Research Report

Reform Scenarios for a Long-term Sustainable NDC Pension System in Austria

Thomas Davoine

Institut für Höhere Studien
Institute for Advanced Studies
Vienna

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Final Report - Macroeconomics Part

Study on behalf of Global Equity Partners

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Institut für Höhere Studien (IHS), Wien
Institute for Advanced Studies, Vienna

Contact:

Thomas Davoine
☎: +43/1/599 91-243
email: davoine@ihs.ac.at

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1. Introduction

1.1. Abstract

Public pension systems face a financing challenge over the long run, as population is aging. One benefit of Notional Defined Contributions (NDC) pension systems is that their financing is sustainable by design, as they equalize average lifetime social security contributions with average lifetime pension benefits, even when population is aging. Using an overlapping-generations model with endogenous labor supply decisions, three skill levels and skill-dependent mortality, this report investigates reform options for the implementation of a NDC system in Austria. Adjustments to implement a NDC system would be significant, even under a constant population: the social security contribution rate for low-skilled workers would need to be increased more than 7 percentage points, their pension benefits cut more than 40 percent or their effective retirement age increased more than 8 years. Whether or not the implementation of a NDC system has a positive impact on GDP depends on the exact reform. Variations in retirement age have the most positive impact. When a NDC pension system is implemented, tax policies to support low-income households can also be performed at a small macroeconomic cost.

1.2. Motivation and approach

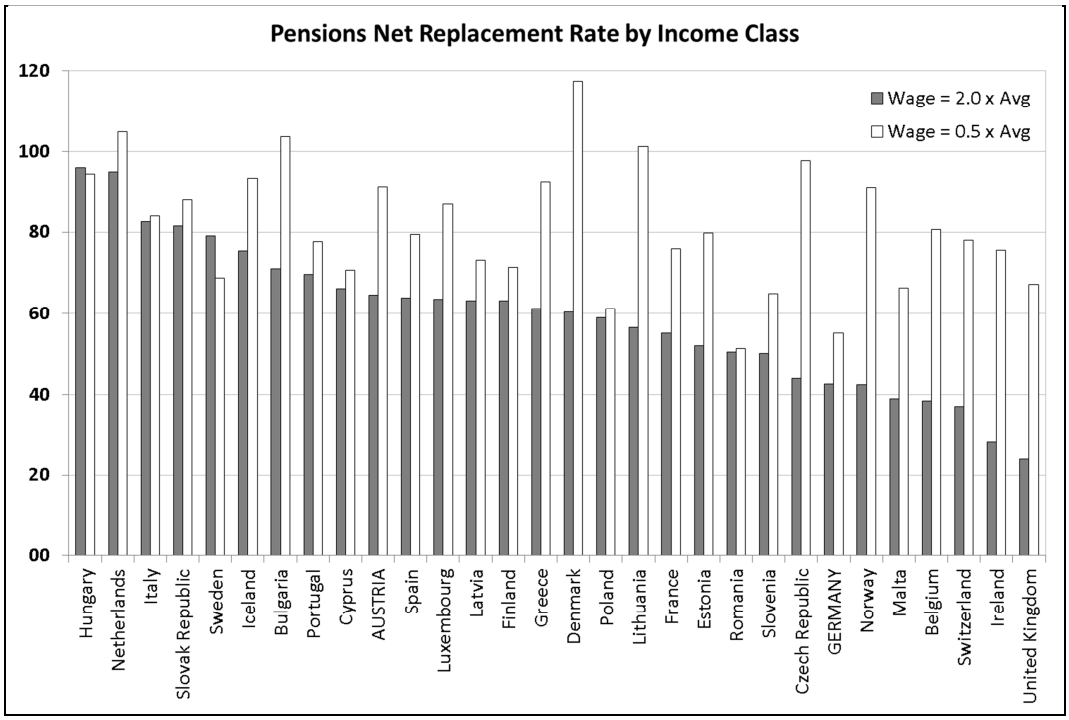
Two observations motivate the analysis of Notional Defined Contributions (NDC) pension systems: financial challenges due to population aging and incentive effects of redistribution via pensions. On the one hand, NDC pension systems are financially sustainable. On the other hand, the redistribution currently embedded in the Austrian pension system would disappear if it was transformed into a NDC system, unless the tax and transfer system was changed at the same time.

Declining fertility and increasing longevity leads to a slow aging of the population. According to projections from Statistik Austria, the old-age dependency ratio[1] should increase from 27% in 2010 to almost 50% in 2060. Without social security reforms, the ratio of active workers over retired workers will sharply decrease, a challenge for the financing of public pensions, healthcare and long-term care expenditures. Most European countries face this challenge and have been considering pension reforms to deal with it (Ageing Working Group, 2012). Further reforms are needed. Jaag, Keuschnigg, and Keuschnigg (2010) for instance estimated in 2010 that the deficit of pension financing in Austria would move from 2.5% of GDP in 2010 to 10% of GDP in 2050 if no reform was undertaken.

[1] The old-age dependency ratio is the size of the population older than 65 years over the size of the population aged between 15 and 64 years.

Redistribution from high-income to low-income households takes place via different channels. The most visible channel is the tax schedule, which is progressive in most developed countries. Another less visible channel is the pension system. The contribution and benefit rates differ indeed by income level. Figure 1 shows that in almost all OECD countries, the benefit replacement rate is larger for low-income households. For instance, workers earning half the average wage can expect to receive a pension payment which amounts to 91% of the wage in Austria; for workers earnings twice the average wage, the benefit replacement rate is 66%.

Figure 1: Pensions Net Replacement Rate, Selected Income Classes, Europe, 2012



Source: OECD (ELS Pensions Dataset, 2012)

Social security contributions on the other hand often come with a maximum amount, mitigating the redistributive nature of pension systems.

The goal of the study is to evaluate NDC pension systems in the Austrian context. In doing so, I will also quantify the public finance and macroeconomic impact of redistribution through the existing pension system. Because of the financing challenge that population aging represents, the study will provide evaluations with constant population and with an aging population.

In technical terms, the report considers reforms which shift the current *defined-benefit (DB)* pension system to a *notional defined contribution (NDC)* system. While payments are defined by the benefit amount irrespective of life expectancy in the first case, they depend on

life expectancy in the second case: with a NDC system, the payment is defined so that the average (past) total contributions over the working life equals the total benefit payments over the remaining (future, uncertain and expected) lifetime after retirement. As a result, population aging leads to deficits in a DB system without reforms. By design, a NDC system never generates deficits, with a constant or an aging population.

To give a concrete measure of the degree of redistribution embedded in the pension system, the study defines reforms to remove intragenerational redistribution. Concretely, we look for the pension reform that is needed so that the average lifetime social security contributions (dedicated to pension financing) for a given skill class is equal to the average lifetime pension benefits received. In other words, the study is looking for the pension reform that is needed so that the pension system is transformed into a NDC system[2]. I consider the three standard pension parametric reforms (changes in social security contributions, pension payments or retirement age), which gives three different measures of the degree of redistribution.

To perform the analysis, the IHS overlapping-generations model TaxLab is used. TaxLab is an overlapping-generations model of the Auerbach and Kotlikoff (1987) type with three skill classes. Labor supply is endogenous along intensive and extensive margins, to better capture the distortive costs of redistribution. Because contributions depend on unemployment, the model takes employment status into account, following the approach of Jaag, Keuschnigg, and Keuschnigg (2010). As in Fehr, Kallweit, and Kindermann (2012) life duration is uncertain and depends on the skill level, a critical feature for the evaluation of redistribution from low-skilled towards high-skilled households. The core model is routinely used for policy evaluations[3].

1.3. Results summary

The gains from implementing a pure NDC system, without associated change in the tax system, depend on the actual reform. Implementing a NDC system with variations of social security contributions leads to 0.4% lower GDP, while variations of pension payments lead to a small 1.4% gain and changes in retirement age boost GDP by 7.7%.

To transform the pension system into a NDC system (and thus remove redistribution from the pension system), the needed pension reforms are large and differ by skill class. The social security contribution rate for the low-skilled households should increase from an average of 15.9 to 23.3%, while that of the high-skilled should decrease from 15.0 to 14.8%. Or, pension

[2] See Sánchez-Romero, Sambt, and Prskawetz (2013) for an analysis of public finance and growth properties of NDC pensions in Austria.

[3] See for instance Davoine, Keuschnigg and Schuster (2014).

benefits should be cut in average 43% for the low-skilled and increase 4% for the high-skilled households. Or, the effective retirement age for the low-skilled should increase from 58 to 66 years, while that of the high-skilled households should drop from 62 to 59.5 years. Needed reforms are larger when population aging is taken into account.

Depending on the reform, gains in general can be positive or negative. Further, they can be larger for low-skilled or larger for high-skilled households. Consumption per capita for an average low-skilled household drops when social security contributions are raised or when pension payment modified. In contrast, it increases more than the consumption of other households when the retirement age is changed.

The study also shows that redistributive tax policy can lead to identical consumption impacts across skill classes, in proportional terms, at a small macroeconomic cost. For instance, variations in pension payments can be combined with transfers to low- and middle-skilled households so that consumption per capita increases in the same proportion (2%) for all households. This policy change would limit output gains to 0.2% (instead of 1.4%, when there are no transfers).

2. Model

Analysis is performed with IHS' overlapping-generations (OLG) model, TaxLab, introduced in Berger, Keuschnigg, Keuschnigg, Miess, Strohner, and Winter-Ebmer (2009). This section presents the main features of TaxLab. Details are contained in the technical appendix Davoine (2015), available upon request.

TaxLab is a single-sector, single-country dynamic OLG model with three skill levels, several margins of labor supply and detailed public institutions. The behavior of agents relies on micro foundations. Households endogenously decide on skill levels (education), continuous training efforts, participation in the labor market, search effort if unemployed, hours supplied and retirement date, as well as the intertemporal allocation of their consumption. TaxLab allows for three skill levels, eight different generations and further unobserved heterogeneity in labor income. Households are forward-looking and maximize expected lifetime utility subject to a budget constraint. Specifically, households of age group $a \in \{1, \dots, 8\}$ and skill class $i \in \{l, m, h\}$ solve the following maximization problem:

$$\begin{aligned} V_t^{a,i} \quad &= \quad \max \left[\left(Q_t^{a,i}\right)^{\rho} + \gamma^{a,i} \beta \left(G V_{t+1}^{a,i}\right)^{\rho} \right]^{\frac{1}{\rho}} \\ & s.t. \quad G\gamma^{a,i} A_{t+1}^{a,i} = R_{t+1}\left(A_t^{a,i} + y_t^{a,i} - C_t^{a,i}\right) \end{aligned}$$

where $V_t^{a,i}$ is the expected remaining life-time utility of the household at time t, ρ defines the elasticity of intertemporal substitution, β is a time discounting factor, $Q_t^{a,i}$ is effort-adjusted consumption, $G = 1 + g$ is the gross factor of growth by which the model is detrended, $A_t^{a,i}$ represent assets, $y_t^{a,i}$ are net income flows, $C_t^{a,i}$ is goods consumption and $R = 1 + r$ is the gross interest rate.

Profit-maximizing firms make capital investment decisions, hire, train and fire workers. Wages are set by bilateral bargaining between workers and firms. In the model, there is one type of good, output of a production process which combines capital and three skill types of labor. In line with empirical evidence, there is capital-skill complementarity in production, low-skilled workers being substituted more easily by capital than medium- and high-skilled workers.

The government raises revenues by taxing consumption, profits, labor and capital income as well as by payroll taxes and social security contributions on both workers' and firms' sides. Revenues are used to provide welfare benefits, unemployment insurance, pay-as-you-go pensions and investment subsidies. Government expenditures also include public consumption, long-term care and health expenditures, all defined exogenously in per capita terms and generating no utility. Long-term care and health expenditures are age-dependent. Pension payments have a flat anti-poverty part and an earnings-related part.

Calibration of the model is performed in a standard fashion, relying on empirical estimates and micro databases. Specific parameters for this study all relate to projections of demographics and social security reforms. Calibration for these parameters is described in more details below.

Skill-independent demographic projections from the Austrian statistical office (Statistik Austria) are used to set net migration and fertility rates over time. Age-dependent mortality rates for medium-skilled households are chosen to match the projected age distribution. Klotz and Asamer (2014) show that households aged 35 in 2012 have a life expectancy of 80.0 if they are low-skilled, 82.0 medium-skilled and 84.3 high-skilled. I assume that the difference relative to the medium-skilled remains constant over time (-2.4% for the low-skilled, +2.9% for the high-skilled) to derive the age-dependent mortality rates for the low- and high-skilled households.

Future variations in individual contribution rates, pension payouts and average retirement age are taken from the Ageing Working Group (2012) and used in a status quo scenario: compared to 2010, the contribution rate is unchanged in 2060, the pension gross replacement rate is 21.8% lower and the retirement age 1.7 years larger[4]. Total factor

[4] As the pension reforms decided in April 2012 are not taken into account in the Ageing Working Group (2012), I apply a further correction. I translate the partial inflation indexation measures and the modifications of penalties for

productivity growth as well as per capita health and long-term care expenditures projections are taken from the same source[5].

early retirement (mostly used by low-skill households) into an additional skill-dependent and gradual reduction of the gross replacement rate comprised between 1.8% and 4.8%.

[5] The Ageing Working Group (2012) assumes that yearly TFP growth is 1.4% and that health- and long-term care expenditures increase from 9 % of GDP in 2010 to 11.8% if GDP in 2060, in their reference scenario.

3. Quantitative results

The first part of the experiments focuses on pure NDC pension systems, which allows quantifying the cost of redistribution which takes place via pensions. The second part focuses on policy design, with mixed pension and tax reforms.

As the calibration of the model is made with projections from the Ageing Working Group (2012) and they report values between 2010 and 2060, simulations are performed for the same time horizon.

3.1. Effects of pure NDC pension systems

Table 1 displays the main results of this subsection. It shows what reform would be necessary to implement a pure NDC system and thus remove redistribution from the Austrian pension system, either through a change in social contribution rates, a change in pension benefits or a change in the retirement age. In all cases, population is constant, to focus on redistribution effects. Any public finance saving of a reform is provided back to households in the form of lower labor income taxes (holding public debt per capita constant): because the current pension system is subsidized by the government budget and because a move to a NDC system would make the system financially sustainable, it would no longer be necessary to subsidize the pension system with the government budget; what the government budget would gain is to be transferred to the households in the form of lower labor income taxes, so that the public debt per capita remains unchanged.

Table 1: Reforms for a NDC pension system, no population aging

	ISS 2010	Higher SSC 2010	Pension Cuts 2010	Ret Age 2010
Demographics				
Population (15+)	100.0	100.0	100.0	100.0
Dependency Ratio	26.3	26.3	26.3	26.3
Labor Market				
Effective retirement age	59.4	59.4	59.4	62.8
- low skill	57.8	57.8	57.8	**66.0**
- med skill	59.1	59.1	59.1	**63.1**
- high skill	61.8	61.8	61.8	**59.3**
Unemployment rate	5.5	5.8	5.1	5.1
Participation rate	55.4	55.3	55.7	60.3
Work hours (yearly hours / worker)	1,623	1,621	1,628	1,624
Effective employment (yearly h. / capita)	850	844	861	929
Gross wages (%)	-	0.5	-0.4	-1.9
Macroeconomics				
GDP/capita (%)	-	-0.4	1.4	7.7
Consumption/capita (%)	-	-0.8	2.6	14.0
- low skill (%)	-	-7.4	-1.8	32.3
- med skill (%)	-	-1.3	1.9	7.6
- high skill (%)	-	3.5	6.2	22.8
Assets/ capita (%)	-	-1.1	5.3	16.5
Public Finance				
Average pension payment (%)	-	-2.4	-18.8	7.1
- low skill (%)	-	-5.4	**-43.0**	8.9
- med skill (%)	-	-2.3	**-22.3**	3.0
- high skill (%)	-	-1.0	**3.6**	8.4
Average Worker SSC rate	15.9	19.5	15.9	15.9
- low skill	15.9	**23.3**	15.9	15.9
- med skill	16.1	**19.5**	16.1	16.1
- high skill	15.0	**14.8**	15.0	15.0
Average lifetime pension (Ben.-Contrib.)/Ben.				
- low skill	43.6	0.0	0.0	0.0
- med skill	22.6	0.0	0.0	-0.1
- high skill	-5.8	0.0	0.0	0.0
Average Labor Income Tax rate	15.6	10.9	9.9	6.2
- low skill	9.6	4.9	3.9	0.2
- med skill	15.7	11.0	10.0	6.3
- high skill	22.4	17.7	16.7	13.0

Legend: *ISS* = Initial Steady State, describing the current Austrian economy; *SSC* = Social Security Contributions; *Ret Age* = Retirement age variations; *(%)* = percentage change compared to ISS value.

Experiment: change in social security contributions, pension benefits or retirement age so that Average lifetime pension (Ben-Contrib)/Ben = 0 by skill class, that is: average lifetime pension benefits equals average lifetime contributions to finance pensions.

Source: simulations with IHS TaxLab Model

To remove redistribution via pensions, the system is reformed until the average lifetime contributions for the pension system equals the average lifetime benefits received, within

each skill class[6]. When this is achieved, the pension system is equivalent to a NDC system. The first column of the table shows key characteristics of the current Austrian pension system, for comparison purposes.

The second column shows the changes in social security contributions needed to implement a NDC system. The average rate needs to be increased from 15.9% to 23.3% for low-skilled households in order to equalize their average lifetime contributions with benefits. An increase to 19.5% for medium-skilled households is sufficient. The rate should decline from 15.0% to 14.8% for the high-skilled. This shows that high-skilled households contribute in average more to the pension system than they benefit from it, over their lifetime. Low-skilled households on the other hand benefit more from the pension system than they contribute. This illustrates the redistribution which takes place through the pension system from high- to low- and medium-skilled households.

Because deficits of the pension system would be eliminated, labor income taxes could be decreased. The associated decrease (4.7 percentage point) then reduces the negative impact of the reform on the net wage for the low- and medium-skilled households, but not enough to compensate the loss due to the increase in the social security contribution rate. In average thus, the new wage declines, reducing incentives to provide labor supply (each worker provides in average 2 hours less of labor).

The third column shows the pension benefit reforms needed to remove redistribution from the pension system: one can equalize average lifetime contributions with benefits by decreasing pension benefits 43% for the low-skilled and 22% for the medium-skilled, while increasing benefits almost 4% for the high-skilled.

In the fourth column, an alternative reform is considered. Increasing the retirement age from 58 to 66 years for the low-skilled would also equalize their average lifetime contributions and benefits[7]. For medium-skilled households, an increase from 59 to 63 years would be sufficient, while a decrease of 2.5 years for high-skilled households would be needed.

In all three reforms considered, efforts fall mostly on the low-skilled households, followed by the medium-skilled households: their pension benefits decline most, social security contributions rate increase most and retirement age increase most. There are two reasons for such outcomes. First, the effective retirement age of the low-skilled is smaller: they retire in average 4 years earlier[8] than the high-skilled in 2010, and thus stop their financial

[6] In table 1, when Average lifetime pension (Ben.-Contrib.)/Ben = 0.

[7] In line with Börsch-Supan (2013), I also assume that workplace conditions and health improvements allow workers around retirement age (55 to 69 years old) to become gradually as fit (smaller disability risk) for work as prime-age workers (40 to 55 years old).

[8] The model also takes differences in education duration into account. While low-skilled workers leave the education system sooner and thus enter the labor market sooner, the unemployment rate in this segment of the population is

contribution to the social security system sooner. Second, at 91%, the pension replacement rate is higher for the low-skilled, compared to 69% for the high-skilled. After retirement, low-skilled households perceive larger benefits, relative to the wage they were earning.

The table also provides labor market and macroeconomic impacts of the reforms. When the retirement age is changed, there is a mechanical impact of the reform[9] on the labor supply (which increases from an average 850 yearly hours per capita to 929). Production then increases, leading to a GDP per capita increase of nearly 8%. In contrast, with the disincentive effects of the social contribution variations (which increases in average 3.5 percentage points) on labor supply (see above), production drops and GDP per capita follows (-0.4%). The pension variations reform is an intermediate case, with a minor increase of GDP per capita (+1.4%).

Except for the retirement age reform, average consumption per capita for the low-skilled households drops more than for other households, because pension benefits cuts, respectively increases in social security contributions, are larger for the low-skilled, reducing their net lifetime income. By contrast, consumption per capita increases most for the low-skilled households when the retirement age is reformed. The larger increase in retirement age for these households leads to a larger increase in lifetime labor supply, net income and thus consumption opportunities. These outcomes will be important for practical policy reform options, investigated in the next section.

Table 2 provides the same analysis but with an aging population, showing outcomes 50 years later. For comparison, the table also provides the effect of population aging and scheduled pension reforms alone (second column), where the increase in social security expenditures (pensions, health- and long-term care) is financed with higher labor income taxes.

large and the wages relatively lower. The social security contribution of young and low-skilled workers is thus low compared to contributions from other categories of workers.

[9] There is also an indirect incentive effect: the resulting decrease in labor income taxes stimulates participation, job search and work hours.

Table 2: Reforms for a NDC pension system, with population aging

	ISS	Aging Alone	Higher SSC	Pension Cuts	Ret Age
	2010	2060	2060	2060	2060
Demographics					
Population (15+)	100.0	114.5	114.5	114.5	114.5
Dependency Ratio	26.3	48.1	48.1	48.1	48.1
Labor Market					
Effective retirement age	59.4	61.1	61.1	61.1	66.6
- low skill	57.8	59.5	59.5	59.5	**68.6**
- med skill	59.1	60.8	60.8	60.8	**66.9**
- high skill	61.8	63.5	63.5	63.5	**64.0**
Unemployment rate	5.5	6.6	7.3	5.8	4.1
Participation rate	55.4	48.1	47.8	48.6	57.4
Work hours (yearly hours / worker)	1,623	1,602	1,597	1,613	1,634
Effective employment (yearly h. / capita)	850	720	707	738	896
Gross wages (%)	-	3.5	4.5	2.2	-1.4
Macroeconomics					
GDP/capita (%)	-	-13.4	-14.5	-11.5	12.2
Consumption/capita (%)	-	-16.9	-18.4	-15.6	76.7
- low skill (%)	-	-16.5	-22.3	-18.1	325.3
- med skill (%)	-	-16.8	-18.5	-16.0	61.2
- high skill (%)	-	-17.5	-16.5	-13.6	8.7
Assets/ capita (%)	-	16.3	13.9	21.9	77.7
Public Finance					
Average pension payment (%)	-	-25.2	-27.0	-51.5	-20.5
- low skill (%)	-	-27.4	-29.6	**-66.4**	-22.9
- med skill (%)	-	-25.1	-26.4	**-52.7**	-22.6
- high skill (%)	-	-23.7	-24.9	**-40.6**	-23.1
Average Worker SSC rate	15.9	15.9	23.2	15.9	15.9
- low skill	15.9	15.9	**27.2**	15.9	15.9
- med skill	16.1	16.1	**23.1**	16.1	16.1
- high skill	15.0	15.0	**18.6**	15.0	15.0
Average lifetime pension (Ben.-Contrib.)/Ben.					
- low skill	43.6	53.1	0.0	0.0	1.9
- med skill	22.6	36.7	0.0	0.0	1.6
- high skill	-5.8	22.1	0.0	0.0	-3.7
Average Labor Income Tax rate	15.6	26.8	18.5	16.9	-10.1
- low skill	9.6	**20.8**	12.5	11.0	-16.1
- med skill	15.7	**26.9**	18.6	17.1	-10.0
- high skill	22.4	**33.6**	25.3	23.7	-3.3

Legend: GDP/capita, consumption/capita and pension payment figures in 2060 are provided relative to the growth trend. See also table 1.

Source: simulations with IHS TaxLab Model

Qualitatively, outcomes are the same as in the case with no population aging, in table 1. As expected, the magnitude of the reform efforts, now needed to remove pension redistribution and finance the increase in social security expenditures at the same time, is greater. For instance, the increase in retirement age for the low-skilled households would be 10.8 years.

Because of the large impact on the labor supply (an increase of 46 hours per capita compared to 2010, instead of a decline of more than 100 hours for other scenarios), household lifetime income increases significantly. Absolute savings then mechanically increase, resulting in a 77% rise of per capita assets. Increase in capital income re-inforce the increase in household income due to labor supply expansion. Larger lifetime income then allows for higher lifetime consumption. The effect is particularly strong for low-skilled households, the retirement age increase being large for them.

Summing up, there are three main results. First, the macroeconomic gain of implementing a NDC system depends on the actual pension design. GDP is lowest with a non-redistributing system balanced by social security contributions and highest when it is balanced by retirement age. Second, implementing a NDC system and thus removing redistribution from the Austrian pension system would require large adjustments, in particular for the low-skilled households, because the net pension replacement rate is higher for these households. Third, gains are larger for low-skilled households than other households with one reform which implements a NDC system, namely retirement age variations, and lower with the other two reforms.

3.2. Reform options for NDC pension systems

The previous section focused on redistribution within pension systems and considered theoretical reforms to implement NDC systems. This section builds on these theoretical results and investigates realistic reforms suitable for the policy debate.

One benefit of NDC pension systems is that they are by design financially sustainable with an aging population. However, two outcomes make the implementation of a NDC system less attractive. First, the necessary reforms to have a NDC system require most efforts from low-skilled households For instance, the effective retirement age for low-skilled households should increase from 58 today to 69 years in 2060 when population is aging. Second, some reforms implementing a NDC system lead to (consumption) losses for low-skilled households.

This section considers realistic reforms which could ease or eliminate these two drawbacks. For the first drawback, I consider a reform so that the pension system in Austria starts from a position comparable to the system in Germany. For the second drawback, I consider a reform which not only eliminates redistribution from the pension system, as was done in the previous section, but also shift redistribution (partially) to the tax system. I start with details and outcomes for reforms dealing with the first drawback, and continue with the second drawback.

3.2.1. Reform efforts

One reason why reform efforts for low-skilled households are larger is that Austria offers a higher pension replacement rate for low-skilled than high-skilled households. Because of a higher replacement rate, the pension benefits compared to the wage and thus the social security contributions are large for low-skilled households. It follows that the average lifetime contributions are smaller than the average lifetime benefits. Because the difference is large, stronger reform efforts are needed for low-skilled households.

In international comparison, the gap is large in Austria (see figure 1): the net replacement rate for low-income households (earning half the average) is larger than 90% and the one for high-income households (earning twice the average) is 65%. As Austria and Germany have similar labor market equilibriums and public policies as well as close cultural ties, implementing some features of German public policy in Austria is a realistic scenario. We thus consider an adjustment of the Austrian pension system so that it has the same replacement rates as in Germany. Because differentials in reform efforts across skill classes is large for retirement age variations, I focus on retirement age reforms and ignore social security contributions and pension cut reforms.

Table 3 presents the outcome of the implementation of such a reform in 2010, followed by a removal of pension redistribution under population aging (columns 2, 4 and 6). For convenience, I include comparable outcomes with the actual Austrian replacement rates from table 2 (columns 1, 3 and 5).

Table 3: Replacement rates as in Germany and reforms needed for a NDC system

	ISS	DE NRR	Aging	DE NRR & Aging	Ret Age	DE NRR & Ret Age
	2010	2010	2060	2060	2060	2060
Demographics						
Population (15+)	100.0	100.0	114.5	114.5	114.5	114.5
Dependency Ratio	26.3	26.3	48.1	48.1	48.1	48.1
Labor Market						
Effective retirement age	59.4	59.4	61.1	61.1	66.6	63.1
- low skill	57.8	57.8	59.5	59.5	**68.6**	**64.2**
- med skill	59.1	59.1	60.8	60.8	**66.9**	**63.2**
- high skill	61.8	61.8	63.5	63.5	**64.0**	**61.8**
Unemployment rate	5.5	5.8	6.6	5.6	4.1	5.3
Participation rate	55.4	55.1	48.1	48.7	57.4	51.4
Work hours (/worker)	1,623	1,617	1,602	1,614	1,634	1,614
Effective employment (hrs./capita)	850	839	720	741	896	786
Gross wages (%)	-	0.4	3.5	2.4	-1.4	1.0
Macroeconomics						
GDP/capita (%)	-	-0.9	-13.4	-9.5	12.2	-5.0
Consumption/capita (%)	-	1.8	-16.9	-12.9	76.7	-5.3
- low skill (%)	-	5.0	-16.5	-15.5	325.3	3.6
- med skill (%)	-	1.6	-16.8	-12.6	61.2	-6.9
- high skill (%)	-	0.8	-17.5	-13.4	8.7	-6.3
Assets/ capita (%)	-	10.5	16.3	14.3	77.7	17.0
Public Finance						
Average pension payment (%)	-	-36.4	-25.2	-13.3	-20.5	-9.8
- low skill (%)	-	-40.3	-27.4	-18.8	-22.9	-17.4
- med skill (%)	-	-36.3	-25.1	-13.8	-22.6	-13.6
- high skill (%)	-	-34.5	-23.7	-11.7	-23.1	-13.1
Average Worker SSC rate	15.9	15.9	15.9	15.9	15.9	15.9
- low skill	15.9	15.9	15.9	15.9	15.9	15.9
- med skill	16.1	16.1	16.1	16.1	16.1	16.1
- high skill	15.0	15.0	15.0	15.0	15.0	15.0
Average lifetime pension (Ben.-Contrib.)/Ben.						
- low skill	43.6	7.8	53.1	25.4	1.9	1.9
- med skill	22.6	-17.7	36.7	11.7	1.6	1.7
- high skill	-5.8	-51.6	22.1	1.6	-3.7	-3.7
Average Labor Income Tax rate	15.6	15.6	26.8	17.8	-10.1	12.5
- low skill	9.6	9.6	**20.8**	**11.8**	-16.1	6.5
- med skill	15.7	15.7	**26.9**	**17.9**	-10.0	12.6
- high skill	22.4	22.4	**33.6**	**24.5**	-3.3	19.2

Legend: *DE NRR* = Counterfactual pension system in Austria with Germany Net pension Replacement Rates; GDP/capita, consumption/capita and pension payment figures in 2060 are provided relative to the growth trend. (%) variations for the *DE NRR & Aging* and the *DE NRR & Ret Age* scenarios are provided relative to the *DE NRR* scenario. See also table 1.

Source: simulations with IHS TaxLab Model

The second column (labelled *DE NRR*) displays the economic equilibrium if Austria had the same pension net replacement rate as Germany today, to be compared with the current equilibrium in the first column (labelled *ISS*). Because the pension replacement rate is lower[10] and the average pensions are 36% smaller, the incentives to provide labor decline: pensions in Austria are strongly tied to past wage revenues; if pensions decline, the overall return to the provision of labor (wage before retirement; pensions after retirement) decreases, a disincentive to provide labor. However, households react by increasing own savings to finance consumption after retirement, leading to an average 10% increase in assets per capita and nearly 2% increase in consumption per capita.

The fourth column (labelled *DE NRR & Aging*) adds population aging and scheduled pension reforms[11]. Outcomes are to be compared to the Aging scenario with the current replacement rates, in the third column (labelled *Aging*). Since the net replacement rate is lower in the fourth column, aggregate pension expenditures increase less with aging, reducing the need to increase labor income taxes (18% instead of 27%, in average). The financing impact of aging is thus less detrimental to labor supply incentives in the fourth column, leading to better GDP outcomes (-0.9% -9.5% instead of -13.4%).

The sixth column (labelled *DE NRR & Ret Age*) adds retirement age reforms so that redistribution is removed from the pension system over the long-run and a NDC system is implemented. This is the case when the average lifetime contributions for the pension system equals the average lifetime benefits received, within each skill class. Outcomes are to be compared to the Aging and retirement age reform scenario with the current replacement rates, in the fifth column (labelled *Ret Age*). The scenario in the sixth column is the same as the scenario in the fifth column except we assume that the Austrian pension system starts with the same replacement rate as in Germany and that pension benefits are reduced at the same (lower) speed as scheduled for Germany.

As before, the interplay of NDC systems and labor supply incentives define the macroeconomic impacts of the reforms. The needed increase in retirement age for the low-skilled households to get a NDC balance in the sixth column is smaller than in the fifth column (64.2 years instead of 68.6) because replacement rates are lower in the first case. As a result, aggregate labor supply decreases in the first case (from 839 to 786 yearly hours per capita instead of 850 to 896 hours), and so does GDP (-0.9% -5.0% instead of +12.2%).

From a policy reform perspective, experiments show that the implementation of a NDC pension system through variations in retirement age in Austria would be more attractive if it

[10] The current Austrian values for the net replacement rates are 91%, 90% and 69% for the low-, middle- and high-skilled classes in the calibrated model, in line with figure 1. With German values, the rates are 55%, 57% and 46% respectively

[11] For consistency, the scheduled pension benefit variations follow the Germany case (-13.3% drop of the replacement rate between 2010 and 2060) rather than the Austrian case (-21.8%), as done in other scenarios. Source: Ageing Working Group (2012).

was combined with an alignment to German pension replacement rates. In this case, the required increase in effective retirement rate for the low-skilled would be the realistic 64 years mark (instead of 69 years) in 2060, which is one year below the current statutory retirement age (65 years for males).

3.2.2. Macroeconomic and distributional consequences

For some reforms implementing NDC systems, low-skilled households gain (in absolute terms or relative to other households) while they lose with other reforms. I consider two reform examples with different consumption impacts for low-skilled households: pension benefit variations and retirement age variations (see table 1). These theoretical reforms implement NDC systems and eliminate redistribution from the pension system. To compensate low-skilled households, I consider twomore realistic reforms which do not eliminate redistribution, but (partially) shift it from the pension system to the tax system, and evaluate their macroeconomic impact. In the first reform, pension benefit variations are associated with lump-sum transfers to the low- and medium-skilled households and lump sum taxes on the high-skilled households so that average consumption per capita is equal across skill classes. In the second reform, retirement age variations are associated with a combination of labor income tax and lump sum tax reforms so that average per capita consumption is identical for all skill classes.

Table 4 provides the outcome of these redistribution-shifting reforms, with a constant population (columns 3 and 5). For convenience and comparison, I include the redistribution-eliminating reform (columns 2 and 4), taken from tables 1.

Table 4: Pension benefit and tax reforms for a NDC pension system

	ISS	Cuts	Cuts & Shift	Ret Age	Ret Age & Shift
	2010	2010	2010	2010	2010
Demographics					
Population (15+)	100.0	100.0	100.0	100.0	100.0
Dependency Ratio	26.3	26.3	26.3	26.3	26.3
Labor Market					
Effective retirement age	59.4	59.4	59.4	62.8	62.9
- low skill	57.8	57.8	57.8	**66.0**	**66.0**
- med skill	59.1	59.1	59.1	**63.1**	**63.4**
- high skill	61.8	61.8	61.8	**59.3**	**58.6**
Unemployment rate	5.5	5.1	5.5	5.1	4.6
Participation rate	55.4	55.7	55.4	60.3	60.4
Work hours (yearly hours / worker)	1,623	1,628	1,623	1,624	1,627
Effective employment (yearly h. / capita)	850	861	850	929	938
Gross wages (%)	-	-0.4	0.0	-1.9	-3.0
Macroeconomics					
GDP/capita (%)	-	1.4	0.2	7.7	8.0
Consumption/capita (%)	-	2.6	1.9	14.0	14.9
- low skill (%)	-	-1.8	1.9	32.3	14.9
- med skill (%)	-	1.9	1.9	7.6	14.9
- high skill (%)	-	6.2	1.9	22.8	14.9
Assets/ capita (%)	-	5.3	7.0	16.5	19.5
Public Finance					
Average pension payment (%)	-	-18.8	-19.9	7.1	7.3
- low skill (%)	-	**-43.0**	**-44.1**	8.9	12.1
- med skill (%)	-	**-22.3**	**-23.3**	3.0	0.6
- high skill (%)	-	**3.6**	**2.1**	8.4	12.6
Average Worker SSC rate	15.9	15.9	15.9	15.9	15.9
- low skill	15.9	15.9	15.9	15.9	15.9
- med skill	16.1	16.1	16.1	16.1	16.1
- high skill	15.0	15.0	15.0	15.0	15.0
Average lifetime pension (Ben.-Contrib.)/Ben.					
- low skill	43.6	0.0	0.0	0.0	0.0
- med skill	22.6	0.0	0.0	-0.1	0.0
- high skill	-5.8	0.0	0.0	0.0	0.0
Average Labor Income Tax rate	15.6	9.9	13.5	6.2	1.8
- low skill	9.6	3.9	7.5	0.2	19.8
- med skill	15.7	10.0	13.6	6.3	-8.8
- high skill	22.4	16.7	20.3	13.0	25.2

Legend: See table 1.

Source: simulations with IHS TaxLab Model

The third column (labelled *Cuts & Shift*) shows the outcome of the redistribution-shifting reform of pension benefits. Compared to the redistribution-eliminating reform in the second column (labelled *Cuts*), output gains are smaller (+0.2% instead of +1.4%) but of similar order of magnitude. By design, consumption per capita variations are identical across skill

classes (+1.9%), rather than heterogeneous (-1.8% for low-skilled and +6.2% for high-skilled households in column 2). The reform thus achieves the goal of a long-term sustainable NDC pension system with identical consumption gains for all households, at a moderate macroeconomic cost.

Outcomes along other economic dimensions are similar for the two reforms. The reason for the similarity of outcomes is that households adjust saving behavior after a reform. In the redistribution-eliminating reform (second column), low-skilled households increase their savings to compensate for the reduction in pension benefits and maintain consumption over their lifetime: assets per capita increase more than 10% for the low-skilled, and less than 1% for the high-skilled (unreported). This saving behavior adjustment mitigates the loss due to cuts in pension benefits. Even if this adjustment does not neutralize the loss (1.8% drop in consumption), it is a significant contribution (to be compared with the 43% cut in the benefits). Moderate lump-sum redistribution in the redistribution-shifting reform (third column) is thus sufficient to neutralize the loss due to pension cuts, leading to similar outcomes[12].

The fifth column (labelled *Ret Age & Shift*) provides the outcome of the redistribution-shifting reform of retirement age. Compared to the redistribution-eliminating reform in the fourth column (labelled *Ret Age*), output gains are greater (+8.0% instead of +7.7%). By design, consumption per capita gains are identical across households (+14.9% in *Ret Age & Shift* case), a favorable comparison for medium-skilled households (+7.6% in *Ret Age* case). This reform thus implements a long-term sustainable NDC pension system with identical consumption gains for all households, for a small macroeconomic gain.

Additional simulations (not reported here) show that conclusions hold when population is aging.

In policy design terms, the experiment shows that adverse distributional effects due to the implementation of a NDC pension system (via pension benefit variations) can be eliminated if the pension reform is associated with a reform of the tax system, partially shifting redistribution from the pension system to the tax system, at no or a small macroeconomic cost.

[12] In the redistribution-shifting case (column 3) the pension cuts for the low-skilled are slightly higher (-44% instead of -43%). Because lump-sum transfers increase the outside option of low-skilled workers, their bargained wage is higher in relative terms, which increases the imbalance further in the pension system (gap between lifetime benefits and contributions), unless pension benefits are cut further.

4. Concluding remarks

Population aging poses a long-term financing challenge for old-age social security expenditures, namely pensions, healthcare and long-term care. Reforms have already taken place in recent decades. Further reforms are needed over the long-run.

The study shows that the implementation of a NDC pension system, which removes entirely redistribution from the pension system and ensures its long-term financial sustainability, has adverse distributional consequences. The analysis also shows that one can combine pension and tax reforms to implement an NDC pension system without adverse distributional impacts. The study did however not consider what level of redistribution is desirable. To identify the most promising reform scenario, further analysis would be necessary to consider different overall redistribution scenarios.

Among the various reform options, increases in retirement age lead to larger gains in output and consumption for all households, including low-income households. Whether gains in output and consumption are the main goals of pension reforms, or not, is a question which is not addressed in this report.

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Author: Thomas Davoine

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Josefstädter Straße 39, A-1080 Vienna • ☎ +43 1 59991-0 • http://www.ihs.ac.at