tax expenditures related to the third voluntary pension pillar and an increase in the share of minimum pensions leads to higher pension system deficits and eventually more public debt at a very long horizon. The simulations also suggest that the Hungarian pension reversal reduces deficit and debt only temporarily, mainly because of Hungary's costly defined-benefit first pension pillar: the weakening of the second pillar is tantamount to swapping low current replacement rates (in the defined-contribution second pillar) against high future replacement rates in the defined-benefit first pension pillar. Finally, results show that the Estonian move will increase public debt only very moderately in the long run, even though this result is sensitive to the effective interest rate on public debt.

JEL classification codes: H55; J32
Keywords: pension system; pension reversal; defined benefit; defined contribution; public finances; Central and Eastern Europe

1. OECD Economics Department; EconomiX University of Paris X-Nanterre; CESifo; William Davidson Institute. Email: balazs.egert@oecd.org. The paper has benefited from comments from Hervé Boulhol, Andrew Dean, Robert Ford, Peter Jarrett, Rafal Kierzenkowski, Monika Queisser, Artur Radziwill and Patrizio Sicari. The author is also thankful to Mee-Lan Frank for excellent editorial support. The usual disclaimer applies.

Introduction

High budget deficits caused by the financial and economic crisis of 2007-09 and the consequent desire to circumvent existing fiscal rules, mainly European but also domestic in origin, pushed a number of Central and Eastern European countries to weaken (or fully scrap) their second fully-funded defined-contribution pension pillars. While diverting temporarily or permanently pension contributions from the second pension pillar, which is outside the general government sector, to the first pension pillar, which is part of it, has reduced budget deficits in the short run, the question economists and policy makers may want to ask is whether such moves will be detrimental to a country's long-run fiscal position.

It is precisely this question this paper seeks to address on the basis of a simulation exercise mainly for Poland but also for Hungary and Estonia. The main questions raised in the paper are the following. What is the impact of the cut in pension contributions from 7.3% of gross wages to 2.3%, raised back to 3.5% in 2017, on the fiscal sustainability of the Polish pension system? How would the results change if the pension contribution rate would be kept at 2.3%? What would happen if the second pension pillar were dismantled altogether? How would those changes influence replacement rates defined as pension benefits over average earnings at the time of retirement? Does the nature of the first pillar matter? What would be the impact if the reduction in the contribution rates were to be compensated as proposed in Estonia?

The main results of the simulation exercise can be summarised as follows. First, the simulation results show that weakening the second pillar would permanently reduce future pension system debt in the Polish case, resulting from lower replacement rates. An important reason for this is that annuities paid from the second pillar is calculated as pension assets divided by life expectancy at the time of retirement, adjusted for the risk-free interest rate. By contrast, the calculation of annuities in the first pillar ignores the interest rate, which in turn decreases already low replacement rates. Nevertheless, using a set of pessimistic assumptions for population ageing, real wage growth and the indexation of existing pension benefits (full wage indexation rather than the current mix of 20% wages and 80% inflation), combined with the costs of the planned tax break to savings going to the voluntary third pension pillar and an increase in the share of minimum pensions, pushes the pension system's deficit and eventually its debt above the levels observed in our no-policy-change scenario in the very long run. Hence, improvements in long-term sustainability cannot be taken for granted under the pessimistic scenario. Two additional mentions are worth here. First, in an actuarially neutral system such as the Polish first pension pillar, lower replacement rates, arising from the weakening of the second pillar, could be offset by working longer. This would considerably dampen the negative effect of the recent change in the second pillar on replacement rates. Second, reducing the general government deficit by the same amount by weakening the second pension pillar (via increasing revenues) and by cutting spending (or increasing taxes) is not necessarily equivalent. The reason for this is that higher revenues generated by the weakening of the second pillar will have to partly finance an increase in future pension liabilities in the first pillar, whereas a reduction in spending or an increase in taxes do not have a counterpart in the future. This would overall mean that while the weakening of the second pillar will permanently improve public debt sustainability in our central scenario, it will do so less than other more conventional consolidation measures would.

Second, the results show that the Hungarian pension reversal will more likely result in a deterioration of the pension system's fiscal position: it reduces deficit and debt as a result of upfront savings, but the deficit and debt start climbing soon above the levels in the no-policy-change scenario.This is mainly because of Hungary's costly defined-benefit first pension pillar, which implies that the change is tantamount to swapping low current replacement rates (in the defined-contribution second pillar) against high future replacement rates in the defined-benefit first pillar. Finally, results show that the Estonian move would increase public debt only very moderately in the long run, even though this result is sensitive to the interest rate used to calculate interest payments on public debt.

The remainder of the paper is organised as follows. The next section briefly discusses pension reforms launched in 1998/99. Section 3 describes the recent wave of actions aimed to weaken the second pension pillar. Section 4 provides an overview of existing studies analysing the impact of pension reforms on fiscal sustainability. Section 5 finally presents the simulation framework and discusses the results.

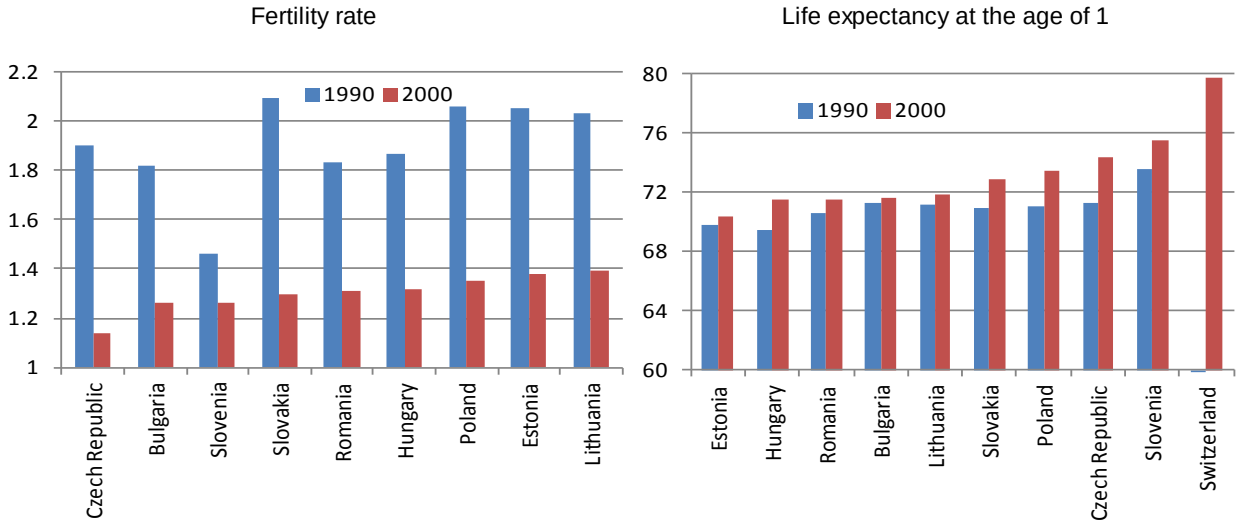
Pension reforms in Central and Eastern Europe

The flipside of the economic transition that Central and Eastern European countries (CEECs) started after the fall of the iron curtain in the 1990s is looming population ageing, which will manifest itself in the coming decades. Population ageing in CEECs is driven by two factors. First, fertility rates dropped substantially in reaction to increased macroeconomic uncertainty and rising unemployment (especially for blue-collar workers and the less well educated) and longer times spent in education resulting from the massive opening up of tertiary education to the younger generations. As a result, the baby-boom generation of the 1970s and early 1980s will not be followed by correspondingly large cohorts. Second, despite considerable health problems, the gradual modernisation of health-care systems lifted life expectancy, though from low levels (Figure 1). As a result of low fertility rates and increasing life expectancy, the working age population over 65+ ratio (the inverse old age dependency ratio) is projected to decline significantly over the coming decades, with the trough occurring somewhere between 2030 and 2060.

Paradigmatic pension reforms

Realising that single-pillar pay-as-you-go pension systems will become unsustainable over the coming decades as a consequnce of the forthcoming population ageing, a number of CEECs decided to reform their pension systems. The pension debate and the direction of the reforms was strongly influenced by the paradigmatic change advocated by the World Bank, which consisted of privatising part of the first pillar. Proponents of the paradigmatic pension reform put forward a number of advantages of private pension funds. A major advantage is the transformation of defined-benefit systems into defined-contribution schemes. This improves incentives to work and withen the economy, as pension benefits will depend on actual pension contributions. The creation of private second pension pillars is also thought to improve the

Figure 1. **Fertility rate and life expectancy, 1990 and 2000**



Source: Eurostat

whole pension system's sustainability, initially undermined by population ageing. A private second pension pillar can also diversify risks related to investment decisions and political interference and can raise people's awareness of the need for self provisioning. Finally, private pension pillars may promote long-term growth by encouraging long-term savings and therefore investment and improving the allocative efficiency of saving and investment decisions. Private pension funds can also contribute to higher economic growth via capital-market deepening, which in turn can improve capital-market regulation, transparency and infrastructure (clearing mechanisms and trading platforms), enforce better corporate-governance standards and reduce price volatility through long-term investment decisions (Simonovits, 2011; Velculescu, 2011).

Criticism voiced against fully-funded private pension schemes emphasises that the incentives to work and declare earnings may be subdued if the second pillar provides only a small part of the final pension benefit. In addition, private pension funds can provide only little diversification if financial-market returns and wage earnings move closely together and if they are not fully sheltered from government intervention. Diversification will not work if asset prices are affected by population ageing (Takáts, 2010). Finally, private second pillars may just crowd out voluntary savings.

The financing gap due to the creation of the second pillar and parametric pension reforms

Countries, which introduced a second pension pillar did so by carving it out from the existing first-pillar system. Part of the pension contributions was channelled into the second pillar, leaving a financing gap in the first pillar. In Poland's case this financing gap is estimated to have been 1 to 2% of GDP (Table 1), which was larger than initially estimated due to a greater-than-expected number of people choosing to avail themselves of the second pillar. Such a gap could have been financed via parametric changes in the first pillar (including increasing the retirement age, further reducing the replacement rate, increasing the contribution rate or eliminating pension privileges), and, because the benefits of those changes materialise only gradually, by implementing extra fiscal consolidation measures (spending cuts or tax hikes). Some countries decided to put privatization revenues aside to smooth the financing gap. For

instance, the 1999 Polish reform package included the creation of the Demographic Reserve Fund, which was to receive 40% of privatisation revenues, with the accumulated funds allowed to be used starting in 2010 to smooth the pressure in the first pillar arising from population ageing.

Table 1. **Social security second-pillar contributions and the resulting financing gap in the CEECs**

	Historical second-pillar contributions, % of gross salary	2010 financing gap, % of GDP	Weakening of the second pillar
Czech Republic	0	–	–
Hungary	9.5	1.2	Second pillar scrapped in 2011.
Poland	7.3	1.7	7.3% reduced to 2.3% in 2011.
Slovakia	9	1.2	No change.
Slovenia	0	–	–
Estonia	6	1.1	Temporary suspension of 4% in 2009 and 2010, a progressive return after 2011, increase to 6%in 2014-17 in compensation for the lower contributions in 2009 to 2011.
Latvia	8	2.3	8% reduced temporarily to 2%.
Lithuania	5.5	1.1	5.5% reduced temporarily to 3%.
Bulgaria	5		Planned increases in the contribution rate delayed from 2010 to 2011.
Romania	2	0.4	Planned increases in the contribution rate delayed.

Source: Bielecki (2011), Schwartz (2011), Simonovits (2011), Velculescu (2011), Stability Programme 2011 and 2014 for Estonia and Slovakia, and the IMF's 2010 Article IV consultation paper for Latvia and Lithuania.

Pension reforms in CEECs included parametric changes. The main measures to reduce imbalances in the first pillar included: *i*) raising pension contributions through a higher rate of pension contributions and/or higher participation and employment rates; *ii*) extending the effective retirement age; and *iii*) lowering the replacement rate, *i.e.* pension payments relative to average salaries. Most countries did not change or even lowered pension contributions, mainly because of the feared detrimental effect of a higher tax wedge on employment. A more common approach was the progressive extension of the legal retirement age (Hungary) or the gradual reduction of the replacement rate (Poland).

Generally, pension reforms should seek to move pension systems closer to actuarial fairness and neutrality. An actuarially fair system would ensure that pension benefits would be directly linked to pension contributions paid over the working lifetime. According to a narrow definition of actuarial fairness, the net present value of lifetime contributions and the net present value of lifetime benefits should be equal (Queisser and Whitehouse, 2006). A broader definition would be to say that lifetime benefits should be directly linked to lifetime contributions. An actuarially fair system would most likely result in a lower replacement rate compared to a defined-benefit system, in which pensioners tend to receive higher pension benefits compared to their lifetime contributions. This would also rule out the implicit transfers to poorer workers that are common features of defined-benefit schemes. Such a system would incentivise people to work longer (by extending the lifetime contribution period) and retire later. Actuarial neutrality means that working longer is not penalised and that the marginal incentives to work longer is the same at all ages. In the absence of legal retirement age, people can choose either to retire at a young age with a low pension or to enjoy a higher pension after a longer working life.

Notional accounts

A first pension pillar based on notional accounts or points is usually actuarially neutral and actuarially fair in a broader sense. Following the Swedish pension reform of 1998, Poland introduced notional accounts, while Estonia and Slovakia chose the German variant based on points. Hungary did not move away from the old defined-benefit first pillar. In a system with notional accounts, each person's pension

contributions are credited to an individual notional account, and a rate of return is applied to the cumulated notional capital. It can be shown that using the rate of change in the wage bill (employment times wages), as is done in Poland, secures the sustainability of the first pillar: a decrease in employment over the working life of a person (due to population ageing) will result in lower returns and thus lower pension benefits, which can be covered by contributions paid by a lower number of workers (Chlon *et al.*, 1999) [2]. Nevertheless, the system may face large imbalances during the transition from low to high economic dependency ratios (number of pensioners over the number of workers). First, the retirement of large cohorts will result in a drop in revenues (from social contributions) and a rise in pension benefits, not fully compensated immediately by a lower indexation for current workers (linked to a slower wage bill). Second, if population ageing continues after the retirement of specific cohorts, existing pension benefits are not indexed to wage bill growth (but to a mix of inflation and average nominal wage growth). This means that once pension benefits are locked in at the time of retirement, the effects of population ageing can not be accounted for any more. Another problem is that life expectancy used for calculating pension benefits is backward looking. Pension benefits are determined as an annuity: the cumulated notional pension capital is divided by life expectancy (adjusted for the risk fee interest rate). If life expectancy continues to rise during an individual's retirement, the annuity obtained using life expectancy based on historical mortality rates will over-estimate the pension benefit, leading potentially to an unsustainable outcome.

Individual accounts based on points

Individual accounts on which points are accumulated instead of notional capital can remedy the above-mentioned problems. Points can be converted into pension payments using a conversion coefficient, which accounts for life expectancy at the time of retirement, demographic projections and projected receipts and outlays of the pension system. The conversion coefficient can be set in a way to balance outlays with receipts. Changing the value of the pension point modifies pension benefits and thus the costs from a budgetary viewpoint, and the decision regarding the timing of retirement. Therefore, such a system is better equipped to deal with forthcoming population ageing if the conversion factor is revisable during a pensioner's lifetime.

Changes to the second pension pillar

The weakening of the first pillar's sustainability before the 2007/2008 crisis

The optimal solution of covering the financing gap due to the introduction of a second pension pillar by pushing through additional parametric changes in the first pension pillar has rarely fully been adopted. Instead, during the good times preceding the financial and economic crisis of 2007-09, governments started granting pension privileges to specific occupational groups or softening up the general framework. In Poland, the government excluded uniformed services (army and police officers) and judges from the general pension scheme in 2003 and miners in 2005, increased the indexation of existing pensions from 100% of inflation to a combination of 20% nominal wage growth and 80% inflation in 2003. In Hungary, a 13th month of pension benefit was gradually introduced between 2003 and 2006, the employers' contribution rate was reduced from 24% in 1998 to 16% in 2009 and employees' contribution rates rose only by 2.5 percentage points during the same period. On top of that, pension contributions diverted from the first to the second pillar were raised from 6% in 2001 to 8% in 2004 (Table 2). Although the 1998 Hungarian reform increased the legal retirement age from 57 to 62 years for women and from 60 to 62 years for men, the effective retirement age did not change much as a result of generous eligibility criteria for early retirement. Hence, the sustainability of the first pillar tended to deteriorate, thus increasing rather than closing the financing gap of the second pillar. The carved-out part of the first pillar was in fact

2. See Jarrett (2011) for a detailed description of the Polish pension reform.

covered by new debt issuance. For instance, the rise in Poland's public debt due to the second pillar is estimated at about 15 percentage points between 1999 and 2010 (Bielecki, 2011; Velculescu, 2011).

Table 2. **Worsening of the sustainability of the first pension pillar in Hungary and Poland**

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Hungary	Pension reform in Hungary	Gradual introduction of a 13th month pension benefit (2003-06) Employers' contribution rate decreased from 24% (1998) to 16% (2009) Pension contributions diverted from first to second pillar increased from 6% (2001) to 8.5% (2004)								
Poland		Pension reform in Poland				Uniformed services & judges excluded from the general system	Indexation of existing pensions becomes more generous	Minders excluded from the general system		Decrease in the disability pension contributio n rate

Source: Bielecki (2011) and Simonovits (2011).

Attempts to acknowledge pension reform-related transitional costs in the EU context

A fair solution to make the transition costs induced by the second, fully funded, defined-contribution pillar more transparent and comparable is to compile international government debt statistics that include both explicit and implicit government liabilities. In the European context, an alternative option would be to adjust government debt and deficit in the Maastricht sense for the costs of pension reforms, if the creation of the second pillar improves overall fiscal sustainability. This indeed might be the case, as the immediate negative impact of the second pension pillar is largely thought to be offset by expected reductions in future pension liabilities. In such a case, currently higher deficits and explicit public debt of the reform countries will ultimately be lower compared to a no-policy-change scenario, while deficit and debt indicators of non-reform countries will be on the rise in the future, as implicit pension liabilities materialise along with an ageing population. Under the European Union's Stability and Growth Pact, reform countries might be even punished for pre-funding future pension liabilities, discouraging countries from carrying out necessary structural reforms to dampen the impact of population ageing.

In 2004, upon the formal request of countries that had put in place a second pillar (including Hungary, Poland and Sweden) to acknowledge transition costs on the general government deficit, the European Commission allowed an adjustment to that deficit over a period of five years but at a declining rate. The financial and economic crisis of 2007-09 put renewed pressure on public finances, and the reform countries submitted jointly in 2010 another request to the Commission to redefine the general government deficit and debt by excluding public spending related to the creation of second pillars (as liabilities are explicitly recognised) so as not to discourage countries from actually dealing with their unfinanced first-pillar systems. The request was turned down.

Circumventing existing fiscal rules as the main motivation to weaken the second pension pillar

Facing exploding budget deficits after the eruption of the economic and financial crisis and to circumvent existing fiscal rules, many Central and Eastern European countries temporarily or permanently lowered pension contributions going to the second pillar (which is outside the government sector) and credited the difference to the pension system's first pillar (which is within it) in order to reduce the budget deficit. Following the Commisssion's refusal to acknowledge transitional costs with straight implications for the EU's excessive deficit procedure, Estonia temporarily suspended contributions to the second pillar in 2009 and 2010 to meet the 3% deficit target in the context of euro adoption. Poland opted for a permanent reduction mainly because the country's general government debt-to-GDP ratio was fast approaching the self-imposed binding intermediate debt ceiling of 55% of GDP, which is part of the

country's constitutional debt rule. Hungary went for the corner solution and fully dismantled the second pillar in 2011 because the newly elected government wanted to create additional fiscal space.

A common justification for weakening the second pillar was the list of weaknesses related to the functioning of private pension funds, including high management fees, low real returns, ineffective/insufficient risk-diversification strategies and the problem of regulating annuities needed for pension payouts. It is clear that most of them could have been sorted out by better regulation. The relevant legislation should be amended to lower excessive management fees, increase competition among pension funds and allow for more effective portfolio diversification, including in particular by raising the ceilings on foreign asset holdings. In addition, individual portfolio choice could be introduced, including life-cyle investment strategies that reduce investment risk as members approach retirement and appropriate default options for those who do not make an active portfolio choice. Finally, the market for annuities needs better regulation to ensure transparent price disclosure and effective competition among providers.

Country-specific details

Table 1 gives a detailed overview of the backtracking on the second pension pillar. Estonia was the first country to step on the brakes and weaken its second pillar. Four (out of six) percentage points of social contributions were diverted from the second pillar to the State pension fund in the second half of 2009 and in 2010. The transfer of social contributions to the second pillar is planned to resume partially in 2011 and things are expected to be back to normal starting in 2012. The government plans to compensate for foregone contributions by increasing transfers by an additional 2 percentage points from 2014 to 2017 for those who continued paying 2% of gross salary to the second pillar in 2010 and 2011 or who are willing to pay an additional 1 percentage point starting in 2014.

Hungary went a long way towards fully scrapping its second pension pillar. In early October 2010, the government announced a temporary suspension of contributions to the second pillar for 14 months and the possibility for workers to leave the second pillar. Only a month later, the death sentence of the second pillar was passed into law. People had two months until January 2011 to decide whether they wanted to stay in the second pillar, with automatic return to the first pillar being the default option. The disincentives to stay were very strong: for those who decided to stay, the employees' contribution would increase from 8 to 10% of gross salary and they would loose all entitlement from the first pension pillar that would stem from contributions paid starting in 2011. As a result, only 3% of the insured and 10% of the pension funds remained in the second pillar. With 97% of second pillar pension members leaving the system, the government effectively nationalised the private pension funds' assets. To offer some compensation, those who returned to the first pillar received a cash cheque for the real returns on their pension assets for the years of their membership. The final nail in the coffin of the second pillar was the decision in late 2011 to permanently divert pension contributions of the few remaining members to the first pillar.

The Polish government decided to reduce, as of May 2011, the government's contribution to the second pension pillar from 7.3 to 2.3% of gross salary. The difference is credited to notional sub-accounts in the pension system's first pillar, in which the accumulated pension contribution will be indexed on the basis of nominal GDP growth, as opposed to the rate of growth of the nominal wage bill used for the original notional accounts. At the same time the government announced that it plans to raise contributions going to the second pillar to 3.5% in 2017. Also, the government mentioned the possibility of a tax break on savings going to the third voluntary pension pillar. The 2011 change is estimated to have reduced the budget deficit by increasing revenues by around 0.8% of GDP in 2011 and a total of 1.2% each year from 2012 onwards.

The impact on general government deficit and debt – a literature review

Little background analysis was done with regard to the fiscal implications of the weakening of the second pension pillar, which is not surprising given the major motivation of a quick and easy fix for public finances. For Hungary, Orbán and Palotai (2005) compared the deficit of the pension system with and without a second pillar in a simulation exercise run from 2004 to 2104. They show that the initially higher deficit of the two-pillar system will become lower than that of a single-pillar system starting around 2050. Yet, the net present value of the cumulated deficits of the two-pillar system will be lower than the single-pillar system's only with a low discount rate of 2%. For discount rates higher than 2%, the introduction of the second pillar does not improve fiscal sustainability. The implications of these results are that the abolition of the second pillar will not worsen Hungary's long-term fiscal position if reasonably high discount rate are employed.

For Poland, Kempa (2010) simulated the deficits of the single-pillar system based on notional accounts, the two-pillar system before the 2011 change and the two-pillar system with pension contributions going to the second pillar reduced from 7.3% to 3% of gross salaries.[3] The simulation results computed until 2060 show that the defined-contribution (notional account) single-pillar system has a permanently lower deficit than the two-pillar system. This implies that the second pillar permanently worsens the pension system's fiscal sustainability over the simulation horizon: hence, a reduction in the contribution rates transferred to the second pillar yields a permanent improvement in the pension system's implicit debt.

Simulating the impact of weakening the second pillar on the system's deficit and implicit debt

The main questions

Given the scarce evidence on the effects on fiscal sustainability of the recent changes in the CEECs' pension systems, we carry out an extensive simulation exercise using a variety of scenarios for the period running from 2011 to 2200 in order to capture very long-term effects for three countries: Poland, Hungary and Estonia. The questions to be addressed are as follows:

1. Does the reduction in pension contributions in Poland from 7.3% of gross wages to 2.3% (and back to 3.5% in 2017) improve fiscal sustainability and at what horizon? How sensitive are the results to alternative scenarios? More specifically, how do the tax breaks proposed by the government for savings going to the voluntary third pension pillar and an increased number of pensioners falling below the social minimum alter the conclusions?
2. What is the differential fiscal impact if the contribution rates are reduced permanently to 2.3% from 7.3%?
3. What is the impact of the Polish government's decision to weaken the second pension pillar on future replacement rates?
4. What is the impact if the reduction in the contribution rates were to be compensated as proposed in Estonia?[4]
5. What is the impact if the second pillar were scrapped altogether? This scenario allows the examination of the Hungarian case in a stylised way using a defined-benefit first pillar?

3. The 2011 change consisted of reducing the contributions from 7.3% to 2.3%.

4. While using the Polish population data to analyse the cases of Estonia and Hungary limit the practical usefulness of the results, the same framework ensures full comparability of the different results.

The framework

Alternative scenarios for tax credits for the third pension pillar and the issue of minimum social pensions

To judge the full impact of the change in the second pillar on fiscal sustainability, the following two factors need to be taken into account: a tax credit offered for savings in the third voluntary pension pillar and minimum social pensions. First, the government announced a tax credit of 4 percent of the tax base for personal income for savings going to the voluntary third pension pillar. The tax credit should be first introduced in 2012 and gradually increased to 4% by 2017.[5] Our baseline scenario assumes that 50% of taxpayers take full benefit of the tax credit. Alternative scenarios assume 10% and 90%. Data available in 2010 for average wages in the 18% and 32% tax brackets are used to calculate the revenue loss for public finances. The tax brackets are revalued each year using an index composed of 50% inflation and 50% nominal wage growth.

The second factor is minimum social pensions, spending on which might rise with a fall in old-age pension replacement rates. Because endogenously calculating spending on minimum social pension benefits is computationally demanding, we use exogenous assumptions. Our baseline assumes that: *i*) the minimum social pension as a share of the average wage is 25%, *ii*) 20% of new pensioners receive pension benefits lower than the social minimum, and *iii*) the average pension below the social minimum is 15% lower than the social minimum. The latter two parameters are changed in two alternative scenarios (Table 3).

Population

The exercise is calibrated to the Polish case. We use data on annual cohorts in Poland to produce population projections. In our baseline scenario, we keep fertility and cohort-specific mortality rates constant at the levels observed in 2009: the ratio of the working-age population to the pension-age population declines rapidly until around 2030, reaches its trough in around 2060 and then stabilises at a level much below the 2011 level (Figure 2, left panel). This scenario might be viewed as somewhat artificial because mortality rates are not allowed to decline, which keeps life expectancy of elderly people unchanged over the projection horizon and fertility rates do not converge to levels needed to reproduce population, *e.g*. slightly above 2. Nevertheless, such a setup has a number of advantages. First, it is difficult to foresee accurately the decline in mortality rates and the rise in fertility rates at longer time horizons. Any assumptions with regard to these two variables will be necessarily arbitrary. The second advantage is that keeping these parameters constant in the baseline scenario allows us to model separately the impact of changes in mortality and fertility rates on the pension system's fiscal balance and implicit debt under alternative scenarios by changing only one of them in alternative scenarios. In the first alternative scenario, the fertility rate is increased gradually from 1.4 in 2011 to 2 in 2025 and is kept at this level thereafter while mortality rates are maintained at the 2009 levels. In the second alternative scenario, mortality rates decline for the cohorts over the age of 65, whereas the fertility rate is kept at 1.4 throughout the simulation period. We keep life expectancy unchanged for the calculation of the pension benefits, which is akin to a life expectancy shock. In fact, Whitehouse (2007) argues that official life expectancy projections have been systematically biased downwards because of the under-estimation of the decline in mortality rates. Overall, the second alternative scenario combines population ageing, which is accompanied by a systematic under-estimation of life expectancy rises.

A gradual increase in the fertility rate will have a large impact, though only with a considerable delay (around 2060) on the working-age (or workers) over pension-age population ratio. By contrast, a constant improvement of mortality rates for the pension-age population will lead to an ever declining ratio over the

5. The draft budget bill 2012 did not include this measure.

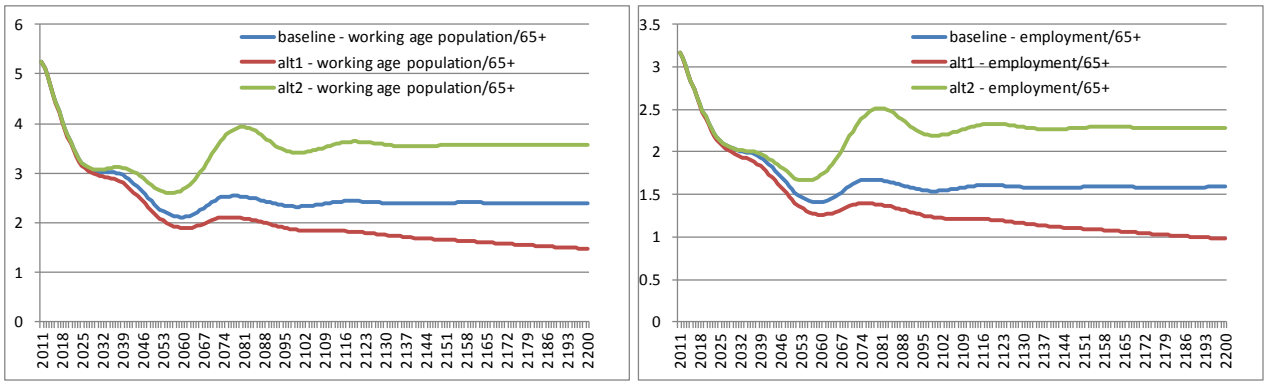
entire simulation horizon. Indicators measuring the number of employed persons relative to that of the pension age population show very similar dynamics (Figure 2).

Table 3. **Main assumptions underlying the simulations**

Scenarios	Baseline	Alternative scenario 1	Alternative scenario 2
Population	Fertility rate: 1.4 (2009) Mortality rates: as in 2009	Fertility rate: 1.4 (2009) Mortality rates: drop (0.005% per year)	Fertility rate: 2 Mortality rates: as in 2009
Employment rates	Carrying over employment rates, pass-through		
	65%	82%	–
Real wage growth			
Starting point	4%	4%	4%
Endpoint	2%	1%	3%
Convergence	Gradual	Fast	Slow
Labour share in GDP	55%	65%	45%
Indexation of existing pensions			
Weight on inflation	80%	100%	0%
Weight on wage growth	20%	0%	100%
Accrual rates			
Non-switchers	0.67%	0.67%	0.67%
Switchers	0.78%	0.78%	0.78%
The share of revenue losses due to public employment, pension privileges and the farmers' pension scheme			
Share	30%	15%	45%
Tax break third pillar			
Taxpayers benefiting	50%	10%	90%
PIT rate 1	18%	18%	18%
PIT rate 2	32%	32%	32%
Minimum social pension			
Minimum pension as % of average wage	25%	25%	25%
Proportion of new pensioners below social pension	20%	10%	30%
Average pensions below social pension as % of social pension	15%	10%	20%
Interest rate on pension debt –>nominal GDP growth + factor			
+ factor	0%	2%	-2%
2nd pillar rate of return –> nominal GDP growth + factor			
+ factor	2%	4%	0%
DB 1st pillar – replacement rate for the simulation of the Hungarian case			
	60%	70%	80%

Source: The accrual rate for switchers and non-switchers is obtained from Mattil and Whitehouse (2011).

Figure 2. **The outcome of population projections underlying the simulation exercise**



Source: OECD calculations.

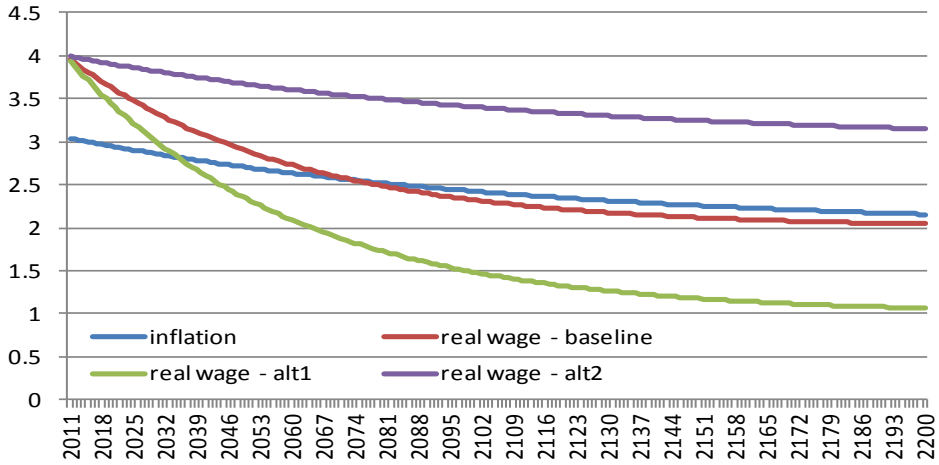
Employment rates

Poland has a low employment rate by OECD standards. Our baseline scenario uses an initial employment rate of about 65%. The low rate is partly because an important share of the working-age cohorts after the start of economic transformation decided to withdraw from the labour market due to skill mismatches. Nevertheless, the employment rate of the younger cohorts is much higher: 78% for those aged between 25 and 34, and 83% for the cohorts 35 to 44, before dropping to 38% for the cohorts aged 55 to 64. Therefore, it is likely that the low employment rate of the older generation will increase with the ageing of the current young generation. The alternative scenario assumes that the current employment rate of the young cohorts will not drop as they age, yielding a long-term employment rate above 80%.

Macroeconomic assumptions

We assume that real wage growth move hand in hand with labour productivity gains and that the starting rate of 4% in 2011 is followed by a gradual decline to 2% in the central scenario and to around 3% and 1% in the optimistic and pessimistic scenarios, respectively (Figure 3). Inflation is assumed to decline from 3% in 2011 (the average of the last ten years) to 2% by 2200, reflecting progress in real convergence. The labour share in GDP is around 55% in Poland. In two alternative scenarios, we use 45% and 65%. In all scenarios, the labour share is kept constant throughout the projection period. Nominal GDP is calculated as the wage bill (employment times the level of nominal wages) divided by the labour share.

Figure 3. **Real wages and inflation**



Source: OECD calculations.

Reconstructing pension payments in the first and second pension pillars

We construct a stylised version of the Polish pension system in which: *i*) special pension schemes (for uniformed services, judges, miners and farmers) are not taken into consideration: everybody is affiliated with the general system; *ii*) both men and women retire at the age of 65; and *iii*) the average contribution period is 40 years. Given these simplifications, pension payments are reconstructed using pensioner inflows starting in 1960. Our system comes to maturity during the late 1990s, when everybody entitled to pension benefits is included in the system. The 1999 pension reform was implemented starting in 2000. Those born after 1949 had to join the notional account-based first pillar, but had the choice to join the second pillar if they were born before 1968. For simplication, we assume that the switching rate to the 2nd pillar was 100%. The post-1968 generation had no choice but to enter both pension pillars. Our 100%

switching rate implies that upfront benefits of any weakening of the second pillar will be overestimated. The results for public debt sustainability can therefore be viewed as optimistic. This means that if our results show problems, they are likely to manifest themselves more forcefully in reality.

Pension benefits from the reformed system will be first paid for the 1949 generation retiring in 2014. For this generation, a small proportion of pension benefits will come from the notional and real capital accumulated in the first and second pillars after 2000, while a major chunk will be calculated using an accrual rate of 0.78% for the years before 2000: the number of years multiplied by the accrual rate multiplied by the last salary. The first generation that will receive a full pension from the notional accounts will retire in 2039.

Another important aspect of pension finances relates to revenue losses. The pension contributions paid by the State for civil servants are fictitious, as they are covered by other tax receipts. The revenue losses are amplified by specific pension privileges, including the uniformed services, judges, miners and by the farmers' pension scheme (KRUS). Our central scenario assumes that the revenue loss is 30%. Alternative scenarios use 15% and 45%.

In our baseline, existing pension benefits are indexed using 80% inflation and 20% nominal wage growth. Alternative scenarios consider 100% inflation and 100% nominal wage growth indexation. For the pre-1949 generation, three alternative replacement rates are considered: 60%, 70% and 80%. These assumed replacement rates will be used to examine the budgetary impact of the weakening of the second pension pillar in Hungary.

The calculations are carried out in an excel file, and the cumulated pension capitals are calculated for each and every cohort both in the first and second pillar, according to the rules of the Polish pension system. The change in the wage bill is applied as a rate of return on cumulated pension capital on individual notional accounts in the first pillar. Contributions diverted from the second to the first pillar are indexed by nominal GDP growth. The rate of return on second-pillar pension funds is shown in Table 3. The value of an annuity from the first pillar is computed as the cumulative pension wealth of an individual divided by life expectancy at the age of retirement. By contrast, the annuity from the second pillar, used to determine replacement rates, is calculated as cumulated pension assets divided by life expectancy, which is corrected for the risk-free interest rate. The calculation of this so-called annuity factor follows Whitehouse (2007, page 28): the survival function (one minus the mortality rate) is discounted using the real interest rate (which is nominal GDP growth minus inflation in our case) for each annual cohort after retirement. The sum of the cohort-specific values gives the interest rate-adjusted life expectancy.

The pension system's deficit and debt

The deficit of our stylised pension system is calculated as total revenues minus pension benefits paid over nominal GDP. The pension system's debt is obtained as follows. The starting point is zero debt in 2010. In each year, the current year's deficit/surplus is added to the stock of debt of the previous year, which is augmented by interest payments. As the long-term nominal interest rate is supposed to equal potential nominal GDP growth and as the implied real GDP growth rates can be viewed as the economy's potential growth rate, the interest rate on debt is assumed to be equal to nominal GDP growth in our central scenario. Alternative scenarios use nominal GDP growth plus 2 percentage points and nominal GDP growth minus 2 percentage points.

Replacement rates implied by various scenarios

A final question that needs to be addressed is the replacement rates resulting from the changes in the pension system and using various alternative assumptions for the simulations. We define the replacement

rate as pension benefits at the time of retirement as a share of the average gross wage in the economy.[6] An important parameter is the rate of return on pension assets accumulated in the second pension pillar. Our baseline scenario is a real rate of return of 2%. Alternative scenarios work with real rates of return of 4% and 0%. But for comparison purposes, the rate of return on pension assets is kept unchanged for the pessimistic and optimistic macroeconomic scenarios. The impact of the rate of return on replacement rates is shown all things being equal.

Simulation results

Poland: the impact of the changes to second pillar on the deficit and implied public debt

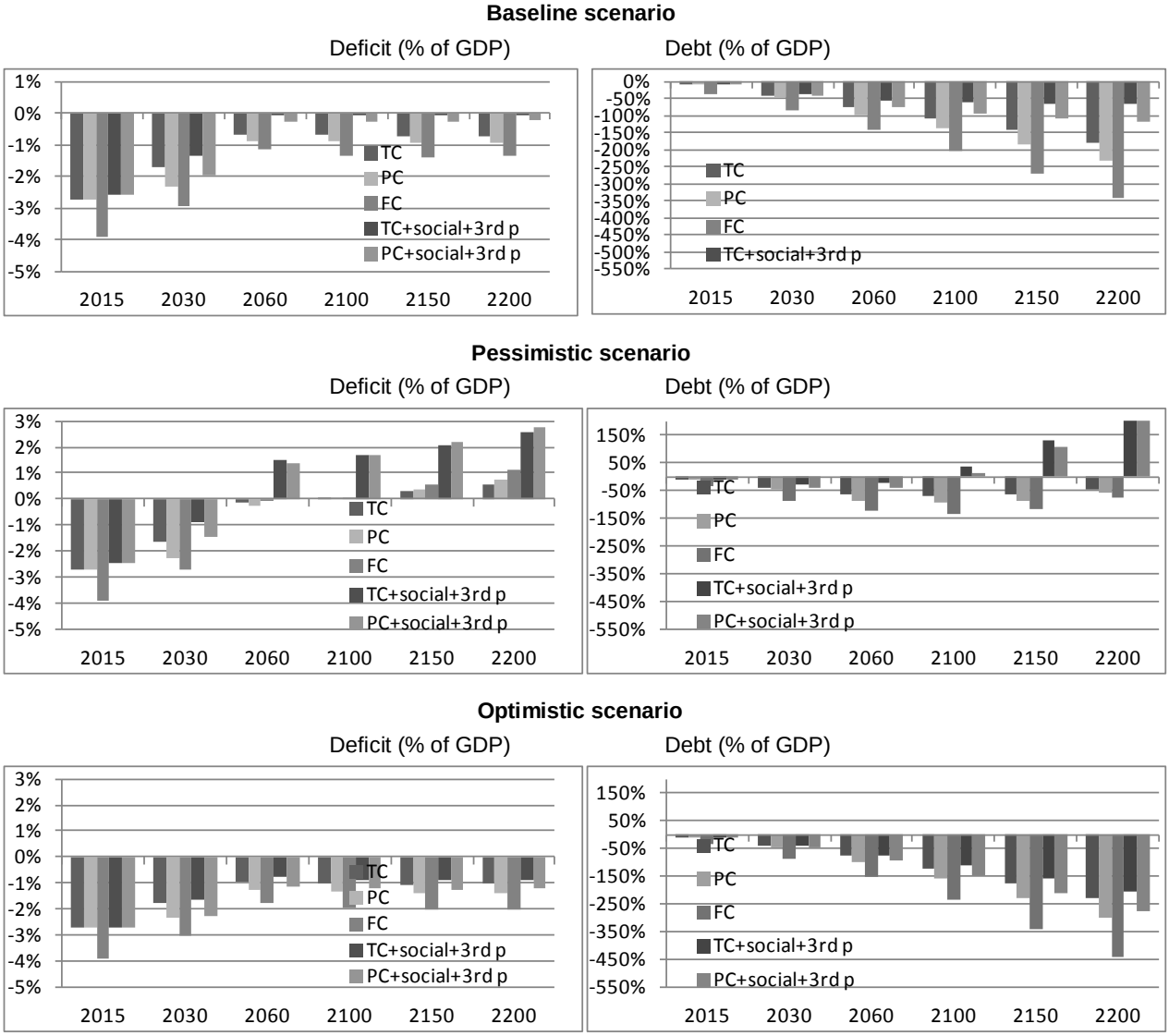
Three policy changes are considered in the simulation exercise: *i*) the lowering of pension contributions going to the second pillar from 7.3% to 2.3% and an increase back to 3.5% after 2017 (temporary change (TC) scenario); *ii*) a permanent cut from 7.3% to 2.3% (permanent change (PC) scenario); and *iii*) the immediate dismantling of the second pillar (full change (FC) scenario). In this case, we assume that second-pillar pension assets amount to 20% of GDP, and implicit debt accumulation starts from that level.

The difference in deficit and debt levels compared to the no-change (NC) scenario (two-pillar system with 7.3 percentage points of contributions going to the second pillar), expressed in percentage points, are shown in Table A1. Negative figures indicate that the change lowers the deficit/debt level, whereas positive numbers show a deterioration of the deficit and debt. The results for the baseline scenario show that any form of changes (TC, PC or FC) will permanently reduce both the pension system's deficit and debt compared to the no-change scenario. Not surprisingly, the smallest savings result from the TC scenario, while the largest gains relate to the full reversal of the second pillar. The permanent change scenario is somewhere in between (Figure 4).

As part of the recent weakening of the second pension pillar, the Polish government also discussed the possibility of introducing a tax break on savings going to the voluntary third (fully-funded) pension pillar. But even so, replacement rates might become unsustainably low from a social point of view, which in turn would increase spending to top up pension benefits below minimum pensions. If one accounts for the extra costs of tax breaks and the existence of minimum social pensions, the pension system's deficit becomes higher around 2050 for the TC scenario compared to the NC scenario, even though permanent gains in debt reduction remain thanks to important upfront savings. For the PC and FC scenarios, the level of the deficit is reduced permanently but only slightly after 2060. Looking at the sensitivity of the results to the underlying assumptions, Table A1 shows that more (less) population ageing, lower (higher) real wage growth and a higher (lower) indexation of existing pension benefits reduce (increase) savings relative to the NC scenario. Also, assumptions yielding higher costs related to tax breaks and more spending on social minimum pensions will increase future deficits, irrespective of the scenario considered (TC, PC or FC). A pessimistic scenario, which combines all these elements (lower wage growth, more rapid population ageing, higher pension indexation, more tax expenditures and higher spending on minimum pensions), shows that costs related to the third-pillar tax breaks and minimum social pensions may offset upfront gains and lead to higher implicit debt around the year 2100.

6. We define replacement rate as the pension benefit over the average gross wage in the economy at the time of retirement. This is different from the definition used in OECD (2011), which compared pension benefits with the average wage over the retiree's career.

Figure 4. **Deficit and debt of the pension system in the baseline, pessimistic and optimistic scenarios, compared to the reference scenario of no-policy change**



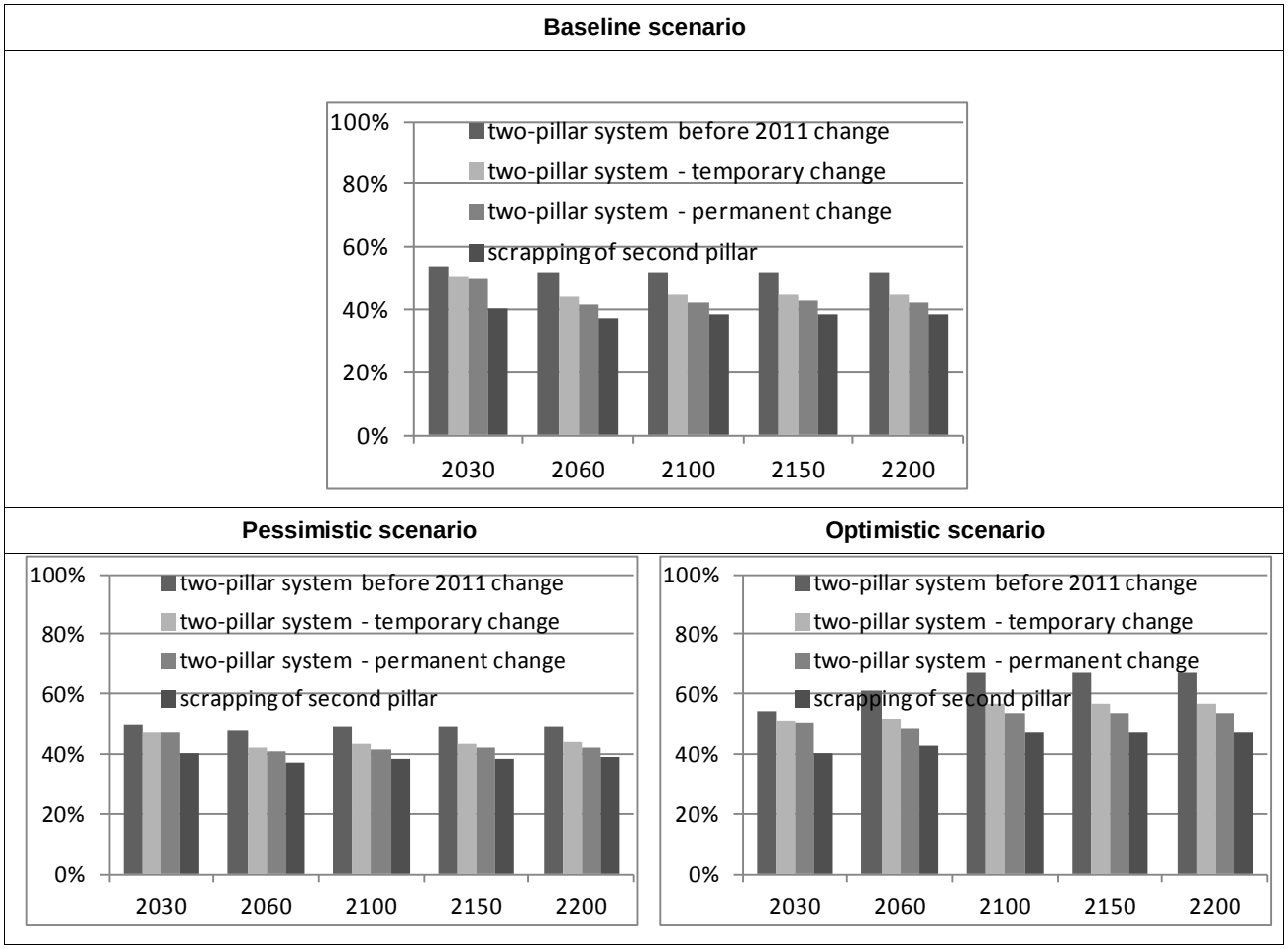
Note: TC = temporary change (lowering of pension contributions going to the second pillar from 7.3% to 2.3% and an increase back to 3.5% after 2017); PC = permanent change (a permanent cut from 7.3% to 2.3%); FC = full change (the immediate dismantling of the second pillar); TC+social+3rdp = TC with social pensions and tax breaks on third pillar savings; PC+social+3rdp = PC with social pensions and tax breaks on third pillar savings.

The implications for replacement rates

Simply put, fiscal sustainability improves because the reform reduces future replacement rates. Annuities paid from the second pillar are calculated as pension assets divided by life expectancy at the time of retirement, adjusted for the interest rate. By contrast, the calculation of annuities in the first pillar ignores the interest rate, which in turn decreases already low replacement rates. Our simulations show that in the baseline scenario, the replacement rate would drop by around 10 percentage points from above 50% to around 40% (Figure 5). The temporary change scenario implies the smallest drop (about 8 points), and scrapping the second pillar would result in a cut of roughly 12 points in future replacement rates. Obviously, replacement rates depend a great deal on the underlying macroeconomic and population

assumptions and the rate of return on second-pillar investment. While pessimistic underlying assumptions would leave replacement rates broadly unchanged compared to the baseline macroeconomic assumptions, a combination of optimistic macro and population scenarios not only raises replacement rates, but also increases the gap between the replacement rate in the no-change scenario and the scenarios involving a weakening of the second pillar. The more pronounced the weakening, the larger the loss. For the temporary change scenario, it is about 10 percentage points, while in the case of a full dismantling, the loss amounts to more than 20 percentage points.

Figure 5. **Replacement rates under the baseline, pessimistic and optimistic scenarios**

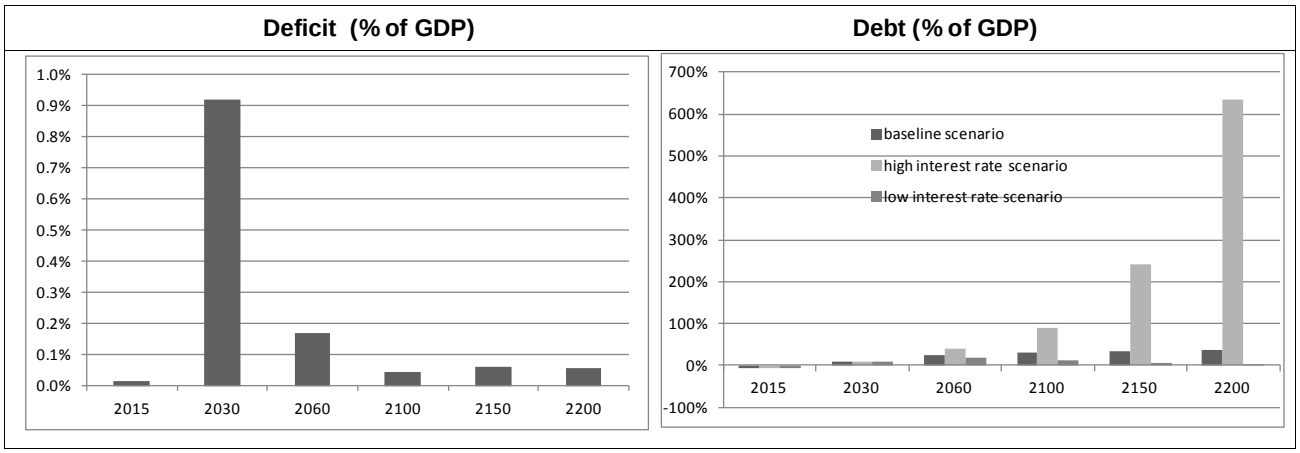


Estonia: compensating for temporary suspension

We use the Polish data to understand the impact of policy changes implemented in Estonia, which consisted in temporarily reducing the contribution rate to the second pillar, followed by a prolonged period of higher contribution rates and finally a return to the initial level of contribution rates. Obviously, such a scenario implies an initially lower deficit level, followed by higher deficits and then a move back to the deficit level of the no-change scenario. Figure 6 shows the debt level implied by such a sequence of deficits. If the effective interest rate used to calculate interest payments equals nominal GDP growth, the Estonian policy leads to permanent but only moderate declines in the public debt level. By contrast, raising the interest rate by 2 percentage points above nominal GDP growth results in an explosion of the implicit

debt after 2010. At the same time, an interest level which is below nominal GDP growth will first induce a small increase in implied debt, which gradually vanishes over the simulation period.

Figure 6. **Deficit and debt of the pension system using policy changes implemented in Estonia, compared to reference scenario of no-policy change**

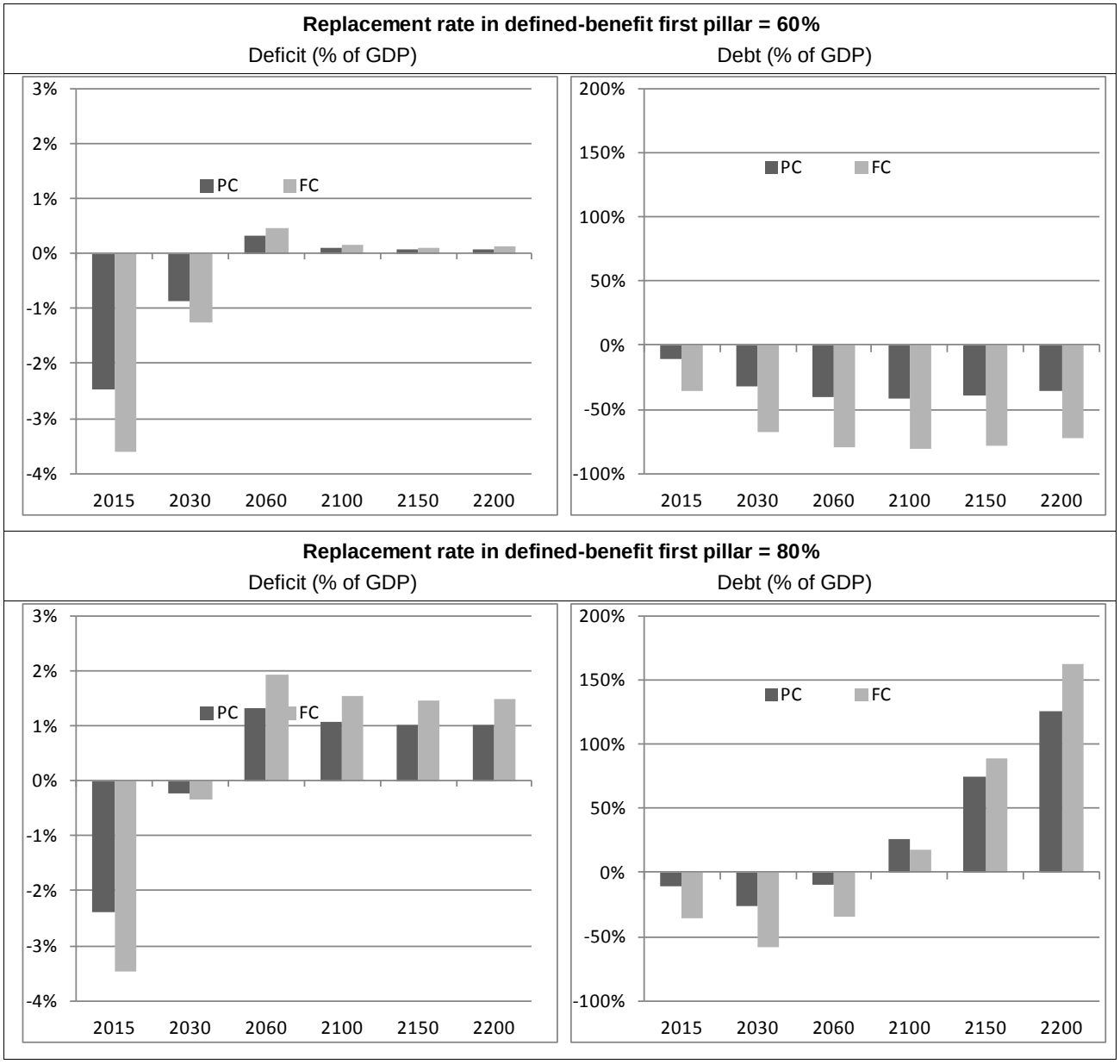


Hungary: the importance of the first pillar

Hungary's first pension pillar is radically different from Poland's: it is a more expensive defined-benefit system. It is therefore interesting to analyse the impact of the Polish changes to the Hungarian system, which is a combination of a defined-benefit first pillar and the defined-contribution second pillar. Based on Polish data and the assumptions underlying the previously used baseline, a permanent reduction in second-pillar pension contributions (scenario PC) yields large upfront saving during the 20 years following the changes (Figure 7). Nevertheless, such a change will trigger permanently higher deficits later on, even though implicit debt will be reduced permanently compared to the no-change reference scenario. These results change substantially if the replacement rate in the first pillar is increased from 60% to levels prevailing currently in Hungary, that is from 70% to 80%. Higher replacement rates imply much more short-lived upfront gains. The deficit first shrinks but then will be higher than the one implied by the no-change scenario after 2030. At the same time, debt will be higher towards the end of this century compared to the no-change scenario. Obviously, a mix of high first-pillar replacement rates and pessimistic underlying assumptions brings the increase in the implicit debt forward.

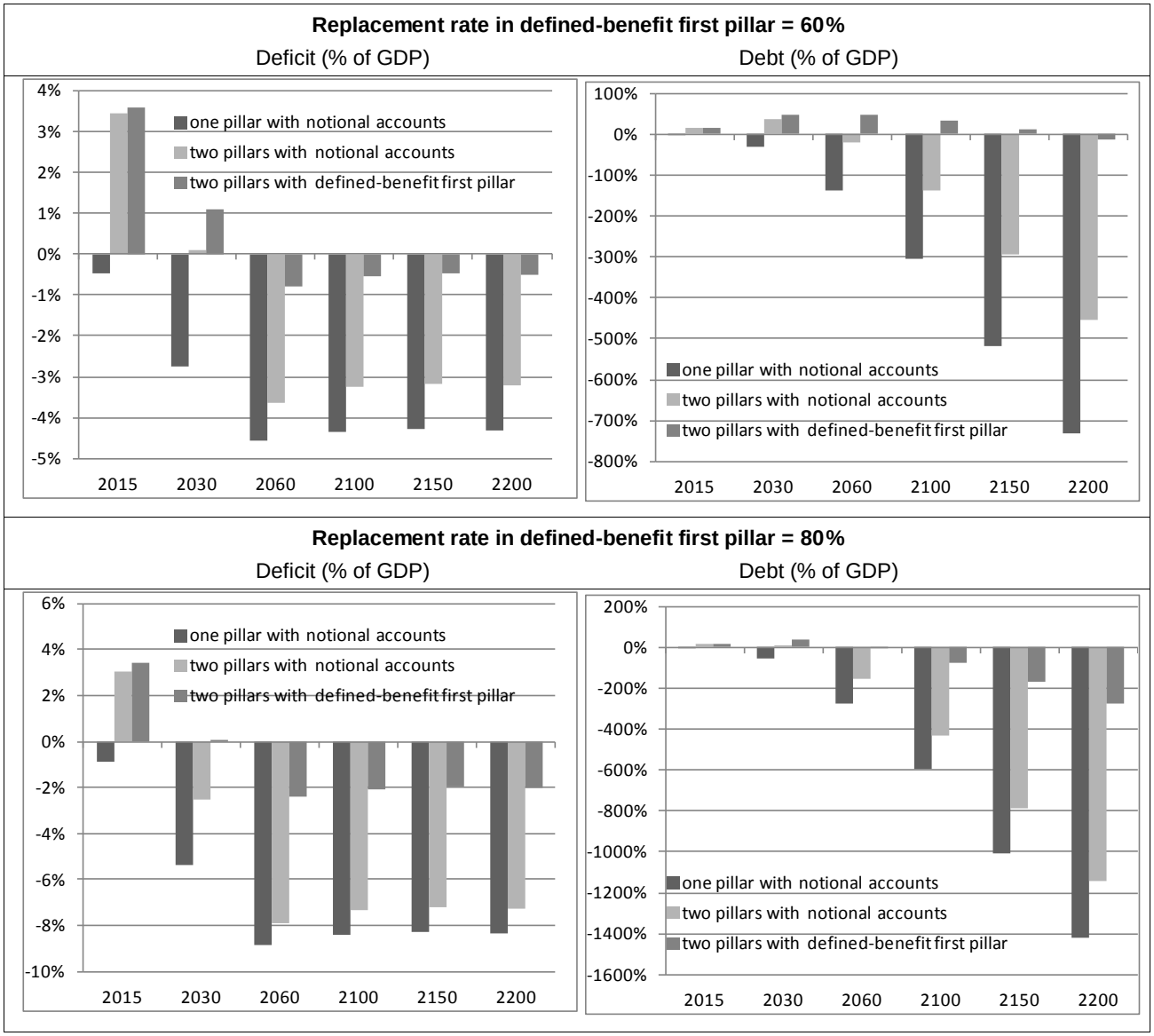
The reason why the Hungarian reversal will have a certain detrimental effect on public debt sustainability is because Hungary did not reform its first pension pillar. Simulations looking at the relative gains from the 1998/99 reforms show clearly that, based on a replacement rate of 60% in the first pillar and the baseline scenario used earlier, the most important improvement in the pension system's sustainability comes from the introduction of (near) actuarial fairness in the first pillar (Figure 8). The introduction of a second pension pillar, which is carved out from the first pillar, reduces sustainability gains. Table A5 shows that replacing part of the defined-benefit first pension pillar by a defined-contribution second pillar will improve pension system debt sustainability only in the very long run and only very marginally. More substantial but still faraway improvements occur if the replacement rate is higher in the first pillar. Nevertheless, these improvements are dwarfed by potential gains brought about by the introduction of the defined-contribution first pension pillar, which reduces future replacement rates.

Figure 7. **Deficit and debt of the pension system using different replacement rates in the defined-benefit first pillar, compared to the reference scenario of no-policy change in the two pillar system including a defined-benefit first pillar and a defined-contribution second pillar**



Note: PC = permanent change (a permanent cut from 7.3% to 2.3%); FC = full change (the immediate dismantling of the second pillar).

Figure 8. **Deficit and debt of the pension system using different replacement rates in the defined-benefit first pillar, compared to the defined-benefit mono-pillar system**



Conclusion

This paper studied the impact of recent changes in second pension pillars of three Central and Eastern European Countries on the deficit and implicit debt of their full pension systems. The paper sought to answer the following questions: i) what is the impact on the sustainability of Poland's pension system of the decrease in the pension contribution going to the second pension pillar from 7.3% to 2.3% in 2011; ii) what are the implications of the recent changes on gross replacement rates; iii) does the weakening of the Polish second pension system have a different impact on pension system sustainability than a similar move in a Hungarian-style pension system with a defined-benefit first pillar and iv) how does Estonia's temporary decrease in pension contributions compensated by temporarily higher future rates affect pension sustainability in that country. Our simulation results indicate that in our baseline scenario the Polish move would permanently lower future pension-system debt, chiefly as a result of a cut in replacement rates. But

using a combination of pessimistic assumptions including strong population ageing, low real wage growth and a high indexation of existing pension benefits, coupled with bringing in tax expenditures related to the third voluntary pension pillar and an increase in the share of minimum pensions leads to higher pension system deficits and eventually more public debt at a very long horizon. The simulations also suggest that the Hungarian pension reversal reduces deficit and debt only temporarily, mainly because of Hungary's costly defined-benefit first pension pillar: the weakening of the second pillar is tantamount to swapping low current replacement rates (in the defined-contribution second pillar) against high future replacement rates in the defined-benefit first pension pillar. Finally, results show that the Estonian move will increase public debt only very moderately in the long run, even though this result is sensitive to the effective interest rate on public debt.

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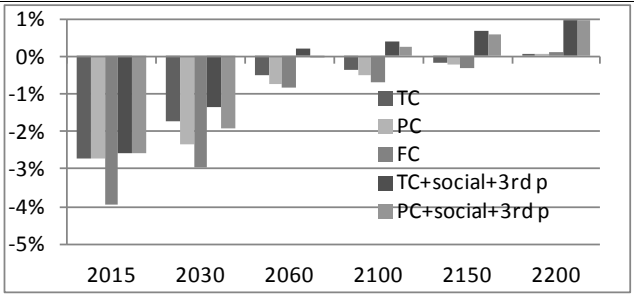
Annex

Table 1. Table A1. **Simulation results – Poland**

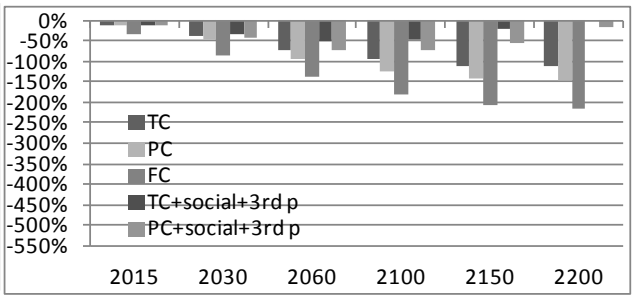
Deficit and debt of the pension system in alternative scenarios, compared to the reference scenario of no-policy change

Population 1 – decrease in mortality rate

Deficit (% of GDP)

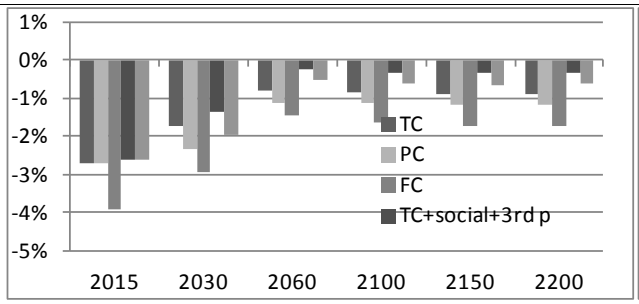


Debt (% of GDP)

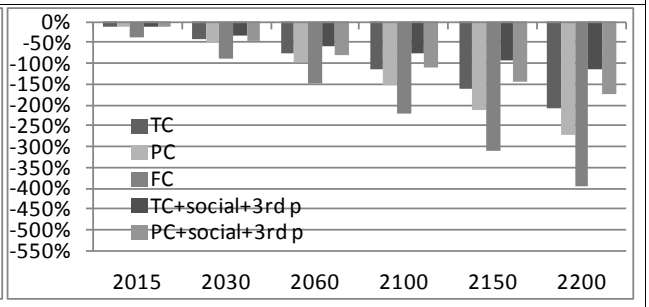


Population 2 – increase in the fertility rate

Deficit (% of GDP)



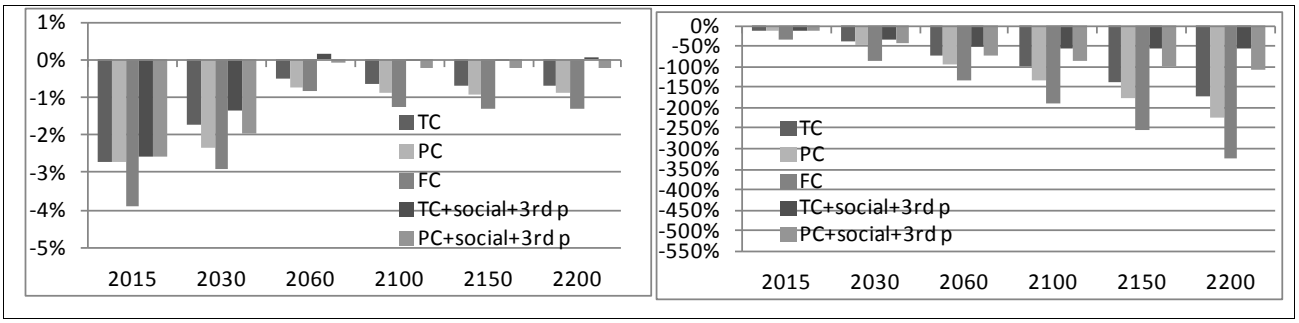
Debt (% of GDP)



Employment – rise in the employment rate

Deficit (% of GDP)

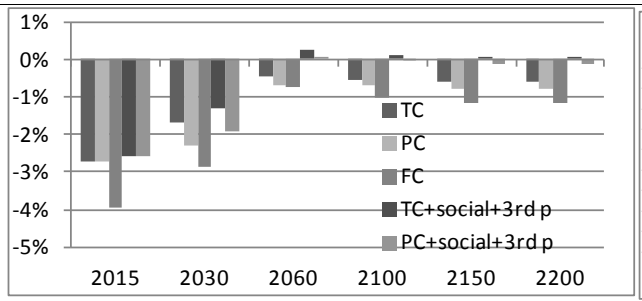
Debt (% of GDP)



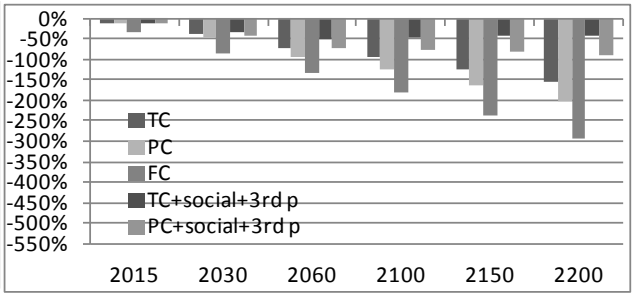
Note: TC = temporary change (lowering of pension contributions going to the second pillar from 7.3% to 2.3% and an increase back to 3.5% after 2017); PC = permanent change (a permanent cut from 7.3% to 2.3%); FC = full change (the immediate dismantling of the second pillar); TC+social+3rdp = TC with social pensions and tax breaks on third pillar savings; PC+social+3rdp = PC with social pensions and tax breaks on third pillar savings.

Real wages 1

Deficit (% of GDP)

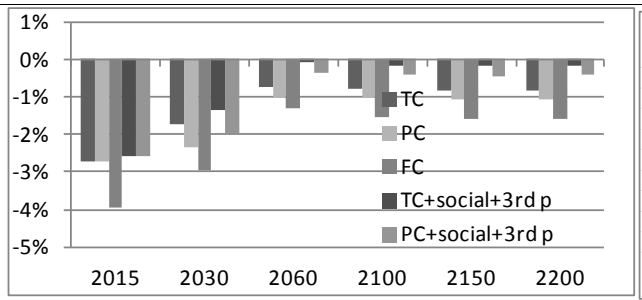


Debt (% of GDP)

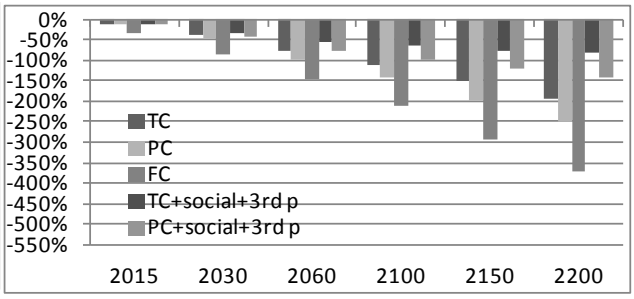


Real wages 2

Deficit (% of GDP)

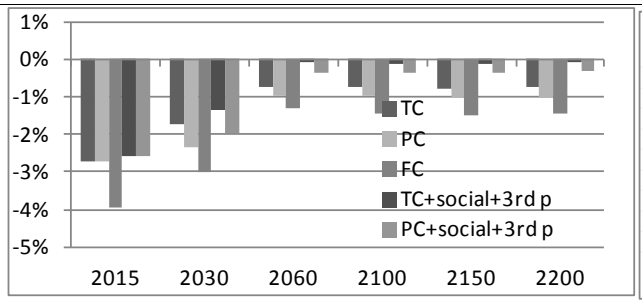


Debt (% of GDP)

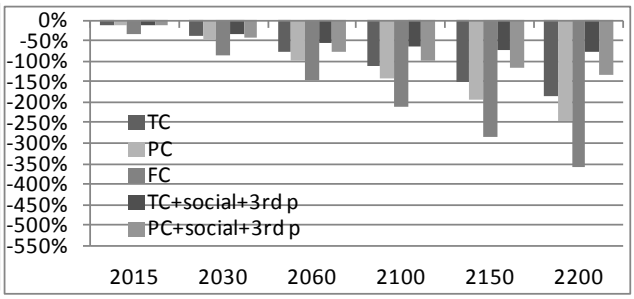


Pension indexation 1 – 100% inflation indexation

Deficit (% of GDP)

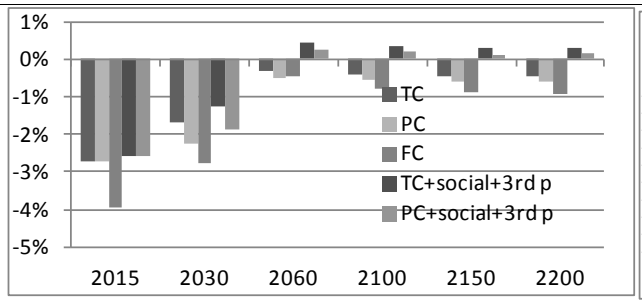


Debt (% of GDP)

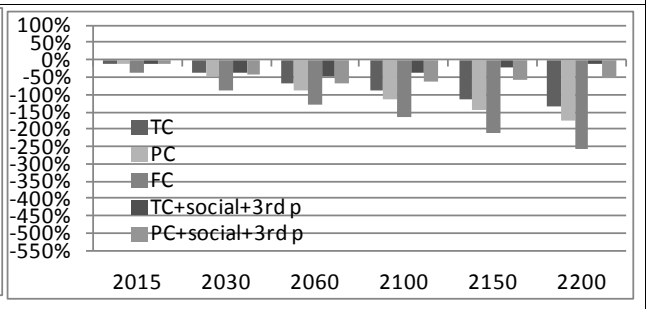


Pension indexation 2 – 100% wage indexation

Deficit (% of GDP)

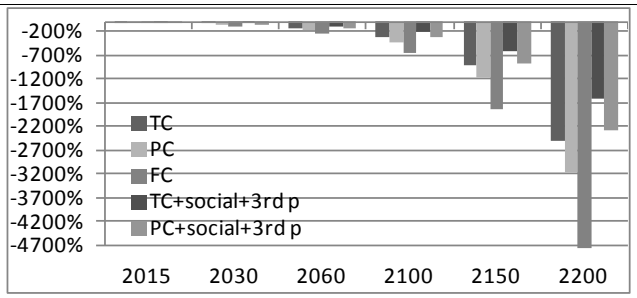


Debt (% of GDP)

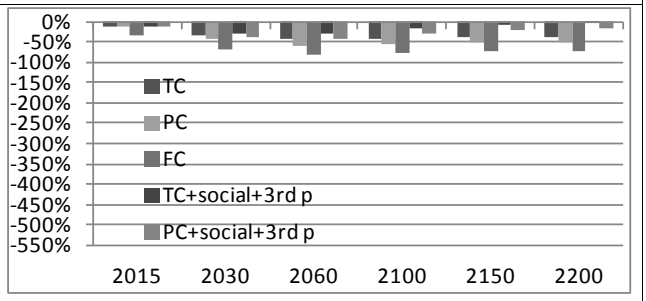


Note: TC = temporary change (lowering of pension contributions going to the second pillar from 7.3% to 2.3% and an increase back to 3.5% after 2017); PC = permanent change (a permanent cut from 7.3% to 2.3%); FC = full change (the immediate dismantling of the second pillar); TC+social+3rdp = TC with social pensions and tax breaks on third pillar savings; PC+social+3rdp = PC with social pensions and tax breaks on third pillar savings.

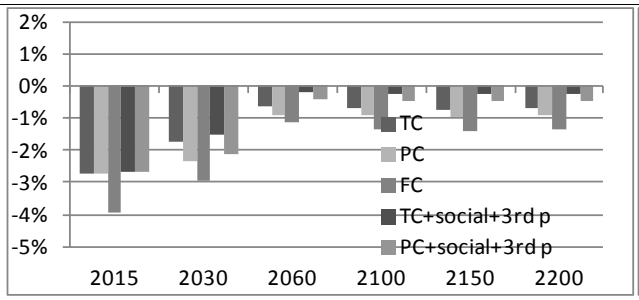
Interest rate: nominal GDP growth +2%
Debt (% of GDP)



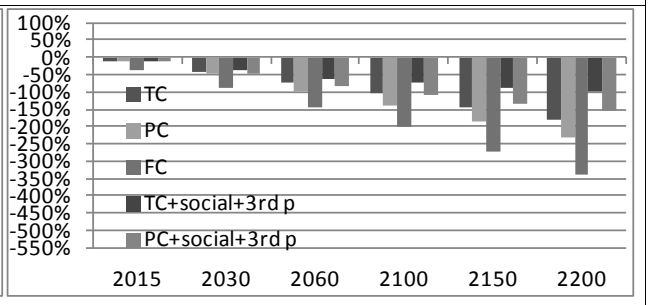
Interest rate: nominal GDP growth -2%
Debt (% of GDP)



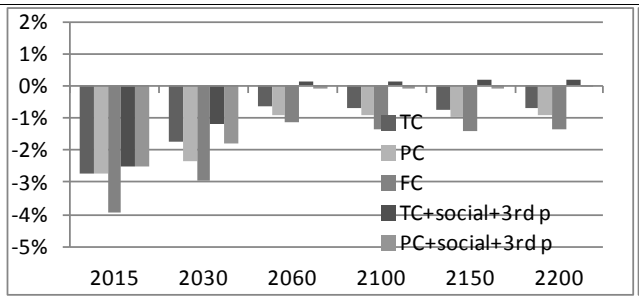
Tax break 1 – optimistic scenario
Deficit (% of GDP)



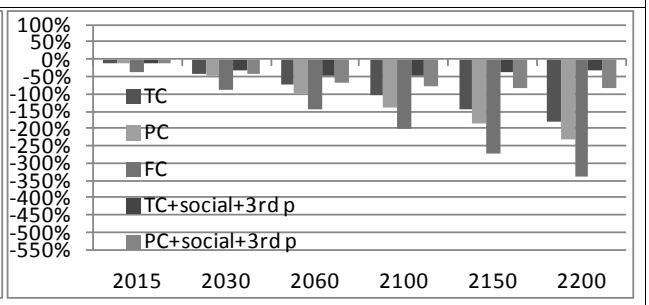
Debt (% of GDP)



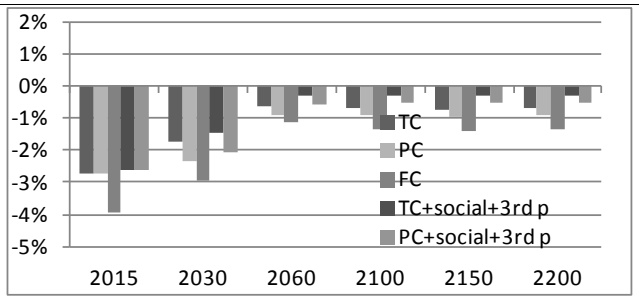
Tax break 2 – pessimistic scenario
Deficit (% of GDP)



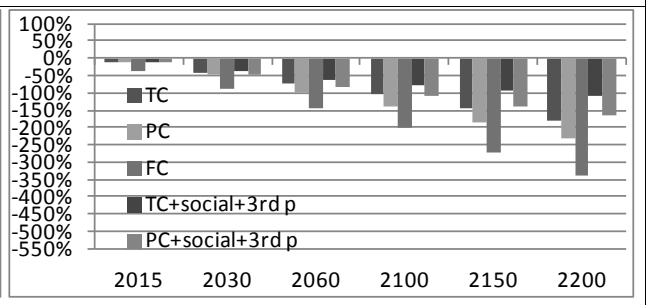
Debt (% of GDP)



Social pensions 1 – optimistic scenario
Deficit (% of GDP)



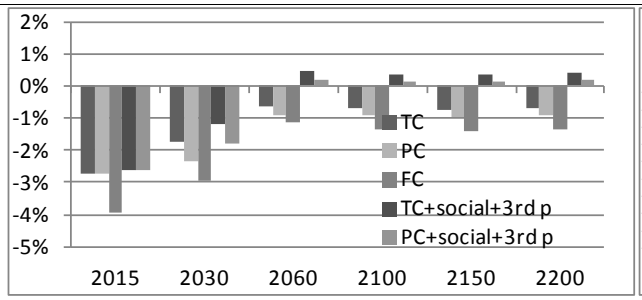
Debt (% of GDP)



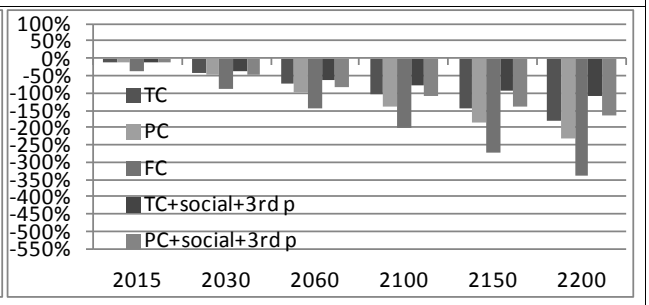
Note: TC = temporary change (lowering of pension contributions going to the second pillar from 7.3% to 2.3% and an increase back to 3.5% after 2017); PC = permanent change (a permanent cut from 7.3% to 2.3%); FC = full change (the immediate dismantling of the second pillar); TC+social+3rdp = TC with social pensions and tax breaks on third pillar savings; PC+social+3rdp = PC with social pensions and tax breaks on third pillar savings.

Social pensions 2 – pessimistic scenario

Deficit (% of GDP)

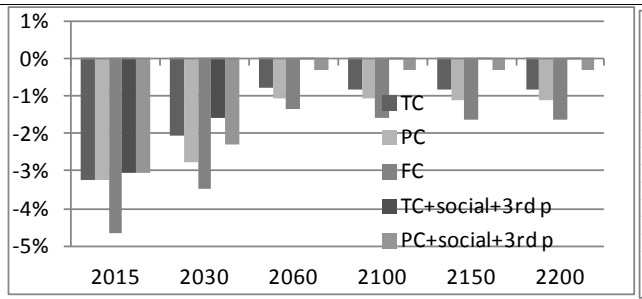


Debt (% of GDP)

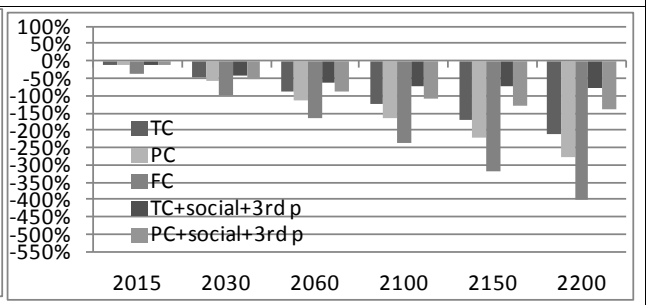


Wage share 1

Deficit (% of GDP)

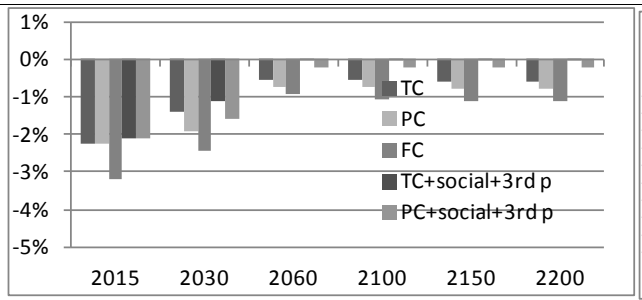


Debt (% of GDP)

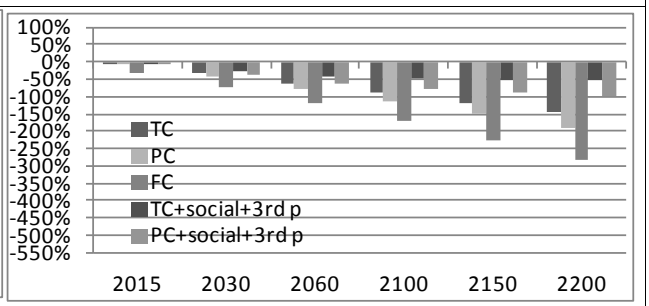


Wage share 2

Deficit (% of GDP)



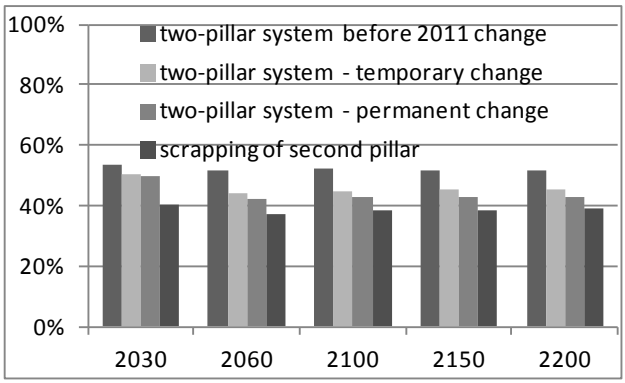
Debt (% of GDP)



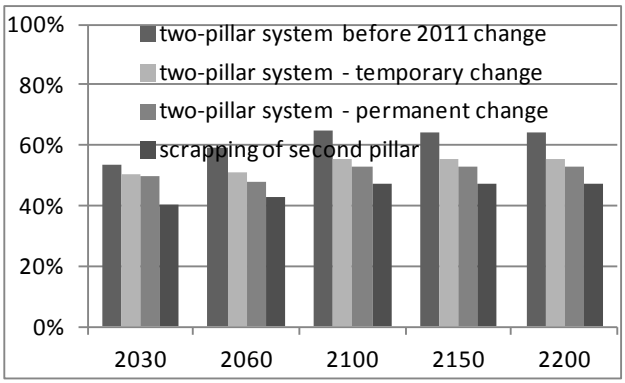
Note: TC = temporary change (lowering of pension contributions going to the second pillar from 7.3% to 2.3% and an increase back to 3.5% after 2017); PC = permanent change (a permanent cut from 7.3% to 2.3%); FC = full change (the immediate dismantling of the second pillar); TC+social+3rdp = TC with social pensions and tax breaks on third pillar savings; PC+social+3rdp = PC with social pensions and tax breaks on third pillar savings.

Table A2. **Replacement rates – Poland**

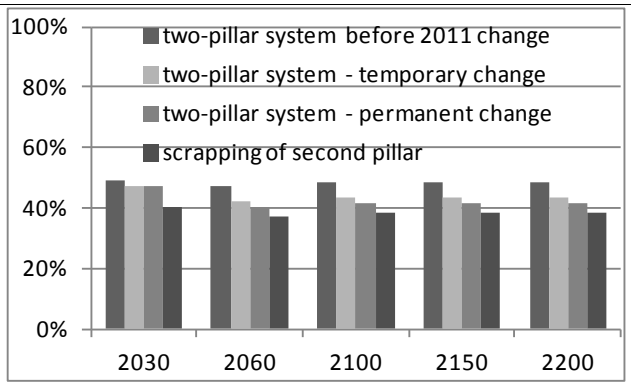
Population 1



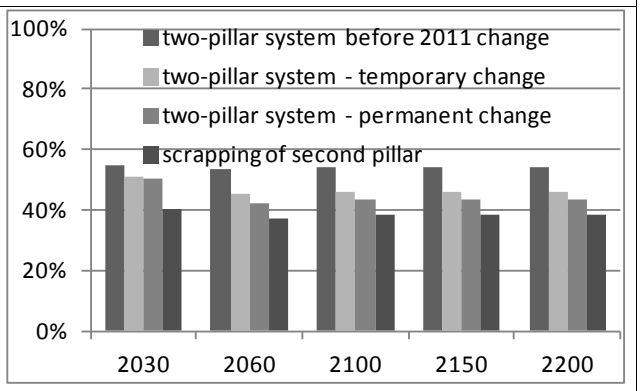
Population 2



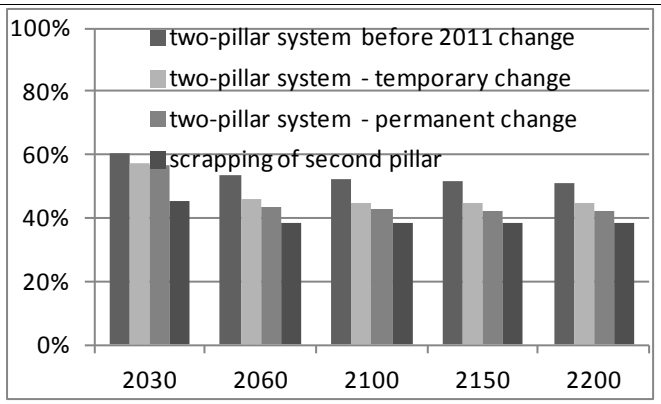
Real wages 1



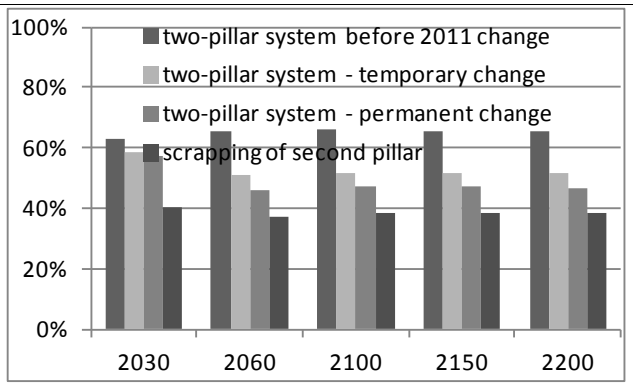
Real wages 2



Employment



Rate of return on 2nd pillar funds 1 - high



Rate of return on 2nd pillar funds 2 - low