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Policy Risk in Action: Pension Reforms and Social Security Wealth in Hungary, Czech Republic and Slovakia

Libor Dušek and Juraj Kopecsni

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Libor Dušek[2] and Juraj Kopecsni[3]

Abstract

We provide evidence on the policy risk of social security in Hungary, Czech Republic and Slovakia by computing the changes in the social security wealth induced by the pension reforms undertaken since the 1990s. Methodologically we follow upon McHale's (2001) study of selected reforms in G7 countries. However, as we measure the differential impact of the reform on workers of different genders, ages, and levels of education, we are able to capture the aggregate, intergenerational, and intragenerational aspects of the policy risk. Overall, the paper documents that also a pay-as-you-go system is not a secure source of retirement income since pension reforms do change the future contributions and benefits in different directions for different workers, and the magnitude of the reductions in social security wealth sometimes exceeds several years' worth of the workers' earnings.

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[2] CERGE-EI, Prague (a joint workplace of the Center for Economic Research and Graduate Education, Charles University, and the Economics Institute of the Academy of Sciences of the Czech Republic). Mailing address: CERGE-EI, Charles University Prague and Academy of Sciences of the Czech Republic, Politickych veznu 7, Prague 11121, Czech Republic. E-mail: libor.dusek@cerge-ei.cz, phone +420-224-005-146, fax +420-224-211_374.
[3] Institute of Economic Studies at the Faculty of Social Sciences, Charles University, Prague. Mailing address: Charles University, Opletalova 26, Prague 11001. E-mail: jurajkopecsni@gmail.com

1. Introduction

The choice between the pay-as-you-go (PAYG) and fully funded pension system is sometimes being put in terms of a trade-off between return and risk. The funded system should provide a higher expected return on workers contributions at the cost of exposing the workers to the investment risk (Feldstein (2005a,b), Lindbeck and Persson (2003)). Since contributions are invested into stock and bonds which yield uncertain returns, workers face uncertainty about the level of their pension when they retire. Feldstein and Ranguelova (2001), Feldstein, Ranguelova and Samwick (2001) and Poterba et al (2005)) produced quantitative estimates of the distribution of benefits upon retirement in a risky funded scheme, and made expected utility comparisons between the funded and PAYG schemes.

However, the PAYG systems are not risk-free either. The rules of the pension system may be changed any time as governments respond to demographic, economic or political shocks. As a consequence of this so-called policy risk, the contributions actually paid and benefits actually received by a worker may differ substantially from what she was promised by the pension legislation at various moments in her lifetime. Appropriate comparisons between the PAYG system and privately funded system should therefore involve a comparison of two risky systems.

An emerging literature has already produced some quantifications of the magnitude of the policy risk. McHale (2001) computes the change in the present value of benefits induced by pension reforms that were implemented in the G7 countries during the 1990's for average workers at age forty-five and at the standard retirement age. He finds that some of the reforms reduced the present value of benefits by as much as 29% (the Italian 1992 reform) or 26% (the German 1992 reform). McHale's contribution was valuable as it demonstrated that cuts in benefits do happen and can be substantial. Shoven and Slavov (2006) compute the internal rates of return from social security in the United States since 1939 for an average, 10th percentile, and 90th percentile worker in 1900-1985 birth cohorts. They find "a considerable variation in the internal rates of return through time for a given birth cohort". They also find substantial differences in IRR's across cohorts. Blake (2008) shows that even the private pensions in the United Kingdom have not been completely immune from policy risk, but have been less sensitive than the public pensions. Holst (2005) looks at a

representative worker in cohorts that have already retired in the United States Germany and computes the discrepancy between the social security wealth[4] (SSW) that they were promised at age 55 and at retirement. He also makes the first attempt to explain the deviation between realized and promised SSW by demographic variables.

In this paper, we provide a detailed descriptive account of the policy risk of social security in three Central European countries, Hungary, Czech Republic, and Slovakia. We compute the impact of all major changes in pension legislation adopted since the early 1990's on the social security wealth of workers of different ages, genders, and education levels. Altogether these countries undertook ten reforms during the span of 14 years covered in this paper. The reforms naturally differed in their breadth, from minor adjustments of some parameters to more radical modernizations of outdated schemes inherited from the communist era to full-scale reforms introducing a mandatory funded pillar (Hungary 1998, Slovakia 2005).

Methodologically our approach is similar to McHale (2001) except that our definition of the SSW deducts the present value (PV) of contributions from the PV of benefits. In our opinion it is appropriate to deduct the contributions as they are an important component of the worker's lifetime wealth. For example, a reform that only raises the contributions clearly makes a worker worse off even thought the PV of benefits remains unchanged.

The contribution of the paper is not just to compute the changes in SSW in different countries but also to provide a more comprehensive picture of the policy risk. The preceding literature generally computes the changes in SSW for a representative worker in different cohorts. It thus captures only the aggregate component of the policy risk (i.e., the risk that a reform hurts all workers) and the intergenerational component (i.e. the risk that a reform will affect one's cohort differently than others). However, most pay-as-you-go systems also redistribute income within cohort. This introduces an intragenerational component to the policy risk, i.e. the risk that a reform will affect one's income group or gender differently than others. As we carry our analysis separately for men and women with different levels of education and for all pre-retirement cohorts we document both the intergenerational and intragenerational impacts of the pension reforms on the SSW.

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[4] The social security wealth is the expected present value of the future stream of pension benefits minus the expected present value of future contributions.

Although each of the reforms had unique impacts, our results do allow several generalizations. Most importantly, pension reforms produced large shifts in the SSW and as such create substantial uncertainty. In 7 of the 10 reforms covered in this paper, there were some workers whose SSW declined by an amount equal to or greater than the average annual earnings in their country, and in 5 reforms there were some workers whose SSW declined by more than twice the average annual earnings. Reforms typically have largely differential impact across cohorts, genders, and education levels. Seven reforms produced both winners as well as losers; e.g there were both workers whose SSW increased and workers whose SSW fell. The Hungarian 1998 reform was most notable in this respect as it effectively created different sets of rules for workers who would retire before 2012 or after 2012. As a consequence, the SSW of university-educated men born in 1951 rose by approximately 1.6 average annual earnings more than SSW of otherwise identical men born just before 1951. As for the intergenerational redistribution, in four of the reforms the older cohorts gained relative to the younger ones (or at least lost less). While McHale (2001) observes that workers in the G7 countries aged slightly below the retirement age were essentially insulated from cuts in their SSW, this was not generally the case of the reforms studied here. In four other reforms the older workers fared worse relative to the younger ones. Specifically, the Hungarian 1993 reform reduced the SSW of women of pre-retirement ages by between 0.5 to 1.4 average annual earnings; the 1998 reform was more severe as it reduced the SSW of both men and women of pre-retirement ages by between 1.1 to 2.5 average annual earnings. The Czech 1996 and Slovak 2006 reforms also hurt men of pre-retirement ages.

As for the intragenerational redistribution, most reforms have larger impact (positive or negative) on the SSW of workers with higher education. This is in part due to the fact that they have higher contributions and benefits in absolute terms. More interestingly, none of the reforms simultaneously benefited workers with lower education and hurt workers with higher education. Each of the countries had at least one reform in which workers with university education benefited substantially relative to the workers with low education (Hungary 1998, Czech Republic 1996, Slovakia 2004-05). The Slovak 2004-05 was extreme in this regard, as for example 50-year old men with elementary education lost 1.8 average annual earnings while equally aged men with university education gained 4.7 average annual earnings. All three countries inherited highly egalitarian pension schemes from the communist era, therefore such changes in the benefit formula were understandably motivated by the desire to

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reduce the degree of redistribution. Nevertheless, the very fact that also some older poor workers experienced large cuts in SSW is troubling as these workers usually typically have neither sufficient savings to cushion the cuts in benefits nor enough years of remaining working life to build them up.

Another observation concerns the political dynamics. Each of the two truly radical reforms that introduced a funded pillar was quickly followed by another reform that mitigated some of its aspects. Should these two cases be generalized, radical reforms tend to suffer from an early reversal similar to one analyzed in the context of economic transition (Roland 2002). On one hand this makes the SSW more volatile as one reform breeds yet another reform, on the other hand it makes it less volatile as long as the reversal reform brings the SSW closer to the level it had had prior to the initial reform. Workers should somewhat discount the rules laid out by the first reform when making plans for the future.

As an interesting byproduct of our analysis we find that in Hungary and Slovakia workers are not made better off by opting into the mixed (partially funded) system. The expected returns on savings in the pension funds are too low for the private pension to exceed the PAYG pension promised by the current legislation. This can be attributed to two factors. First, the returns do appear to be low due to a combination of poor historical performance, overly conservative investment strategies, and high fees charged by the funds. The policy lesson is that the rules governing the pension funds are indeed critical in order to provide workers with high return on their savings and to keep the administrative costs low. Our calculations indicate that neither Hungary nor Slovakia have set the rules well enough to realize the potential of the funded system. Second, despite the fact that the PAYG provides higher SSW a large fraction of workers switched to the mixed system (50 % in Hungary, 60% in Slovakia). This is consistent with the hypothesis that workers do not take the pension promises at face value but instead anticipate that there will be additional reforms in the future that will reduce the PAYG benefits.

The rest of the paper is organized as follows. Section 2 describes our methodology for computing the social security wealth and the assumptions involved. Section 3 provides a brief institutional background on the pension reforms in Hungary, Czech Republic and Slovakia and we present the results for individual pension reforms. Section 4 concludes.

2. Methodology and data

Social security wealth (SSW) is defined as the difference between the present value of expected future benefits and contributions promised to workers under the current pension legislation. We compute the impact of each reform on the SSW of all cohorts were either working as of time of the reform or were born but not yet working, and within each cohort, we carry out the computation separately for men and women and for representative workers with different levels of education: elementary, lower secondary (apprenticeship), upper secondary (high-school with a school-leaving exam), and college/university.

The SSW for each cohort *(a)* at the time of reform *(T)* is calculated according to the following formula:

$$SSW(a,T) = -\sum_{t=T}^{R-1}\left[w_{a,t}\frac{C_e+C_r}{(1+r)^{t-T}}S(t|T)\right] + \sum_{t=R}^{a+100}\left[\frac{B(a,R)}{(1+r)^{t-T}}\prod_{k=R+1}^{t}(1+i_k)S(t|T)\right]$$

where R is the year of retirement, t is a current year, C_e and C_r are the employee and employer contributions, respectively, B is the value of the initial pension, r is the discount rate, w is a gross nominal wage, $S(t|T)$ is probability of surviving till year t conditional on being alive at T, and i is the rate at which the benefits are indexed. Calculating the SSW involves three basic steps. First, the discounted value of future contributions is calculated from a projected path of wages and contribution rates specified by current legislation. Note that they include contributions paid by both the employee and the employer. Second, the initial benefit is computed according to the formula prescribed in the legislation. Third, the discounted value of benefits is computed using the current indexation rules and a projected path of variables that affect the indexations. To put the results in perspective we normalize the change in SSW by the average annual earnings in the economy in the year of the reform. A change in SSW by -1.0 units hence means that the worker lost SSW equivalent to annual earnings of an average worker.[5]

Computing the social security wealth required a number of assumptions about the wage profiles of workers, evolution of certain variables in the future, and returns on savings in the

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[5] The level of SSW of the worker who is at the beginning of the working career also indicates the degree of redistribution built into the PAYG system. If it is positive, the system effectively provides a net transfer to the worker, while if it is negative, the system effectively taxes the worker.

pension funds. These assumptions and the data used to construct them are described in detail in Appendix A. Our general principle is that we attempt to compute the SSW under a legislation as it is written on the books and as actually implemented. For example, if a particular reform was passed with an understanding that some additional changes will be made in the future, we ignore those envisioned but not legislated changes.[6] Similarly the rates of return on the savings in the pension funds are to a large extent affected by regulations of the funds' portfolio choices and performance embedded in the pension legislation. Our assumptions about the future returns are thus based on the actual portfolio choices and performance of the funds instead of on arbitrary stock and bond market indices which are rather indicators of potential returns that the funds could have earned.

Our representative" workers start working at age 20, work without interruption until the standard retirement age, and at each age they are earning the wage that is predicted by the wage profile specific for their gender, education level, and calendar year. The wage profiles were estimated for each country from large individual-level datasets. The length of life is probabilistic, and the future taxes and benefits are discounted by the survival probability.

While the above assumptions are natural they inevitably have some limitations. Analyzing only the representative workers does not fully characterize the impact of the reforms across the income distribution. Likewise, the assumption that the worker's wages follow a typical wage profile and that the worker is employed without interruption leaves out a part of the intragenerational component of the risk. Two workers with identical lifetime earnings may be affected differently by a particular reform if they differ in their individual wage profiles or working histories. Also, by assuming that workers work until the standard retirement age we do not analyze the impact of changes in early retirement provisions that were part of some of the reforms studied here and undoubtedly affected the workers who choose to exercise the early retirement option. Analysis of such finer impacts of reforms would be worthwhile but would require detailed data on individual working histories that were not available to us.

We assume that as of the time of the reform people had perfect foresight about the future evolution of the relevant variables. That is, the actual wages, inflation, and returns on assets in pension funds until 2005 are used as the expected wages, inflation, and returns as of time

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[6] The Hungarian 1998 reform is the most significant case; see section 3.c.

of the reform. For the years 2006 onwards, we assume a 3% growth rate of real wages for all education categories and genders, and a 2% inflation rate.[7] To project the future returns on savings in the Hungarian pension funds, we compute their average returns realized since the time they were established (1998). For Slovakia, which introduced pension funds too recently to infer their historical returns, we set the expected future returns equal to the average historical return on the portfolios that the funds currently hold. The fees charged by the funds are deducted from gross returns.

3. Description of reforms and their impact on SSW

The key characteristics of reforms are summarized in Table A. Tables H.1-10, C.1-2, and S1-4 present the main result, the change in SSW separately for men and women of different levels of education and birth cohorts. When the pension system has two pillars, separate tables are reported for workers in the PAYG pillar and the mixed pillar. Due to space limitations, we report results averaged over cohorts born during 5-year intervals.[8] Figures H.1-10, C.1-5 and S.1-6 illustrate the impact of each reform for selected genders and education levels, and also separate the overall impact into a change in contributions and a change in benefits.

3a. Hungary: Reform 1993

At the beginning of transition, Hungary had a pay-as-you-go pension system that had remained unchanged since the mid 1970's.[9] The first reform came in 1993, and since then there were five other reforms. The 1993 reform[10] postponed the retirement age for women gradually from 55 to 60 and modified the benefit formula. Before the reform the initial benefit was based on earnings during 4 years with the highest earnings in the period of 5 years before retirement while after it was based on earnings from 1988 until retirement. The benefit was set as a certain fraction (referred to as pension accrual) of average earnings during the period considered.

The reform did not affect the contributions paid by men, and its overall impact on the SSW of men was negligible. It had a negative impact on all cohorts of women who lost between 0.38

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[7] These are roughly the rates of wage growth and inflation currently experienced by all countries.
[8] Detailed results for individual cohorts are available upon request.
[9] The Social Security Act of 1975 (Law No. 1975 II).
[10] Law No. 1993 VIII

to 2.15 annual average earnings (Table H.1). Postponement of the retirement age is responsible for an increase in the PV of contributions that, in percentage terms, is particularly pronounced for the cohorts close to retirement (by 50% - 100%). The new benefit formula was relatively more favorable to workers with lower wages, as evidenced by an increase in the PV of benefits for women with elementary education (Figure H.1) compared to a decrease for women with university education (Figure H.2). This is due to the fact that the wage profiles for workers with university education are steeper. Since the new formula counts also the earlier years when their earnings lower than in their pre-retirement years, the average earnings used by the formula are effectively reduced. This effectively reduces the average earnings during the period considered.

3b. Hungary: Reform 1997

The 1997 reform[11] postponed the retirement age for men and women gradually to 62. However, it shifted the retirement age back by 1 year for women born between 1942-1944. The contribution rate paid by employers was reduced from 24.5% to 24%, and the pension accrual increased by 1.5% - 8% depending on the number of years worked.

The reform was clearly beneficial for women born between 1942-44 whose SSW rose by as much as 2 average annual earnings (Figure H.3). For the younger women, higher accrual and lower contributions did not compensate for the postponed retirement, and their SSW fell by approximately 0.4 (upper secondary education) and 0.8 (university education) average annual earnings. Men close to retirement lost between 0.7 (elementary education) to 1.66 (university education) average annual earnings. Younger cohorts lost gradually less, those just entering the labor market lost about 4 times less than their counterparts close to retirement.

3c. Hungary: Reform 1998

The fundamental reform of 1998[12] split the mandatory PAYG system into a public PAYG and a privately funded pillar. The workers already employed had the option to switch from the public to the mixed system and more than 50% of eligible workers did switch[13]. For new

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[11] Law No. 1996 LIX and 1996 LXXXVII

[12] Law No. 1997 LXXX deals with contributions, Law No. 1997 LXXXI regulates the Social Security Pension Scheme (public PAYG, 1st pillar), Law No. 1997 LXXXII establishes the legal framework for the Mandatory Private Pension Funds (2nd pillar)

[13] Augusztinovics et al (2002).

entrants to the labor market participation in the mixed system was compulsory. Workers in the mixed system will have their benefit from the public pillar reduced by 25%.

The employer contribution was reduced from 24% to 23% by 1999 and to 22% by 2000. At the same time the employee contribution was gradually increased from 6% to 9% by 2000. From this percentage employees in the mixed system had to pay 1% to the PAYG pillar and the rest of their contribution went to the private pillar.

The benefit formula remains unaffected until 2013 after which it should switch from the net to the gross principle, meaning that the benefit will then be set as a fraction of average gross earnings instead of net earnings. It was also planned that benefits would become taxable at the same time; however, the corresponding change in the income tax code has not been implemented. This rather ambiguous provision creates additional uncertainty over whether benefits will be taxable at all after 2013, and if so, what the income tax rates will be at that time.

The reform implies that a worker who retires at standard retirement age in 2012 will have his initial benefit calculated as 83% of the average net earnings. A worker one year younger than him retiring in 2013 will have his initial benefit set at 69.3% of the average gross earnings. The latter amount is approximately 20% higher than what the older retiree will receive. Should the benefits indeed become taxable at current income tax rates, the additional income tax should approximately erase the 20% difference, although the exact percentage will vary across retirees as they face different marginal tax rates. Since our goal is to evaluate the impact of reforms as they were actually legislated, we do not subtract any income tax when we compute the benefits after 2012.

The indexation rule was changed gradually from the net wage indexation to the Swiss indexation (50% CPI and 50% net wage growth). The income brackets in the benefit formula were indexed by nominal wage growth till 1998 while between 1998 till 2013 they were to be indexed by nominal wage growth plus 8%. The annuities from the funded pillar must be unisex and also indexed by Swiss indexation.

Results are reported separately for workers who stayed in the PAYG system and those who switched to the mixed system (Tables H.3 and H.4). The PV of contributions in the pure

PAYG rose by 3.3% for all workers (Figures H.4, H.5 and H.6). Changes in the present value of benefits vary substantially across cohorts, genders, and education levels. Those already retired saw their benefits cut by about 20% due to a gradual switch to the Swiss indexation. Benefits rose for the 1942-1950 cohorts as they were also affected by faster indexation of income brackets in the benefit formula. It increased the PV of benefits for men with elementary education only slightly (by approximately 1%, Figure H.6) but for men with university education substantially (by approximately 49%, Figure H.7). Cohorts retiring since 2013 will have their benefits set according to a new formula. For them it implied a large increase in the PV of benefits - by 80% (!) for men with university education born in 1951 at the extreme. For the post-1950 cohorts of workers with lower earnings this increase is less dramatic since they face a smaller gap between gross and net earnings (compare Figures H.6 and H.7).

In SSW terms, men and women with university education were the clear winners as they gained at least 2 average annual earnings. Among them, the cohorts born in the 1950's did particularly well (gained 3.2 to 3.5 average annual earnings). Both men and women with upper secondary education gained less than 1 average annual earnings, and again those born in the 1950's were treated better than cohorts born both earlier and later. Finally, workers with lower education levels were unaffected or mildly negatively affected (the largest loss of 0.57 average annual earnings was suffered by women with elementary education born in the late 1940's.)

Outcomes of workers who switched to the mixed system reveal a surprising result – most workers should not gain by switching or gain only marginally. Consider the group that supposedly has most to gain from switching to the private pillar, i.e., men with university education at the beginning of their career (1975-79 cohorts). Their gain from the reform is 2.28 average annual earnings if they switch, but 2.27 if they stay in the PAYG. This is largely due to the generous increase in PAYG benefits stipulated by the reform. Since older cohorts contribute to the PAYG for a shorter time, they do not accumulate enough savings to compensate for the 25% cut in the PAYG benefit, and so they are relatively even worse off by switching. The differential impact of the reform on the switchers and stayers is similar, although less pronounced in magnitude, for other types of workers. It should be pointed out that if the PAYG benefits do become taxable after 2013, the gains to switching to the mixed

system relative to staying in the PAYG system will be more favorable that our computations suggest.

3d. Hungary: Reform 1999

Mere one year later, the new government which had been opposed to private pensions adopted adjustments that scaled down the importance of the private pillar.[14] It cancelled the increase in employees' contribution to the private pillar that was promised by the previous legislation; workers in the mixed system had to contribute additional 1% to the PAYG pillar, and employers' contribution was to be cut from 23% to 22% by 1999 and to 21% by 2000.

In percentage terms, the reform had the same effect on all education levels, but differential impact on different cohorts and on workers in the mixed system vis-à-vis workers in the pure PAYG. Figures H.7 and H.8 show that while men in both systems experienced a 3% cut in contributions, workers in the PAYG had their benefits unaffected while cohorts 1951 and younger in the mixed system saw the PV of their benefits decline by 2.6-6.5 % (gradually more for younger cohorts, who, due to longer accumulation of savings, have a greater gap between the benefit from the funded pillar and the benefit from the PAYG pillar). In SSW terms, the reform benefited everyone in the pure PAYG system by the order of 0.2 to 0.5 average annual earnings, and had negligible net effect on the SSW of workers in the mixed system.

3e. Hungary: Reform 2003

The 2003 reform[15] increased employees' contributions from 8% to 8.5%, reduced contributions to the PAYG pillar to 1.5% for workers in the mixed system, and increased their contribution to the private pillar form 6% to 7%. The major change brought by this reform was a gradual introduction of an additional monthly benefit (13th monthly pension) within the PAYG pillar. Initially set at 25% of the regular benefit, this additional is planned to gradually increase such that pensioners would effectively receive their benefits 13 times a year from 2006 onwards.

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[14] Law No. 1998 LXVII
[15] Law No. 2003 IV

In SSW terms, the reform increased SSW of all workers by 0.1 to 0.8 average annual earnings. It was more beneficial to older workers in the pure PAYG system (who typically gained between 0.1 to 0.2. average annual earnings more than their counterparts in the mixed system; see Table H.7). It was also more advantageous to cohorts close to retirement than to younger cohorts. (E.g. women with university education born in the late 1950's gained 0.66 average annual earnings while those born in the early 1990's gained 0.34 average annual earnings, and similar relative differences are observed for other types of workers.) Figure H.9 illustrates the change in the PV of contributions and benefits for men with upper secondary education.

3f. Hungary: Reform 2007

The last reform covered in this paper[16] was motivated by cutting budget deficits. While the previous legislation was prescribing a reduction in employer contributions from 18% to 16% by 2009, the 2007 reform raised the employer contributions to 21%. The reform also affected the benefit formula for workers who would retire between 2008 and 2012 by changing the deduction of health care and unemployment insurance in a way that will effectively reduce the benefit. On the other hand the reform adjusted future indexation in a way that will slightly increase the future benefits. Specifically, earnings during the whole life will be indexed to the level of the individual's last working year, while before the reform earnings in last three working years were not indexed at all. The pension accrual will increase by 0.5% for each additional year but only for workers with more than 40 years of working history. The reform did not affect pensions that would be newly granted after 2012.

The combined effect of these changes was clearly negative, especially for workers with higher education and for all younger workers. The new formula cut the initial benefit by 5-6% for cohorts 1946-1950, which is demonstrated in Figure H.10. In addition, the PV of contributions increased by 15-20%. The differential impact of the reform for different educational categories shows that the SSW of men with elementary education decreased by only 0.35 to 1.1 average annual earnings, while the SSW of men with university education decreased by 0.85 to 2.5 average annual earnings (Tables H.9-10).

3g. Czech Republic: Reform 1996

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[16] Law No. 2006 CVI

The Czech Republic has a very traditional pay-as-you-go, defined benefit pension system. The 1996 reform[17], the first one undertaken after the end of communism, changed most of its parameters.

The new benefit formula introduced a flat component of the benefit (same for all retirees) and at the same time made the variable component (which depends with the workers average lifetime earnings) less regressive; among other changes, it abolished the ceiling on the maximum benefit[18]. It also increased the number of years over which the average earnings are computed – before the reform the initial benefit was based on earnings during 5 years with the highest earnings in the period of 10 years preceding retirement while after it was based on earnings during 30 years preceding retirement, or years since 1986, whichever is shorter.

The reform did not affect the contribution rates which were 6.50% (employee) and 19.5% (employer). The standard retirement age was increased by 2 years for men (from 60 to 62 for men) and by 5 years for women (from 55 to 60 for women with two children).[19] The increase was phased-in gradually such that the target retirement ages were supposed to apply since 2007.[20]

The pre-reform system lacked any built-in adjustments to inflation. Once granted, the benefits were fixed and the legislation did not provide any rule for their indexation. High inflation during the early 1990's exposed this major drawback.[21] Benefits granted in the past declined in real terms and newly granted benefits also lost value because they were based on historical wages and brackets in the benefit formula that were not revalued to current levels.

Prior to the reform the government was compensating for inflation by passing ad-hoc increases in benefits. The 1996 legislation laid out stable indexation rules. The benefits had to

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[17] Law No. 155/1995.
[18] Effectively, workers with average earnings exceeding CZK 10,000, or 90% of the average earnings in 1996, received benefits equal to the ceiling.
[19] It is a peculiar feature of the Czech pension system that the standard retirement age of women declines in the number of children. Before the 1996 reform it was 57 for childless women, 56 for women with one child, 55 for women with two children, 54 (three or four children) or 53 (five and more children).
[20] Higher retirement age was somewhat neutralized by several options for early retirement – for example, workers who were unemployed for more than half a year could retire 2 years before reaching the standard retirement age, and their pension was somewhat reduced.
[21] The inflation rate exceeded 9% every year between 1991 and 1995 and was as high as 50% in 1991.

be indexed for inflation plus at least once every two years also for at least 33% of the real wage growth.[22] The law, however, prescribed only minimum increases and gave the government the discretion to increase benefits more generously. In practice, the indexations were more generous.[23] The past earnings used to compute the average earnings were to be indexed by the wage index.[24]

Table C.1 shows the impact of the reform on SSW. Except for the cohorts that were just about to retire, all cohorts lost. The losses are larger for the younger cohorts and for workers with lower education.

Figure C.1 illustrates the results for men with lower secondary education (who have slightly less than average earnings). The PV of contributions increased for all cohorts as the retirement age was postponed. The percentage increase is naturally most dramatic for the cohort close to retirement. The PV of benefits declined for all cohorts except the 1936 cohort which was just about to retire, and declined more severely (by 18-25%) for the post-1944 cohorts as they were fully affected by the postponement of the retirement age.

The level and change in SSW of men with lower secondary education is illustrated in Figure C.2. The pre-reform system was generous to them in the sense that the SSW of the 1975 cohort was 3.89 average annual earnings above zero, and the reform reduced it to 1.05. Almost all cohorts lost. The losses are increasing in the cohort's year of birth and there are large differences among cohorts close to retirement – while the 1937 cohort was essentially unaffected, the 1944 cohort lost 1.68 average annual earnings. All remaining cohorts that were working at the time of the reform (1945-1975) lost approximately 2 annual average earnings, while the younger cohorts lost even more (on the order of 3 annual wages).

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[22] The timing of indexation was not annual but instead should occur each time when the increase in the consumer price index accumulated since the last increase exceeded 5%.

[23] Dušek (2007).

[24] The last feature of the 1996 reform relevant to our computations was its safeguard against making some new retirees explicitly worse off. The entry benefit had to be compared with the benefit that the retiree would have been entitled to under the pre-1996 legislation, and if the latter was higher she would still receive the "old" entry benefit. This provision was abandoned in 2005.

The negative impact on the SSW was less pronounced for workers with university education (see Table C.1.). The main reason is the less regressive benefit formula. Except for the cohorts close to retirement, all cohorts lost about 2 average annual earnings. For women, the reform implied higher increases in contributions and comparable cuts in benefits (see Figure C.3). The pattern of losses for women is similar to that of men, although women lost more in absolute terms (by 0.1 to 0.2 average annual earnings) than men of the same age and education.[25]

3h. Czech Republic: Reform 2002-2003

The next reform (adopted through two laws passed in 2002 and 2003 which we consider to be a single reform package[26]) was intended to improve the long-term financial sustainability of the PAYG system. It changed the indexation rule such that the benefits had to be adjusted annually and the minimum increase in benefits had to include inflation plus at least 33% of the real wage growth. This change merely codified the existing practice. Second, the retirement age was further postponed such that it would reach 63 for men and 61 for women by 2013. Third, employers' contributions were increased from 19.5% to 21.5%.[27]

All workers lost from this reform, and women lost more than comparable men in absolute terms. Figures C.4-C.5 compare the outcomes for men and women with upper secondary education. The reform increased the PV of contributions for all cohorts by raising the contribution rates and postponing the retirement age. It was most pronounced for the cohorts that were close to retirement and at the same time were fully affected by the phased-in postponement of the retirement age (i.e., the 1953 cohort whose contributions rose by 14%). Younger cohorts were affected less (contributions rose by 9.2% for all cohorts that were not working yet as of 2003). The combination of more generous indexation and a postponed retirement age implied a very slight increase in the PV of benefits for the 1942-1945 cohorts

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[25] We also checked whether our main result is not driven by a conservative assumption that benefits after 2005 would be indexed by the minimum prescribed by the reform legislation since the actual increases up to 2005 were more generous. To check robustness, we re-ran our computations with an assumption that benefits are indexed annually for inflation plus 33% of real wage growth, as later legislated in 2002. This had a negligible effect on the results for example, the reduction in SSW for women (for whom indexation rules are more important as they live longer) is smaller by 0.2 to 0.3 annual average earnings.

[26] Law No. 264/2002 and 425/2003.

[27] The reform also reduced the extent to which the time spent in school and other non-work activities can be counted as years of employment in the benefit formula and it made early retirement less generous and gradually increased the contribution rates of the self-employed. As our computations concern only employees who work till the retirement age, these aspects of the reform are not captured in our results.

and a reduction for all younger cohorts. The reduction is proportional for all cohorts that were fully affected by the postponement of the retirement age and varies between 4.9-6.5%. Translating into SSW (Table C.2), the reform reduced SSW by approximately 1.0 average annual earnings for all men born after 1955, and proportionately less for older cohorts (the 1942-1949 cohorts were little affected). For women, the patterns are similar but the SSW reductions are about 10-20% greater in absolute magnitude than for men (e.g., while the SSW men with upper secondary education entering the labor market – the 1982 cohort – fell by 1.09 average annual earnings, the corresponding number for women is 1.45).

3i. Slovakia: Reform 2004 - 2005

As Czechoslovakia split in 1993, Slovakia inherited the same pension system as the Czech Republic did. In the Slovak case, however, it remained unreformed until 2004. In the late 1990's the PAYG system generated a deficit caused by a combination of high unemployment and high evasion attributed to a weak connection between contributions and benefits (Melichercik and Ungvarsky (2004)). The government in response pushed through two successive reform packages in 2004 and 2005 which should be regarded as a single reform.[28]

The reform increased the retirement age from 55 to 62 years for women[29] and from 60 to 62 years for men. The increase was phased-in gradually such that the target retirement is reached in 2020 for women and in 2006 for men. The contribution rates were decreased from 20.6% to 16% (employer) and from 5.9% to 4% (employee). In addition, one of the parents could deduct additional 0.5% from contributions for every child aged below 26 as long as the child was studying.

The new benefit formula made the benefit linear in the worker's average earnings over his entire working history since 1994, up to a cap beyond which workers with more than 3 times the average earnings do not receive higher benefits. The formula set the benefit as the workers' average earnings times the number of working years times a number (the so called actual pension value) set such that a worker who has been working for 40 years and has always had the average wage in the economy achieves a 50% replacement rate

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[28] Laws No. 461/2003, 43/2004 and No. 121/2005.
[29] This is the case of women with two children. For women with no children the eligible age increased from 57, with 1 child from 56, with 3-4 children from 54 and for women with 5 or more children it gradually increased from 53 to 62.

The reform provided for a transitory period, initially legislated to last till 2006, during which the benefits were in fact regressive in the worker's lifetime earnings but were gradually becoming less regressive over time.[30] Compared to the old formula, the new one gave higher benefits to high-wage workers. The ad-hoc adjustments in benefits were replaced by the Swiss indexation, i.e. the benefits are increased by the average of the nominal wage growth and inflation in the economy.

The mandatory PAYG system was split into a public PAYG pillar and a mandatory fully funded pillar. The mixed system is mandatory for new entrants to the labor market. Workers aged below 52 had a choice to switch from pure PAYG to a mixed system, and 60% of workers did switch by 2006. After switching the workers could not return back to the pure PAYG system.

The employees' contribution rates to the PAYG pillar remained unchanged. The employers' contributions were reduced from to 14%. For switchers, the employers' contribution is split such that 5% goes to the PAYG pillar and 9% to the funded pillar. The PAYG benefits for switchers are cut proportionately to the number of years they have participated in the mixed system.[31]

Savings into the funded pillar are managed by pension fund administrators who in turn have to offer three types of pension funds differentiated by their risk and expected return − a growth, balanced, and conservative fund. Conservative funds may invest only in bonds and money market instruments and must be secured against the currency risk. The balanced funds must invest at least 50% of its assets in bonds and money market instruments and at most 50% in stocks. The growth funds may invest at most 80% of their assets in stocks and at most

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30 Specifically, the benefit is set as B = APV * N * APWP where APV is the actual pension value, N is a number of years of paying contributions, and APWP is the average personal wage point, i.e., the average ratio of the individual's annual gross earnings to the average annual gross earnings in the economy during the individual's whole working career. If the workers' APWP is less than 1, certain percentage of the difference between 1 and APWP is added to the original APWP, while if APWP is between 1.25 and 3, a certain percentage of the difference between APWP and 1.25 is deducted. The percentage difference to be added/deducted was 60% in 2004, 40% in 2005 and 20% in 2006. Only *APWP* between 1 and 1.25 is counted without adjustments. After the transitory period, the benefits should increase linearly in one's average lifetime earnings.

31 The PAYG benefit formula for the switchers is B = = *APV * APWP*(N - M/2),* where *M* is a number of years of paying contribution in the mixed system.

80% of their investments may be left unsecured against the currency risk. The worker's choice of the type of the pension fund is regulated in order to prevent a significant loss as the worker approaches the retirement age.[32]

The fees that the pension fund administrators may charge are regulated. They may charge 0.07% of the average monthly net value of the assets plus 1% of the amount of a monthly contribution.

The impact of the reform is clearly visible in Table S.1. The reform greatly increased the SSW of men with university education (by more than 7 average annual earnings for some cohorts), and somewhat less of men with lower levels of education. It had a negative impact on women, and increasingly negative for the poorest women (women with elementary education born between 1955-59 lost 4.48 average annual earnings, women with university education of the same age lost 1.17). It also affected the intergenerational distribution of SSW, as older cohorts lost more or gained less than the younger cohorts irrespective of the workers' gender or education.

The stark difference between the impacts of the reform on workers with different education levels is illustrated in Figures S.1 and S.2. As the new benefit formula largely eliminated the redistribution from high-wage to low-wage workers, the PV of benefits fell by 36% for almost all working men with elementary education while it increased by between 61 to 71% for almost all working men with university education. The retired cohorts were affected only by a change in indexations and the PV of their benefits rose by 11-14%. The percentage change in contributions is the same for all education levels but differs by cohorts – those very close to retirement (1945-48) saw a large increase while the cohorts just at the beginning of their working careers experienced a 32% reduction in the present value of contributions.

Figure S.3 and S.4 depict the differential impact in SSW terms. The SSW increased by at least 4 annual average earnings for all male cohorts with university education born in 1947 or later, and it increased by 7.6 annual average earnings for the 1982 cohort (i.e. just entering the labor market). It should be noted, however, that the pre-reform system was taxing the

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[32] Young workers can choose the pension fund according to their risk preferences. Workers with less than 15 years until retirement age cannot invest in the growth fund while workers with less than 7 years until retirement age must invest only in the conservative fund.

high-wage workers particularly heavily – an average man with university education who just started to work had a negative SSW of minus 13.1 average annual earnings. Young men with elementary education gained comparably little from the 2004-05 reform (0.7 average annual earnings), although their post-reform SSW is still higher (-2 average annual earnings) than that of men with university education.

Table S.2 presents the impact of the reform on workers who decided to switch into the mixed system. Almost all workers gained slightly less or lost more (typically by 0.1 to 0.4 average annual earnings) than their counterparts who stayed in PAYG. In other words, workers should be better off staying in the PAYG system. This is true even for the group that is bound to gain most from the funded system, i.e. young men with university education. This finding is due to a combination of rather high fees charged by the pension funds and their very conservative investment strategy – even though the growth funds are allowed to invest 80% of their assets in stocks, they actually invest only 20%. While our calculations assume somewhat higher share (30%) the resulting projected nominal return of 6.9% is not sufficient to make switching into the mixed system attractive. It is our understanding that this very conservative strategy is induced by additional regulations of the funds' performance. According to our calculations, the growth funds would have to invest 50% in stocks in order to achieve the 8.1% return required to make young men with university education indifferent between staying and switching. As Slovakia implemented a regulatory regime that yields to unnecessarily low returns on savings, the potential gains from the funded system appear to being foregone.

3j. Slovakia: Reform 2006

The last changes in the pension scheme came into force in 2007[33]. The child deduction was abolished and the benefit formula started to count in the entire working history since 1984. Also the gradual adjustment in the benefit formula which was creating a stronger link between earnings and benefits and was supposed to be fully phased in by 2006 was prolonged till 2014, after which the benefits should indeed be linear in earnings.

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[33] Law No. 513/2006

The reform kept the SSW of women essentially unchanged (Table S.3) with the exception of women with lower education born in 1940-45 who lost 0.4 average annual earnings. Also unaffected were men born before 1965 with less than university education. Men born after 1965 suffered a reduction in SSW which was almost uniform across cohorts but varied across education levels. Men with elementary education lost on average only 0.12 average annual earnings, those with upper secondary education 0.19 and those with university education 0.35. Among older cohorts, men with university education were the only ones who experienced a tangible loss from the 2006 reform. The differential impact on the PV of contributions and benefits is shown in Figures S.5 and S.6.

4. Conclusions

We documented the existence of the policy risk of social security by computing changes in benefits, contributions, and the social security wealth induced by pension reforms in three transition countries, Hungary, Czech Republic and Slovakia. Although the policy risk has various sources it always materializes through pension reforms when the past promises are replaced by the new ones. Reforms usually involve numerous adjustments to contribution and benefit formulas that are complicated, not very transparent, and contain a large number of parameters. Such adjustments may affect people of different ages and earnings histories differently, often times in ways that may not have been recognized or anticipated by the legislators.

Our findings confirm that the policy risk is real and can be substantial. We also show that the PAYG system exposes workers to aggregate as well as intergenerational and intragenerational risk. For example, the 1993 Hungarian reform or the 1996 and 2002-03 Czech reforms and the 2006 Slovak reforms were typical manifestation of the aggregate risk, cutting the social security wealth to most workers by amounts equal to several years of labor earnings. Both inter- and intra-generational risks were clearly present in the 1997 and 1998 Hungarian and 2004-05 Slovak reforms. Some of the reforms affected different cohorts and education groups in quite peculiar ways. For example, the 1997 Hungarian reform provided sizeable gains to women born in the early 1940's while simultaneously hurting everyone else. The 1998 Hungarian reform effectively created different sets of rules for workers who would retire before 2012 or after 2012, the latter group being rewarded with much larger SSW than the former. The 2004-05 Slovak reform substantially redistributed income across genders, cohorts and education levels such that the SSW of old women with elementary education fell

by more than 4 average annual earnings while the SSW of young men with university education rose by more than 7 average annual earnings.

The presence of policy risk of the PAYG system as documented here suggests a general policy implication that the choice between the PAYG and funded systems should perhaps follow the old investors' strategy of "don't put all your eggs in one basket". Finding the optimal balance between the PAYG and funded pillar would require an appropriate quantitative comparison of risks involved in the both schemes, one that would characterize the policy risk in a similar way that stock market risk has traditionally been characterized. Making such comparison represents a challenge as the data-generating process driving the changes in the SSW induced by pension reforms is fundamentally different from the data-generating process driving the stock market fluctuations. Our work may be regarded as the necessary first step towards making such a comparison.

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Appendix A. Detailed assumptions

Wage profiles

Our "average" workers start working at age 20, work full-time until the standard retirement age[34], and they are earning the wage that is predicted by the wage profile specific for their gender, educational category, and calendar year. The wage profiles are estimated from individual level cross-sectional datasets described below and they have the standard form

$$\log w_{ijt} = \alpha_{jt} + \beta_{1jt} a_{ijt} + \beta_{2jt} a_{ijt}^2 + u_{ijt}$$

where w is the monthly wage, subscript i denotes an individual, j denotes the worker's gender and educational category, t denotes year, a is the worker's age, and α, β_1 and β_2 are parameters that we estimate. The profiles were estimated on the sample of workers aged between 20 and the standard retirement age who worked at least 6 months in a given year. The regression estimates and the corresponding wage profiles are available upon request.

We constructed the wage profiles from individual-level datasets that were best suited for the task in each country. All of them contain the basic information about each worker (gender, age, education level), and sufficient information about his/her employment status and labor income (either the monthly wage or the annual/quarterly wage and the number of weeks/months worked from which the monthly wage can be imputed.) For Hungary, we used the Harmonized Hungarian Wage Survey of the Public Employment Service. The survey was collected at the firm level in 1986, 1989 and annually since 1992 to 2003 and contains data on 100,000 to 200,000 employees depending on year. For the Czech Republic, we used the Czech Microcensus, a representative household survey conducted once every 4 or 6 years by the Czech Statistical Office. The surveys that we use were collected in 1992, 1996, and 2002[35] and they cover approximately 44,000, 64,000 and 19,000 individuals in the respective years. For Slovakia, we used the TREXIMA dataset, a representative survey of firms. Collected in 2001, it contains quarterly data on 350,000 employees.

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[34] Workers with university education start working at age 22.

[35] Unfortunately, the 1988 microcensus was not usable for our purpose, since all observations are recorded at a household level but not individual level. Even though it does report the earnings of the head of household and his spouse, it does not allow identifying the gender of workers who live in households other than the traditional families of married couples.

Since the samples allow estimating the wage profiles only for some years[36] while we need to have profiles for all years since 1988 (Hungary), 1986 (Czech Republic) or 1984 (Slovakia), we impute the profiles for the remaining years. We assume that the coefficients on the age and age squared are the same as in the nearest adjacent year for which the profile was estimated[37]. Then we adjust the intercept α such that the average fitted wage in the sample is equal to the actual average wage in the year for which the wage profile is being imputed.[38]

Macroeconomic assumptions

Certain assumptions about the future were required to project future benefits and contributions. The length of life is probabilistic and the future money flows are discounted by the survival probability. We had survival probability tables for all countries (unfortunately without a finer breakdown by education categories) until 2004. For years 2005 and onwards, we assume that the survival probabilities are the same as in 2004.[39]

We assume that as of the time of the reform people had perfect foresight about the evolution of all economic variables that affect future taxes and benefits (aggregate and individual wage growth, inflation, survival probabilities). That is, future contributions and benefits that are expected as of time of the reform are equal to the wages and inflation rates that were actually realized up to 2005, and for the years 2006 onwards, we assume a 3% growth rate of real wages for all education categories and genders, and a 2% inflation rate.[40]

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[36] The Hungarian Wage Survey is not available for 1987-1988, 1990-1991 and 2004+. Moreover, the surveys from 1993, 1998-1999 and 2002 appeared to contain data problems since the estimates of the wage profiles in these years produced estimates that were substantially different from the estimates for adjacent years and, more importantly, were economically implausible.

[37] For example, the coefficients on age and age squared estimated from the Czech 2002 Microcensus were used to generate wage profiles for 2000-2004.

[38] The average wages of employees by gender and education level were taken from the Czech Statistical Office publications "Průměrné hrubé měsíční mzdy v letech 1996 - 2004 v třídění podle vzdělání a pohlaví zaměstnanců", "Mzdová diferenciace v čs.národním hospodářství - zhodnocení vybraných aspektů odměňování na základě jednorázového šetření o mzdách pracovníků za červen 1984", and "Mzdy pracovníků za červen 1988 (z jednorázového výběrového šetření o mzdách za červen 1988) - I.díl", which altogether cover the year 1984, 1988, and 1996-2004. For the years 1985-87, and 1989-95, the average wages by education levels are not reported, only averages across all education levels. We imputed the average wages by education level by linearly extrapolating the ratios of the average wage in each education level to the overall average wage, and then multiplying this ratio with the overall average wage in each year for which the wages by education level were missing. For Hungary we computed the average wages from the Wage Survey and extrapolated them for the missing years. Slovak average wages were reported in "Statistický úrad SR: Priemerná mesačná mzda v hospodárstve SR a indexy miezd".

[39] This assumption leads likely underestimates the true survival probabilities since the life expectancies have been increasing in all three countries since the 1990's and are expected to increase in the future. However, we were not able to obtain specific projections of future survival probabilities.

[40] These are roughly the rates of wage growth and inflation currently experienced by both countries.

The rate of return on savings in pension funds is the key parameter affecting the benefits from the second pillar. It is to a large extent determined by the regulations of the funds' investments and fees. Our choice of the rates of return is an estimate of the net rate of return that the pension funds, as actually established and regulated by the Hungarian and Slovak law, are expected to deliver to their clients. That is, we avoid using an average historical return on some "optimal" stock and bond portfolio as commonly done in simulations of benefits from the funded pillar (e.g. Feldstein and Ranguelova 2001) since that approach would give the level of benefits that the funded pillar could provide rather than it did provide.

For Hungary, the expected real return on savings is calculated as the weighted average of the real net return[41] of all Hungarian pension funds during 1998-2005, which was 2.7%[42]. Pension funds in Slovakia were established too recently to project future returns from historical returns. Instead we compute the expected future returns as the average historical returns on the portfolios that the growth funds currently hold. Specifically, we calculate the average historical return for each of the major bond and stock indices in which the funds currently invest, and then compute the average of these returns weighted by their share in the average growth fund's' portfolio.[43] The resulting projected nominal rate of return after deducting fees is 6.9 percent.[44] As workers approach the retirement age they may prefer a gradual switch to a complete risk-free portfolio (and in Slovakia they are in fact required to switch for more conservative funds). We therefore assume that the above mentioned returns apply only from the beginning of employment until 15 years before retirement. Afterwards workers rebalance the portfolio each year such that the real return linearly decreases to zero by the age of retirement.

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[41] That is, after deducting the fees.

[42] Source: Czajlik and Szalay (2006)

[43] Specifically, the expected returns are computed from the returns on the following indices over the periods indicated: UX 1991-2007, PX 1995-2007, SLOVN SK 1999–2007, VIX 1990-2003, MXEU 1995-2007, FTSE 1990-2003, DAX 1990-2007, SPX 1990-2007. The funds' stock portfolio is composed of stock indices in the Visegrad countries (20%), the EU-15 countries (50%), and the United States (30%). Data on the portfolio compositions were taken from the funds' annual reports.

[44] The growth funds currently invest 80% of their assets in bonds, which appears to be an overtly conservative strategy, particularly if the legislation restricts them to invest at most 80% in stocks. Even though other regulations give funds incentives to invest in stocks below the maximum limit, several fund managers admit in official reports that they do plan to increase the share of stocks in the near future. In our computation of the expected return we therefore assume that they will invest 30% in stocks.

The 2004-05 Slovak reform allowed one of the parents to deduct 0.5% for every child from their PAYG contributions. We assume that the deduction is claimed by men since they earn more on average, and we do all our calculations for a family with two children that has both children at the average age of first and second childbirth.[45]

Computing future indexations of benefits in the Czech Republic and Slovakia required additional assumptions. The legislation before the first reform did not prescribe any indexations, yet it is implausible to assume that the benefits or the system parameters would never be indexed. In fact, the benefits had been indexed in an ad-hoc manner with a clear goal to preserve their real value. Therefore we assume that once granted, benefits would have been indexed for inflation, and the income brackets in the benefit formula would be indexed for wage growth. Under these assumption, the replacement ratio[46] remains at a similar level (48-50% in the Czech Republic, 30-35% in Slovakia) as it was during the years just preceding the reform.[47] After the 1996 reform, the Czech law prescribed minimum indexations, but the government frequently provided more generous increases. Therefore until 2006 we assume perfect foresight and compute the benefits as they were actually indexed, and only after 2006 we index them conservatively by the minimum prescribed by the legislation.

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[45] The average age of mother at the first and second childbirth is 28 and 30, respectively. Source: Statistical Office of Slovak Republic, publication: "Pohyb obyvateľstva v Slovenskej republike v roku 2006". We assume the father is 2 years older than the mother.

[46] The ratio of the benefit to the (gross) wage in the last year before retirement

[47] In addition, prior to 1995, the new benefits were computed according to the old formula but were increased immediately (by 32% in 1995) to make up for the inflation that accumulated since 1990. We assume that such increases in newly granted benefits would continue into the future with the same purpose for compensating for a reduction in the real value of past wages that enter the benefit due to inflation. We increase the new benefits by 32%, and further increase it by the ratio of the price index at the time of retirement to the average price index during the 5 years preceding retirement.

Table A: Main Features of the Reforms

Reform	Retirement Age	Contribution Rate	Assessed Earnings	Benefit Formula	Funded System	Retirement Indexation
HU (1993)	Men: 60 Women: 55 to 60	Employer: 24.5% Employee: 6%	average net monthly earnings during 4 years with highest earnings in the period of 5 years before retirement ➜ average net monthly earnings from 1988 until the year of retirement	degression [average(net earnings after taxation * valorization)] * accrual, taxation changes every year, after the reform the degression is less restrictive		Net wage indexation
HU (1997)	Men: 60 to 62 Women: 55 to 62	Employer: 24.5% to 24.0% Employee: 6%		higher accrual was applied		
HU (1998)		PAYG: Employer: 24% to 23% (1999), to 22% (2000), Employee: 6% to 7% (1998), to 8% (1999), to 9% (2000)		degressions are less restricitve, higher accruals are applied, benefit as a fraction of average net earnings ➜ a fraction of average gross earnings since 2013		net wage indexation ➜ Swiss indexation gradually 2001
		Mixed system: Employer: 24% 23% (1999), to 22% (2000), Employee (2nd pillar): 6% (1998), 7% (1999), 8% (2000)		degressions are less restricitve, higher accruals are applied, switchers' accruals are 75% of stayers' accruals, benefit as a fraction of average gross earnings ➜ a fraction of average net earnings since 2013	switchers receive unisex annuities from the amount invested at the pension fund	net wage indexation ➜ Swiss indexation gradually 2001
HU (1999)		PAYG: Employer: 23% to 22% (1999), 22% to 21% (2000), Employee: 8% (1999), 9% to 8% (2000)				
		Mixed system: Employer: 23% to 22% (1999), 22% to 21% (2000, Employee (PAYG): 1% to 2%, Employee (2nd pillar): 7% to 6% (1999), 8% to 6% (2000)				
HU (2003)		PAYG: Employer: 18% , Employee: 8% to 8.5%		additional (13th monthly) monthly pension benefit gradually until 2006		
		Mixed system: Employer: 18%, Employee (PAYG): 2% to 1.5%, Employee (2nd pillar): 6% to 7%		additional (13th monthly) monthly pension benefit gradually until 2006		
HU (2007)		PAYG: Employer: 17% to 21% (2007), 16% to 21% (2009, Employee: 8.5%		for entry pension benefits that will be granted between 2008 and 2012 employees' pension and health care contributions and the employees' contribution to the employment fund will be deducted from the net earnings entering the calculation of the entry pension		
		Mixed system: Employer: 17% to 21% (2007), 16% to 21% (2009), Employee (PAYG): 0.5%, Employee (2nd pillar): 8%		for entry pension benefits that will be granted between 2008 and 2012 employees' pension and health care contributions and the employees' contribution to the employment fund will be deducted from the net earnings entering the calculation of the entry pension		
CZ (1996)	Men: 60 to 62 Women: 55 to 59	Employer: 19.5% Employee: 6.5%	earnings from 5 years with the highest earnings during the 10 years priors to retirement ➜ average monthly earnings from the 30 years of employment preceding retirement since 1986	$B=B_0+0.5*I+0.01*(max\{y-25,0\}+0.04*max\{y-R,0\})*I$, where B is the benefit, B_0 is the fixed component of the benefit, I is the income base, y is the number of years of insurance, and R is the eligibility age, there is degression applied on past average earnings		indexation ad hoc ➜ indexation as a combination of consumer price index and real wage growth
CZ (2002-03)	Men: 60 to 63 Women: 55 to 61	Employer: 19.5% to 21.5% Employee: 6.5%				change ➜ annual indexation with inflation plus min 33% of real wage growth
SK (2004-05)	Men: 60 to 62 Women: 55 to 62	PAYG: Employer: 20.6% to 16% (2004), to 14% (2005), Employee: 5.9% to 4%, one of the parents can deduct additional 0.5% in contributions for every child		$B=B_0+0.5*I+0.01*(max\{y-25,0\}+0.04*max\{y-R,0\})*I$, where B is the benefit, B_0 is the fixed component of the benefit, I is the income base, y is the number of years of insurance, and R is the eligibility age, there is degression applied on past average earnings		indexation ad hoc ➜ Swiss indexation
		Mixed system: Employer (PAYG): 5% (2005), Employer (2nd pillar): 9% (2005), Employee: 4%, one of the parents can deduct additional 0.5% in contributions for every child	earnings from 5 years with the highest earnings during the 10 years priors to retirement ➜ entire working period since 1994, which in turn should be at least 10 years	$B = APV * APWP*(N - M/2)$, where M is a number of years of paying contribution in the mixed system.	switchers receive unisex annuities from the amount invested at the pension fund, they pay remuneration for managing the pension fund (0.07% of the average monthly net value of assets), remuneration for keeping personal pension account (1% of the amount of contribution)	indexation ad hoc ➜ Swiss indexation
SK (2006)		Employee: the 0.5% deduction in contributions for every child was abolished	entire working period since 1994, which in turn should be at least 10 years ➜ entire working period since 1984, which in turn should be at least 20 years	change in calculation of APWP		

Tables – Hungary

H.1 Reform 1993, pay-as-you-go, Change in SSW as a fraction of annual average wage

Cohort	Men				Women			
	Elementary	Lower	Upper	University	Elementary	Lower	Upper	University
1935-39	-0.01	-0.03	-0.19	-0.23				
1940-44	0.11	0.07	-0.03	-0.16	-0.48	-0.63	-1.04	-1.45
1945-49	0.27	0.25	0.15	0.09	-0.45	-0.46	-0.79	-2.06
1950-54	0.23	0.24	0.11	0.10	-0.45	-0.50	-0.83	-2.15
1955-59	0.19	0.19	0.06	0.06	-0.43	-0.52	-0.87	-2.07
1960-64	0.16	0.16	0.00	0.02	-0.41	-0.53	-0.88	-2.02
1965-69	0.13	0.12	-0.06	-0.01	-0.40	-0.54	-0.89	-1.95
1970-74	0.09	0.08	-0.08	0.03	-0.39	-0.53	-0.85	-1.80
1975-79	0.06	0.05	-0.09	0.04	-0.38	-0.52	-0.82	-1.67
1980-84	0.04	0.02	-0.11	0.02	-0.39	-0.52	-0.81	-1.57
1985-89	0.02	0.00	-0.12	0.01	-0.39	-0.51	-0.79	-1.50
1990-94	0.01	-0.01	-0.12	0.00	-0.38	-0.50	-0.76	-1.44

H.2 Reform 1997, pay-as-you-go, Change in SSW as a fraction of annual average wage

Cohort	Men				Women			
	Elementary	Lower	Upper	University	Elementary	Lower	Upper	University
1935-39	0.04	0.02	-0.07	-0.34				
1940-44	-0.69	-0.84	-1.18	-1.66	0.63	0.74	0.99	1.00
1945-49	-0.49	-0.53	-0.70	-1.09	-0.09	-0.11	-0.17	-0.60
1950-54	-0.42	-0.45	-0.59	-0.92	-0.31	-0.34	-0.45	-0.97
1955-59	-0.35	-0.38	-0.50	-0.77	-0.27	-0.29	-0.39	-0.86
1960-64	-0.31	-0.34	-0.44	-0.67	-0.24	-0.26	-0.35	-0.78
1965-69	-0.27	-0.29	-0.38	-0.58	-0.21	-0.23	-0.30	-0.69
1970-74	-0.23	-0.25	-0.34	-0.51	-0.18	-0.20	-0.26	-0.63
1975-79	-0.20	-0.22	-0.30	-0.46	-0.15	-0.17	-0.23	-0.57
1980-84	-0.18	-0.20	-0.28	-0.43	-0.14	-0.16	-0.21	-0.54
1985-89	-0.17	-0.19	-0.26	-0.41	-0.13	-0.15	-0.20	-0.51
1990-94	-0.16	-0.18	-0.25	-0.38	-0.12	-0.14	-0.19	-0.48

H.3 Reform 1998, pay-as-you-go, Change in SSW as a fraction of annual average wage

Cohort	Men				Women			
	Elementary	Lower	Upper	University	Elementary	Lower	Upper	University
1935-39	-1.13	-1.21	-1.36	-1.46				
1940-44	-0.38	-0.16	0.69	2.08	-1.74	-1.92	-2.49	-1.91
1945-49	-0.05	0.21	1.06	2.72	-0.57	-0.37	0.57	2.55
1950-54	0.07	0.37	1.36	3.49	-0.47	-0.25	0.78	3.46
1955-59	0.04	0.31	1.17	3.24	-0.44	-0.26	0.65	3.27
1960-64	-0.03	0.20	0.88	2.77	-0.42	-0.29	0.44	2.78
1965-69	-0.08	0.10	0.65	2.44	-0.40	-0.31	0.29	2.45
1970-74	-0.12	0.03	0.54	2.37	-0.36	-0.29	0.26	2.45
1975-79	-0.12	0.02	0.48	2.27	-0.30	-0.24	0.26	2.47
1980-84	-0.08	0.03	0.45	2.14	-0.22	-0.15	0.29	2.45
1985-89	-0.04	0.06	0.45	2.04	-0.14	-0.09	0.32	2.36
1990-94	0.00	0.09	0.44	1.95	-0.08	-0.03	0.34	2.26

H.4 Reform 1998, mixed system, Change in SSW as a fraction of annual average wage

Cohort	Men				Women			
	Elementary	Lower	Upper	University	Elementary	Lower	Upper	University
1951-54	-0.57	-0.32	0.51	2.41	-1.10	-1.00	-0.31	1.72
1955-59	-0.47	-0.26	0.46	2.29	-0.84	-0.78	-0.24	1.57
1960-64	-0.38	-0.19	0.42	2.21	-0.58	-0.53	-0.14	1.45
1965-69	-0.31	-0.14	0.39	2.17	-0.34	-0.31	-0.02	1.42
1970-74	-0.23	-0.08	0.42	2.27	-0.10	-0.09	0.15	1.58
1975-79	-0.14	0.00	0.46	2.28	0.12	0.12	0.32	1.71
1980-84	-0.07	0.05	0.47	2.17	0.27	0.28	0.42	1.70
1985-89	-0.03	0.08	0.47	2.06	0.35	0.35	0.45	1.63
1990-94	0.00	0.10	0.46	1.97	0.39	0.38	0.47	1.56

H.5 Reform 1999, pay-as-you-go, Change in SSW as a fraction of annual average wage

Cohort	Men				Women			
	Elementary	Lower	Upper	University	Elementary	Lower	Upper	University
1935-39	0.00	0.00	0.00	0.01				
1940-44	0.03	0.04	0.06	0.09	0.01	0.01	0.01	0.02
1945-49	0.07	0.08	0.11	0.17	0.06	0.07	0.09	0.15
1950-54	0.10	0.11	0.16	0.26	0.09	0.10	0.14	0.24
1955-59	0.13	0.15	0.20	0.34	0.12	0.13	0.18	0.31
1960-64	0.16	0.18	0.24	0.42	0.14	0.16	0.21	0.37
1965-69	0.19	0.21	0.28	0.50	0.17	0.18	0.25	0.42
1970-74	0.21	0.24	0.31	0.56	0.19	0.20	0.28	0.47
1975-79	0.23	0.27	0.34	0.59	0.21	0.23	0.30	0.51
1980-84	0.24	0.27	0.34	0.57	0.21	0.23	0.30	0.50
1985-89	0.22	0.25	0.32	0.54	0.20	0.22	0.29	0.47
1990-94	0.21	0.24	0.31	0.51	0.19	0.21	0.27	0.45

H.6 Reform 1999, mixed system, Change in SSW as a fraction of annual average wage

Cohort	Men				Women			
	Elementary	Lower	Upper	University	Elementary	Lower	Upper	University
1951-54	0.00	0.00	0.00	0.01	-0.07	-0.06	-0.04	0.03
1955-59	0.01	0.02	0.02	0.04	-0.08	-0.07	-0.04	0.06
1960-64	0.03	0.03	0.04	0.07	-0.10	-0.09	-0.04	0.09
1965-69	0.04	0.05	0.06	0.11	-0.11	-0.10	-0.04	0.11
1970-74	0.05	0.06	0.08	0.14	-0.12	-0.11	-0.04	0.13
1975-79	0.07	0.07	0.09	0.16	-0.12	-0.11	-0.04	0.15
1980-84	0.07	0.08	0.09	0.16	-0.13	-0.12	-0.05	0.16
1985-89	0.07	0.07	0.09	0.15	-0.13	-0.12	-0.05	0.15
1990-94	0.06	0.07	0.09	0.14	-0.12	-0.11	-0.04	0.15

H.7 Reform 2003, pay-as-you-go, Change in SSW as a fraction of annual average wage

Cohort	Men				Women			
	Elementary	Lower	Upper	University	Elementary	Lower	Upper	University
1935-39	0.24	0.26	0.33	0.40				
1940-44	0.37	0.41	0.53	0.69	0.31	0.36	0.47	0.57
1945-49	0.36	0.40	0.50	0.68	0.42	0.47	0.61	0.81
1950-54	0.29	0.33	0.43	0.62	0.35	0.39	0.52	0.76
1955-59	0.24	0.27	0.35	0.52	0.30	0.33	0.44	0.66
1960-64	0.20	0.22	0.28	0.41	0.27	0.29	0.38	0.56
1965-69	0.16	0.18	0.23	0.33	0.23	0.25	0.32	0.48
1970-74	0.13	0.15	0.19	0.29	0.20	0.22	0.29	0.44
1975-79	0.10	0.12	0.15	0.24	0.18	0.19	0.25	0.41
1980-84	0.08	0.10	0.12	0.20	0.16	0.17	0.22	0.37
1985-89	0.08	0.09	0.11	0.19	0.15	0.16	0.21	0.35
1990-94	0.07	0.08	0.11	0.18	0.14	0.15	0.20	0.34

H.8 Reform 2003, mixed system, Change in SSW as a fraction of annual average wage

Cohort	Men				Women			
	Elementary	Lower	Upper	University	Elementary	Lower	Upper	University
1951-54	0.24	0.27	0.36	0.53	0.30	0.33	0.43	0.61
1955-59	0.21	0.23	0.31	0.46	0.28	0.31	0.39	0.54
1960-64	0.18	0.20	0.26	0.39	0.27	0.29	0.35	0.47
1965-69	0.15	0.17	0.22	0.34	0.26	0.27	0.32	0.42
1970-74	0.13	0.15	0.19	0.31	0.25	0.26	0.30	0.40
1975-79	0.12	0.13	0.17	0.28	0.24	0.25	0.29	0.38
1980-84	0.10	0.12	0.15	0.25	0.23	0.23	0.27	0.35
1985-89	0.09	0.11	0.14	0.24	0.22	0.22	0.25	0.33
1990-94	0.09	0.10	0.13	0.23	0.21	0.21	0.24	0.32

H.9 Reform 2007, pay-as-you-go, Change in SSW as a fraction of annual average wage

Cohort	Men				Women			
	Elementary	Lower	Upper	University	Elementary	Lower	Upper	University
1935-39	0.00	0.00	0.00	0.00				
1940-44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1945-49	-0.26	-0.29	-0.37	-0.66	-0.21	-0.24	-0.30	-0.47
1950-54	-0.25	-0.28	-0.38	-0.61	-0.24	-0.26	-0.35	-0.63
1955-59	-0.33	-0.38	-0.53	-0.85	-0.31	-0.34	-0.47	-0.86
1960-64	-0.46	-0.53	-0.72	-1.22	-0.43	-0.47	-0.64	-1.16
1965-69	-0.58	-0.67	-0.90	-1.58	-0.54	-0.58	-0.80	-1.44
1970-74	-0.70	-0.81	-1.07	-1.91	-0.64	-0.69	-0.95	-1.69
1975-79	-0.81	-0.94	-1.22	-2.19	-0.74	-0.80	-1.08	-1.90
1980-84	-0.92	-1.04	-1.35	-2.40	-0.83	-0.89	-1.20	-2.09
1985-89	-0.99	-1.12	-1.45	-2.45	-0.90	-0.96	-1.28	-2.15
1990-94	-0.97	-1.09	-1.40	-2.33	-0.88	-0.94	-1.24	-2.04

H.10 Reform 2007, mixed system, Change in SSW as a fraction of annual average wage

Cohort	Men				Women			
	Elementary	Lower	Upper	University	Elementary	Lower	Upper	University
1951-54	-0.21	-0.24	-0.34	-0.52	-0.20	-0.22	-0.30	-0.55
1955-59	-0.33	-0.38	-0.53	-0.85	-0.31	-0.34	-0.47	-0.86
1960-64	-0.46	-0.53	-0.72	-1.22	-0.43	-0.47	-0.64	-1.16
1965-69	-0.58	-0.67	-0.90	-1.58	-0.54	-0.58	-0.80	-1.44
1970-74	-0.70	-0.81	-1.07	-1.91	-0.64	-0.69	-0.95	-1.69
1975-79	-0.81	-0.94	-1.22	-2.19	-0.74	-0.80	-1.08	-1.90
1980-84	-0.92	-1.04	-1.35	-2.40	-0.83	-0.89	-1.20	-2.09
1985-89	-0.99	-1.12	-1.45	-2.45	-0.90	-0.96	-1.28	-2.15
1990-94	-0.97	-1.09	-1.40	-2.33	-0.88	-0.94	-1.24	-2.04

Tables – Czech Republic

C.1 Reform 1996, Change in SSW as a fraction of the annual average earnings

Cohort	Men				Women			
	Elementary	Lower	Upper	University	Elementary	Lower	Upper	University
1936-39	0.00	-0.08	-0.34	-0.31				
1940-44	-1.30	-1.26	-1.48	-1.22	2.38	2.03	1.36	0.96
1945-49	-1.79	-1.62	-1.83	-1.54	-1.24	-1.37	-1.13	-1.12
1950-54	-1.97	-1.80	-1.99	-1.68	-1.74	-2.04	-1.82	-1.70
1955-59	-2.17	-2.02	-2.15	-1.78	-2.02	-2.35	-2.06	-1.87
1960-64	-2.42	-2.29	-2.30	-1.80	-2.31	-2.63	-2.17	-1.94
1965-69	-2.66	-2.56	-2.50	-1.88	-2.63	-2.94	-2.32	-2.08
1970-74	-2.86	-2.73	-2.65	-1.96	-2.88	-3.18	-2.44	-2.17
1975-79	-3.04	-2.89	-2.80	-2.05	-3.10	-3.40	-2.56	-2.25
1980-84	-3.26	-3.10	-3.01	-2.20	-3.37	-3.68	-2.77	-2.43
1985-89	-3.44	-3.26	-3.18	-2.30	-3.59	-3.91	-2.91	-2.52
1990-94	-3.63	-3.43	-3.35	-2.39	-3.81	-4.14	-3.05	-2.62
1995-96	-3.86	-3.65	-3.58	-2.55	-4.05	-4.40	-3.26	-2.81

C.2 Reform 2002-03, Change in SSW as a fraction of the annual average earnings

Cohort	Men				Women			
	Elementary	Lower	Upper	University	Elementary	Lower	Upper	University
1941-44	0.02	0.02	0.02	0.02				
1945-49	-0.09	-0.10	-0.18	-0.23	-0.02	-0.02	-0.02	-0.04
1950-54	-0.44	-0.49	-0.60	-0.78	-0.54	-0.55	-0.65	-0.86
1955-59	-0.56	-0.61	-0.74	-0.99	-0.85	-0.90	-1.10	-1.38
1960-64	-0.61	-0.67	-0.82	-1.12	-0.90	-0.94	-1.18	-1.49
1965-69	-0.64	-0.70	-0.87	-1.21	-0.91	-0.95	-1.21	-1.53
1970-74	-0.70	-0.77	-0.95	-1.34	-0.96	-1.01	-1.29	-1.63
1975-79	-0.76	-0.83	-1.03	-1.46	-0.99	-1.04	-1.32	-1.67
1980-84	-0.79	-0.85	-1.06	-1.51	-0.99	-1.04	-1.33	-1.67
1985-89	-0.81	-0.88	-1.08	-1.50	-1.02	-1.08	-1.38	-1.69
1990-94	-0.82	-0.88	-1.09	-1.49	-1.05	-1.10	-1.40	-1.71
1995-99	-0.79	-0.85	-1.05	-1.43	-1.02	-1.08	-1.37	-1.66
2000-03	-0.82	-0.88	-1.07	-1.45	-1.08	-1.13	-1.43	-1.72

Tables – Slovakia

S.1 Reform 2004-05, pay-as-you-go, Change in SSW as a fraction of annual average wage

Cohort	Men				Women			
	Elementary	Lower	Upper	University	Elementary	Lower	Upper	University
1935-39	0.37	0.39	0.41	0.42				
1940-44	0.21	0.24	0.52	0.89				
1945-49	-2.38	-1.83	-0.41	3.97	0.46	0.49	0.59	0.98
1950-54	-1.83	-1.22	0.11	4.69	-4.25	-3.99	-2.74	-0.15
1955-59	-1.29	-0.66	0.62	5.27	-4.48	-4.24	-3.17	-0.83
1960-64	-0.80	-0.14	1.10	5.89	-4.08	-3.82	-2.83	-0.43
1965-69	-0.37	0.33	1.54	6.42	-3.64	-3.34	-2.37	0.10
1970-74	0.01	0.76	1.92	6.86	-3.25	-2.89	-1.95	0.54
1975-79	0.35	1.13	2.28	7.31	-2.87	-2.47	-1.53	1.01
1980-84	0.65	1.45	2.58	7.55	-2.51	-2.07	-1.12	1.39
1985-89	0.75	1.54	2.62	7.24	-2.29	-1.84	-0.92	1.38
1990-94	0.71	1.46	2.49	6.87	-2.17	-1.75	-0.87	1.31

S.2 Reform 2004-05, mixed system, Change in SSW as a fraction of annual average wage

Cohort	Men				Women			
	Elementary	Lower	Upper	University	Elementary	Lower	Upper	University
1953-54	-1.72	-1.16	0.14	4.59				
1955-59	-1.38	-0.80	0.45	4.94	-4.61	-4.40	-3.31	-1.17
1960-64	-0.91	-0.32	0.90	5.51	-4.25	-4.05	-3.02	-0.88
1965-69	-0.49	0.14	1.33	6.05	-3.82	-3.59	-2.59	-0.40
1970-74	-0.10	0.57	1.72	6.53	-3.43	-3.17	-2.18	0.04
1975-79	0.26	0.95	2.08	6.96	-3.05	-2.75	-1.76	0.49
1980-84	0.56	1.28	2.37	7.15	-2.70	-2.36	-1.35	0.82
1985-89	0.67	1.38	2.41	6.85	-2.48	-2.12	-1.15	0.83
1990-94	0.63	1.30	2.29	6.50	-2.35	-2.02	-1.09	0.79

S.3 Reform 2006, pay-as-you-go, Change in SSW as a fraction of annual average wage

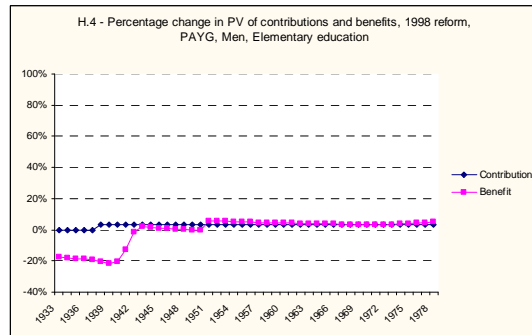| Cohort	Men				Women			
	Elementary	Lower	Upper	University	Elementary	Lower	Upper	University
1935-39	0.00	0.00	0.00	0.00				
1940-44	0.00	0.00	0.00	0.00				
1945-49	0.30	0.19	0.02	-0.85	0.00	0.00	0.00	0.00
1950-54	0.08	0.09	-0.05	-0.26	0.44	0.40	-0.03	-0.16
1955-59	0.00	0.03	-0.10	-0.25	-0.06	-0.01	-0.14	-0.11
1960-64	-0.07	-0.05	-0.19	-0.45	-0.10	-0.02	-0.13	-0.20
1965-69	-0.11	-0.11	-0.21	-0.41	-0.08	-0.02	-0.09	-0.13
1970-74	-0.12	-0.14	-0.19	-0.32	-0.03	-0.01	-0.02	-0.02
1975-79	-0.14	-0.16	-0.19	-0.36	0.00	0.00	0.00	0.00
1980-84	-0.13	-0.16	-0.19	-0.35	0.00	0.00	0.00	0.00
1985-89	-0.13	-0.15	-0.18	-0.34	0.00	0.00	0.00	0.00
1990-94	-0.12	-0.14	-0.17	-0.32	0.00	0.00	0.00	0.00

S.4 Reform 2006, mixed system, Change in SSW as a fraction of annual average wage

Cohort	Men				Women			
	Elementary	Lower	Upper	University	Elementary	Lower	Upper	University
1953-54	0.02	0.06	-0.06	-0.10				
1955-59	0.00	0.02	-0.08	-0.21	-0.05	-0.01	-0.13	-0.09
1960-64	-0.06	-0.05	-0.15	-0.37	-0.08	-0.02	-0.10	-0.15
1965-69	-0.10	-0.10	-0.18	-0.35	-0.06	-0.02	-0.06	-0.09
1970-74	-0.12	-0.13	-0.18	-0.31	-0.02	0.00	-0.02	-0.01
1975-79	-0.14	-0.16	-0.19	-0.36	0.00	0.00	0.00	0.00
1980-84	-0.13	-0.16	-0.19	-0.35	0.00	0.00	0.00	0.00
1985-89	-0.13	-0.15	-0.18	-0.34	0.00	0.00	0.00	0.00
1990-94	-0.12	-0.14	-0.17	-0.32	0.00	0.00	0.00	0.00

Figures – Hungary

H.1 - Percentage change in PV of contributions and benefits, 1993 reform, Women, Elementary education

H.2 - Percentage change in PV of taxes and benefits, 1993 reform, Women, University education

H.3 - SSW before and after the 1997 reform, Women, Upper secondary education

H.4 - Percentage change in PV of contributions and benefits, 1998 reform, PAYG, Men, Elementary education

H.5 - Percentage change in PV of contributions and benefits, 1998 reform, PAYG, Men, University education

H.6 - Percentage change in PV of contributions and benefits, 1998 reform, Mixed system, Men, University education

H.7 - Percentage change in PV of contributions and benefits, 1999 reform, PAYG, Men, All education levels

H.8 - Percentage change in PV of contributions and benefits, 1999 reform, Mixed system, Men, All education levels

H.9 - Percentage change in PV of contributions and benefits, 2003 reform, PAYG, Men, Upper secondary education

H.10 - Percentage change in PV of taxes and benefits, 2007 reform, PAYG, Men, Elementary education

Figures – Czech Republic

C.1 - Percentage change in PV of contributions and benefits, 1996 reform,
Men, Lower secondary education

C.2 - SSW before and after the 1996 reform,
Men, Lower secondary education

C.3 - Percentage change in PV of contributions and benefits, 1996 reform,
Women, Lower secondary education

C.4 - Percentage change in PV of contributions and benefits, 2002-03 reform,
Men, Upper secondary education

C.5 - Percentage change in PV of contributions and benefits, 2002-03 reform,
Women, Upper secondary education

Figures – Slovakia

S.1 - Percentage change in PV of contributions and benefits, 2004-05 reform, PAYG, Men, Elementary education

S.2 - Percentage change in PV of contributions and benefits, 2004-05 reform, PAYG, Men, University education

S.3 - SSW before and after the 2004-05 reform, PAYG, Men, Elementary education

S.4 - SSW before and after the 2004-05 reform, PAYG, Men, University education

S.5 - Percentage change in PV of contributions and benefits, 2006 reform, PAYG, Men, Lower secondary education

S.6 - Percentage change in PV of contributions and benefits, 2006 reform, PAYG, Men, University education

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