Future public pensions across cohorts

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The impacts of changing careers and pension reforms in Germany

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Abstract

Decades of rising unemployment, changing labour market behaviour and pension reforms that were aimed at a sustainable public pension scheme raise concerns about the future level of old-age pensions. In this paper, we estimate cohort effects in aggregated labour market experience in East and West Germany for men and women and their impact on future public pensions. The analysis accounts particularly for differences in education. Labour market experience is modelled as full-time employment and unemployment. For women, we also take into account "inactive" periods and part-time employment. We find positive evidence for cohort effects for most groups. The results indicate a strong impact of education, however the differences in cohort effects across gender and region are large. To assess the impact of these estimated cohort effects, we estimate wage profiles that take into account past labour market experience. The results are used to simulate future careers and wages for cohorts born between 1937 and 1971. Using simulated life cycle employment and income, we project gross pensions. The simulation takes into account recent pension reforms, e.g. the lower growth rate of pensions compared to wages. Changing demographics are modelled by a static ageing approach. Our findings suggest that pension levels will decrease in East Germany, not only because of policy reforms but also due to higher cumulated unemployment of younger cohorts. For West German men, the impact of pension reforms is stronger as the differences in aggregated unemployment experience are rather small across cohorts. For West German women we find even increasing or stable future pension levels due to a rising labour market participation of younger female cohorts.

Keywords: Public pensions, cohort effects, microsimulation

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1. Introduction

The political debate about the German public pension insurance has shifted: only some years ago the discussion focused on the financial sustainability of the pension insurance while today the question of old age poverty has moved to the center of this debate. The pension reforms since 1992 have improved the long-term financial sustainability of the pension system. On the other hand, Germany reduced target pensions within these reforms. The target gross replacement rate for average earners was lowered from 48.7% to 39.9% for an average earner which is well below the OECD average of 73% (Oecd (2007)). The OECD argues that Germany has to pay attention to low-income pensioners in the future to prevent an increase in old-age poverty.

But the current debate has also another source of worries: the German labour market has been characterised over decades by rising and persistent unemployment. Furthermore, Germany experiences a trend to adapt flexible employment relationships like marginal employment, temporary employment, part-time jobs, and self-employment without employees. At the same time, the corresponding standard emplyoment relationship looses significance. These changes in the labour market have a direct implication on the income maintanance in old age.

The goal of our analysis is to give an account of how both the pension reforms and a changing labour market influence the individual public pension benefits of future pensioners. To this end, we develop a microsimulation model that combines simulated employment biografies and pension reforms. Throughout this analysis we take a cohort perspective which is reasonable for both sides of the model. On the one hand, the long term pension reforms will affect different cohorts differently:[1] The newly introduced adjustment mechanism of pension benefits incorporates demographic ageing which will accelerate in the future. And additionally, the move of the retirement age beyond 65 will not be fully implemented until 2029. On the other hand, the labour market changes over the past decades affected cohorts in different ways. One of the most obvious examples might be the employment shock of the reunification and the subsequent worsening of the labour market situation in East Germany. Cohorts in East Germany differ with respect to the share of their working life that they have

[1] In this paper, we only focus on gross pensions and ignore taxation. Therefore we do not model the long-term reform of the tax treatment of pensions in 2004. An analysis of that reform can be found in .

spent in the former GDR. Unemployment and low wages were virtually not existent in the GDR and lead to relatively high pension entitlements of East Germans when they were integrated into the West German public pension scheme. However, this was true only for persons near the retirement age. Obviously, people who were in the middle of their career experienced a different shock: endowed with human capital from the former GDR they often had to find a new job on the unified labour market. It turned out that this was not easy and besides all convergence between East and West Germany, the unemployment rate is still double as high as in West Germany. Nevertheless, the existence of cohort effects is of course an empirical question and depends on the chosen identification strategy. We use the estimated cohort effects to project individual employment biografies.

The biografies that we model consist of two states for men (full-time employment and unemployment) and two additional states for women (part-time employment and inactive periods) to account for the most important components of the working life. We use these information to estimate and project wages because time spent out of the labour market reduces future wages through the depreciation of human capital. Thus, the negative effect of unemployment on pension works through a direct and an indirect channel.

Using a large and representative panel data set we are able to place emphasis on important socio-economic characteristics in addition to the birth cohort. We distinguish between East and West Germany and men and women throughout our analysis. Furthermore, we analyse the impact of education. Education has a well documented effect on both the employment probability and the wage level. In addition to the perspective of the individual pension, we simulate pension outcomes also on a household level.

This paper is structured as follows. The first section gives some background on the German pension system and illustrates briefly how wages and lifetime employment are linked to old age pensions. It also comprises a short account of the most important pension reform for our analysis, the introduction of the “sustainability factor” in the pension adjustment rule. In the next section, we discuss how the German labour market changed and how this is reflected in the individual careers. This section provides some descriptive statistics and motivates our empirical approach. The third section provides an overview of the simulation. We present our data and discuss our econometric approach and the simulation techniques. The fourth section illustrates important outcomes of the simulation. We look mainly at the individual level pensions from various perspectives. The last section concludes and gives an outlook for further research.

2. The German PAYG pension system and long-term reforms

The public pension scheme in Germany is a pay-as-you-go system and population ageing is expected to put pressure on its financial sustainability in the coming decades. Demographic ageing will be particularly strong and accelerate in Germany, comparable to Italy or Japan. This trend is mainly caused by three factors: a rising life expectancy, very low fertility rates (between 1.3 and 1.4), and a baby boomer generation reaching the retirement age in the coming years.

This shift of the age structure will also shift the ratio of contributors to the pay-as-you-go system and its recipients. As reinforcing negative factors, Germany has experienced a constant rise in unemployment over the past decades and a very low effective retirement age. This situation lead to a series of reforms, starting in 1992 until 2007 – so far. It started with introducing net wage indexation in 1992 abolishing the previous gross wage indexation. Additionally, actuarial adjustments for early retirement were introduced and the phase out of special early retirement options for the unemployed and women was decided. In 2001, a small pre-funded pillar was introduced ("Riester-pension"). In 2004, the benefit indexation was changed by introducing a so called sustainability factor that takes into account the development of the ratio of contributors to the pension system and its recipients. According to the new benefit indexation rule, pensions will have a lower real growth rate as long as this ratio declines. In 2007, a law came into effect that increases the statutory retirement age from 65 to 67 until 2029.

These reforms go mainly in two directions: first, the extension of the working life, and second, the gradual lowering of the pension level.

Public pension benefits in Germany are strongly related to individual employment careers. The pension scheme has relatively few redistributive elements. The pension is calculated according to the following rule:

$$PB_{T+s} = \left(\sum_{t=1}^{T} PP_t \right) \times PT_T \times EF_T \times CPV_{T+s}$$

$$s = 0,1,\ldots,S$$

PB: Pension benefit

PP: Pension points

PT: Pension type. Equals unity if the pension is an old-age pension.

EF: Entry factor. A factor that determines actuarial deductions for early retirement.

CPV: Current pension value. This factor is a value in Euros that is adjusted with the new indexation rule.

The pension benefit payment is the product of four factors: the sum of Pension points (PP), a pension type factor (PT), an entry factor (EF) and the current pension value (CPV). In the following, we only analyse old age pensions, which implies that the PT always equals one.[2] As explained above, in 1992 deductions for early retirement were introduced. For each month (year) of early retirement the benefit is lowered by 0.3% (3.6%). EF is equal to one if the age at retirement equals the statutory retirement age and lower for early retirement. In section four, we provide some descriptive evidence on the significance of early retirement and how we treat the retirement decision in our simulation.

PP result mainly from wage earnings. The PP is calculated as the ratio of individual annual earnings and the average annual earnings in that year. Thus, if a person earns the average wage in a given year she receives one PP. Earnings are only subject to social security contributions if they exceed a lower limit and contributions have to be paid only up to a higher limit. Both limits restrict the possible PPs to lie roughly between 0.15 and two. For the accumulation of Pension points it is thus relevant, where the relative wage profile over the life cycle is and how scattered or continuous the career proceeds. The sum of Pension points over the whole career becomes the most important factor of individual pension benefits. Thus, employment spells and the relative wage position over the life cycle mainly determines the pension benefit.

Pension points can also be acquired through other channels. The most important are unemployment and children. For example, a mother receives one pension point for the first three years of a child born after 1992. The treatment of periods of unemployment has changed over time. Currently, a person might receive ALG I which is a wage related unemployment benefit for short-term unemployment. Then she would accumulate pension entitlements as if she earned 80% of the former gross wage. The other possibilty is ALG II which is a means

[2] PT is less than unity if the pension is, e.g., a widow's pension.

tested benefit for long-term unemployed. People who receive a year ALG II acquire currently pension entitlements of a bit more than 2€ for that year. It used to be different before 2005. [3]

The CPV is the factor that determines the growth rate of pension benefits. The CPV results from the following formula:

$$CPV_t = CPV_{t-1} \times \frac{G_{t-1}}{G_{t-2}} \times \frac{100 - PP_{t-1} - CR_{t-1}}{100 - PP_{t-2} - CR_{t-2}} \times \left(\underbrace{\left(1 - \frac{PR_{t-1}}{PR_{t-2}}\right)}_{\text{"Sustainability factor"}} \times \alpha + 1 \right)$$

CPV	Current pension value
G	Sum of gross wages
PP	Subsidised private and/or occupational pension contribution rate
CR	Contribution rate
PR	Ratio of retirees and contributors
α	Weighting factor, currently set to 0.25

The CPV has been subject to a couple of reforms. As mentioned above, a small pre-funded pillar has been introduced. This is reflected in the factor PP which comprises the subsidised contribution to a private pension plan ("Riester pension"). The contribution rate is set to increase to 4% of gross earnings until 2011 and remains constant thereafter. While this factor lowers the benefit indexation, the supplementary private pension is not mandatory.

The 2004 reform introduced the sustainability factor which links pension growth to demographic ageing.[4] Demographic ageing will most likely reach its peak in the 2030s which results in a growth rate of pensions that is lagging behind the growth rate of wages. Due to the complex rule for the adjustment of the CPV, it's future trajectory has to be simulated making

[3] Both reforms are again interesting in a cohort perspective but we won't discuss them at length in this paper. A more detailed discussion can be found in .

[4] The reform was based on suggestions of an expert commission ().

assumptions on the changes of all factors that enter the adjustment rule. For the growth of gross wages, we use the assumptions of the Ageing Working Group (AWG) which is 1.6 % real growth on average per year (European Commission (2005))[5]

We adjust a simulation of the CPV of Buslei and Steiner (2006) to meet AWG projections. The development of wages and current pension value are shown in Table 1. While wages double up to the year 2050, the current pension value increases by about 73%.

Table 1 about here

The future prospect of the public pension scheme implies lower individual replacement rates on average. The question we would like to add here is how pension claims evolve over time for different cohorts when their labour market behaviour changes.

3. Changes in the labour market and related studies

The German labour market has been characterised for decades by high and persistent unemployment. Long-term unemployment is a particular problem but unemployment in general has increased (cp. Dundler and Müller (2006)). While unemployment spells become a more common phenomenon in individual careers, we also observe a transition to more flexible employment relationships. The standard employment relationship - a male full-time employee with a stable job - looses significance at the expense of, part-time jobs, marginal employment, and self-employment without employees (see e.g. Rische (1999); Faik, et al. (2001); Bezelt and Fachinger (2004)) The changes in employment over the life-cycle have direct implications for the individual pension. It is feared that these processes could reinforce the likely negative impact of the pension reforms. This could be a particular problem in East Germany which is much more affected by unemployment than West Germany.

The relationship between individual careers and future pension benefits has been analysed for Germany by different empirical studies. Most of these studies were based on the "AVID" reports 1996 and 2005 (DRV (1996, (2005)) which give an account of public and private pension provision of people aged between 40 and 60 years.[6] The AVID 1996 is based on relative old data, for a summary of literature based on it see e.g. Steiner (2003) or Faik, et al.

[5] http://ec.europa.eu/economy_finance/publications/publication6502_en.pdf

[6] Both reports are based on survey data that are not available for the scientific or public community. Thus we can only refer to publications based on that data.

(2001). AVID 2005 is newer and partly comparable to our simulation. It mainly consists of a pension scenario with a fixed retirement age of 65 and no adjustment of the pension value. The data set is a single cross section and does not allow for modelling cohort effects.[7] Our study also looks at cohorts that are not part of AVID 2005, namely those born between 1962 and 1971.

Already in the AVID 1996 it was reported that cohorts differ with respect to their careers. For younger cohorts born between 1951 and 1955 they find a slight negative trend for pension entitlements of men compared to those born between 1936 and 1940, particularly in East Germany. For women, they find opposite trends: in West Germany younger cohorts tend to work more than their older counterparts and in East Germany younger cohorts loose periods of insurance. The new AVID 2005 study shows that these trends were reinforced in general. West German women continue to extend their labour market participation, in particular part-employment tends to increase. West German men keep a rather stable level of pension benefits. For East Germany, the trend is negative for both men and women.[8]

Looking at prospective studies, we get a mixed picture: the situation in West Germany looks rather stable or positive but for East Germany the negative risks seem to be more important. Looking at current entry cohorts of pensioners, we do find similar but weaker trends (e.g. Himmelreicher and Frommert (2006)).

In addition to these descriptive studies, a number of analyses looked at the influence of non-employment spells on future wage income levels – and therefore indirectly on pensions. On the basis of the human capital theory using SOEP data, Licht and Steiner (1992) modelled the short- and long-term effects of employment breaks with respect to depreciation and restoration of human capital. Their results suggest that employment breaks have persistent negative effects on future wages which can only partly be compensated by restoration of human capital. Newer studies by Beblo and Wolf (2002) and Wunder (2006) using more recent waves of SOEP data come to qualitatively similar results. Schwarze, et al. (1995) find the same negative short-term impact also for East Germany. Using individual case studies,

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[7] Unfortunately, a report on the methods used in the AVID 2005 study has yet to be published. Therefore, we cannot really compare our simulation to the AVID 2005. However, in we will provide a short comparison of both studies.

[8] An advantage of the AVID 2005 is that they have data on second and third pillar pensions. Pensions from these sources compensate the reduction in the public pensions in East Germany.

Wunder (2006) also analyses the impact of unemployment on future pensions. He shows that the depreciation of human capital has a particular strong effect for people with short insurance records.

For this study, two aspects are important: if people get unemployed they acquire reduced pension entitlements and face a lower wage at reentry into employment. This makes it harder to compensate for periods of unemployment if they occur more often in life and last for longer periods. As explained above, short-term unemployment might still generate relatively generous pension entitlements and people may be able to compensate for the losses but long-term unemployment is another issue.

4. Methodological approach

4.1 Data

Appropriate data for the analysis of careers and their changes across cohorts are hard to find. At first, to conduct a cohort analysis it is necessary to have all relevant data over a long period of time, most suitable panel data. And secondly, to study careers over the life course we need to take into account non market activities in addition to market activities. Non market activities are particularly important for the analysis of female biographies. Thirdly, data should be accurate and comprise information on the household level.

For Germany, unfortunately, there is no publicly available dataset at hand that fullfills all criteria completeley. For this micro simulation study we combine three distinct datasets.

We choose data from the German Socio-Economic Panel Study (SOEP) to estimate cohort effects in activity profiles and wages. SOEP is a representative longitudinal micro-database that provides a wide range of socio-economic information on private households in Germany. Data were first collected from about 12,200 randomly selected adult respondents (in 6,000 families) in West Germany in 1984. After German reunification in 1989, the SOEP was extended by about 4,500 persons (in 2,200 families) from the former GDR (for more information, see e.g. Wagner, et al. (2007)). SOEP contains a detailed retrospective questionaire from which we reconstruct individual employment histories to estimate cohort effects. The data we use range from 1984-2006 for West Germany and 1990-2006 for East Germany.

SOEP data do not provide information on wages of the time before the individual joined the survey. This is a particular problem for East Germany because we can't estimate former GDR wages based on market wages. Furthermore, due to the complex law of integrating former

GDR pension claims into the unified pension system in Germany[9], we needed data to complement the SOEP.[10] To this end, we choose the scientific use file of the sample of individual insurance records SUFVSKT2005[11] and use a propensity score matching procedure to integrate additional information into our dataset.[12] SUFVSKT2005 is a random sample of individual insurance records that comprises about 60,000 observations in the age between 30 and 67.

The data were matched within small cells. The cells were grouped by age-groups, gender, region, and education. For the matching we used SOEP data from 2005. Basically we replace all data on pension entitlements in SOEP with data from the SUFVSKT2005. For more information on SUFVSKT2005 see DRV (2008) and Himmelreicher and Stegmann (2008).

For the simulation of the age of retirement, we use a scientific use file of all new retirees in 2005 (SUFRTZN05XVSBB). This file is a 10% random sample and comprises about 90,000 observations. Even after restricting the sample to old-age pensioners who retired between 60 and 65 we are left with about 68,000 observations. For more information on this data set see DRV (2006). How we model the age of retirement is explained below.

4.2 Econometric specification

The most important component of the simulation is the estimation of cohort effects in individual careers and a wage estimation that takes into account past non-employment spells. All multivariate analyses are conducted separately for men and women, East and West Germany, and for different skill groups. For West Germany we can distinguish three skill groups (low/middle/high) and due to low observation numbers only two groups in East Germany (low or middle/high). Cohort effects are estimated with respect to four different

[9] Himmelreicher, et al. (2007) give a good overview of the integration of pension entitlements from former GDR citizens.

[10] The same argument applies to women who are more often than men entitled to accumulate individual pension claims through other channels than employment.

[11] "Versichertenkontenstichprobe"

[12] provide more details and statistics on the matching procedure.

dependent variables: full-time employment and unmeployment for men and women; part-time employment and inactive periods only for women.[13]

As dependent variables we use the individually aggregated totals of the depencent variables. These variables are positive and continuous but have positive probability mass at zero. For the population, the standard Tobit model is

$$y_{it}^{*} = x_{it}\beta + u_{it}, \quad u_{it} \mid x_{it} \sim> N(0, \sigma^2)$$
$$y_{it} = \max(0, y_{it}^{*}), \quad t = 1, 2, \ldots, T$$

In the simulation we are interested in the unconditional expectation of the observed y_{it} $E(y_{it} \mid x_{it})$ and in the conditional expectation $E(y_{it} \mid x_{it}, y_{it} > 0)$ or the probability of y_{it} to be positive $P(y_{it} > 0 \mid x_{it})$.

Cohort effects and wage equation

In economics, it has become common to distinguish conceptually between cohort, age, and period effects on a variety of indicator such as lifetime savings, consumption, earnings, labour force participation, and wages (cp. Attanasio and Davis (1996); Beaudry and Green (2000); Blundell and Preston (1998); Boockmann and Steiner (2006); Deaton (1997); Fitzenberger, et al. (2004); McKenzie (2006); Heckman and Robb (1985)).

The quantities we analyse, labour market experience, unemployment, periods of inactivity that prevent particularly women from work, and hourly wage rates have distinct and characteristic life cycle profiles. Wage rates usually show a hump-shaped age profile which starts low at the start of one's career, reaches its maximum in the middle years of life and is declining afterwards. Bearing and raising children induces a similar profile in time spent on household chores. However, family formation is mainly visible in female and not in male careers. It is generally found that family formation in Germany is associated with a withdrawal from the labour market. As women tend to have less children and to have children later in life this profile is expected to shift.

[13] This results in 30 equations for the activity profiles and 10 wage equations. Full estimation results can be found in .

To identify linear cohort effects in addition to age and period effects it is necessary to make structural assumptions about the data generating model. We would like to estimate the following equation:

$$y = \alpha + A\beta + C\delta + P\mu + \varepsilon$$

where A is a matrix of age dummies, C a matrix of cohort dummies and P a matrix of period effects. We cannot estimate that equation because of the fact that age, period, and cohort have an exact linear relationship. We follow an frequently applied approach by Deaton (1997) who assumes that period effects are orthogonal to a linear trend. Period effects are restricted to sum up to zero over all observation periods. This assumption allows to decompose the effects in three different dimensions: the trend (cohort), the profile (age), and the business cycle (period). Deaton (1997) notes that in order to separate these three effect sufficient data are needed.[14]

For the wage equation we use a random effects specification and model the effect of the depreciation of human capital with polynomials of order three:

$$\frac{W_{it}}{\bar{W}_t} = \alpha + \delta_1 A_{it} + \delta_2 A_{it}^2 + \delta_3 A_{it}^3 + \beta_1 NE_{it} + \beta_2 NE_{it}^2 + \beta_3 NE_{it}^3 + \varphi_1 PT_{it} + \varphi_2 PT_{it}^2 + \varphi_3 PT_{it}^3 + \omega X_{it} + \mu_i + \varepsilon_{it}$$

We estimate a relative wage equation, i.e. the individual gross monthly wage divided by the average monthly wage. Periods of non-employment (NE) comprise unemployment as well as inactive periods. PT denotes part time experience. We included age (A) rather than full-time experience because the model would otherwise be not identified. X contains a couple of socio-economic and job characteristics.

Simulation

We use predicted unconditional expected values from the tobit regressions to construct individual activity profiles. From these predicted values, we calculate the volume of labour in each year. This number is then multiplied with the corresponding predicted relative wage. This results in a certain number of pension points for each year.

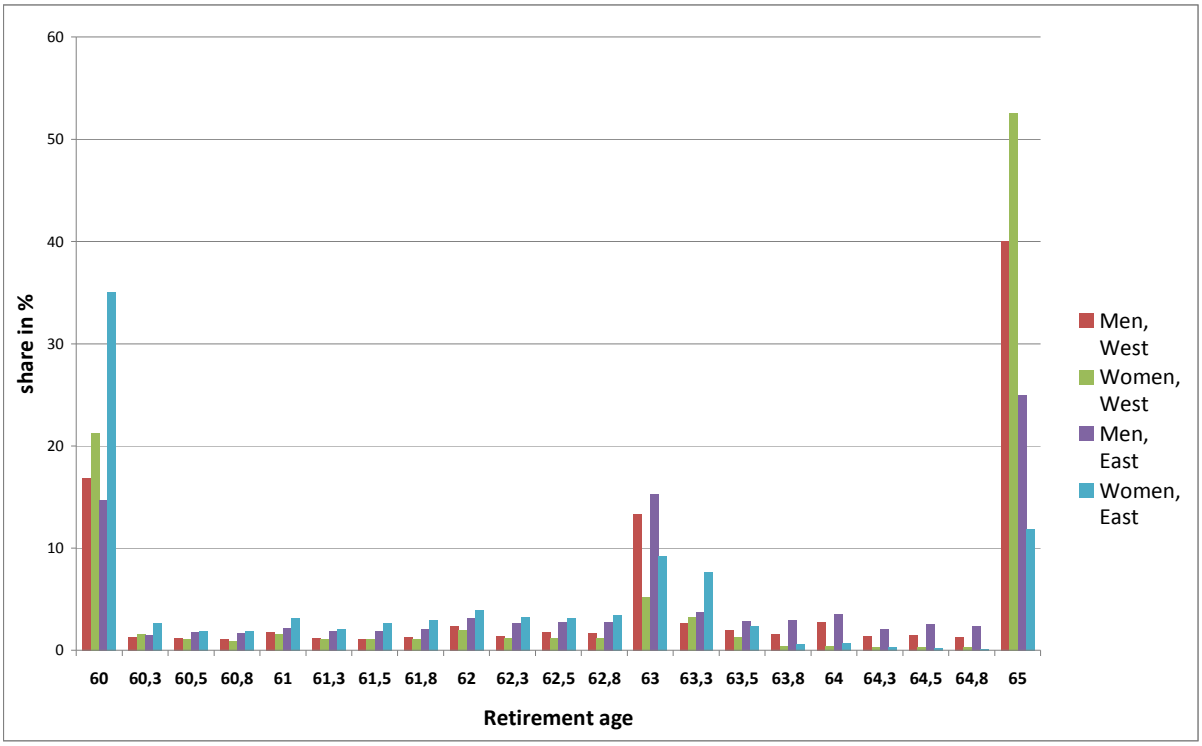
At the outset in 2005 we have a representative sample of Germans born between 1937 and 1971. For the simulation we apply a static ageing procedure and adjust the SOEP weighting factors to a household projection of the DIW. In that way, we can mimic socio economic

[14] An extended discussion of the estimation strategy can be found in .

processes simply by reweighting. The household projection accounts among other things for demographic ageing and household composition. For further information on the reweighting, see Merz, et al. (2004).

In a simplified way we model the entry into retirement. We do this because of the importance of early retirement. Figure 1: Retirement age of the entry cohort in 2005. Figure 1 shows how the retirment age was distributed in 2005 for West and East German women and men. First of all, it is worth remembering that a year of early retirement results in a pension reduction of 3.6%. People retiring at 60 might loose a maximum of 18% deductions.

Figure 1: Retirement age of the entry cohort in 2005.



Albeit these high negative factors early retirement is the rule rather than the exception. This is particularly true for East German women of which more than 30% retired with 60 in 2005. The only group with a majority retiring at the statutory retirement age of 60 are West German women. For the simulation we keep the structure of this retirement window constant and raise linearly the retirement age for each individual with the increase of the statutory retirement

age. The average retirement age in 2005 was about 63 and this increases during the simulation to 65 – corresponding to a statutory retirement age that increases from 65 to 67.[15]

5. Results

The results presented in this section refer to the scenario with the CPV growing slower than wages and with an increase in the statutory retirement age. In general, we report the pension level at the time of retirement, the only exception is when we look at two-person households. For couples, we refer to the date when both spouses are retired. All values are discounted with the growth rate of real wages. Due to the lower growth rate of pensions, we observe a decline in the CPV. It is important to keep in mind that pensions will continue to grow in real terms. The sample is restricted to persons who were not civil servants or self-employed in the SOEP data in 2005. This excludes mainly very low pensions, e.g. pension benefits of persons who acquired pension entitlements at the beginning of their career but became civil servants after some years.

One important aspect has to be noted: we do not analyse other income then own gross pensions derived from the public pension scheme. We also do not take into account private pensionen, taxes and transfers, or wealth. Thus we cannot identify poverty thresholds or alike. On the other hand of course, the public pension benefits is the most important source of income in old age for the vast majority of the population – in particular in East Germany. Although we do not make statements about poverty, we can compare the individual pension benefit with the individual margin of subsistence of about 660€. A single with an income below that threshold would be entitled to receive social assistance up to that limit by the state.

Comparing the reform effects

Both reforms, the demographically adjusted CPV growth and the prolongation of the working life to 67, have opposing impacts on the level of pension benefits and gain importance over time. The first obvious question asks for a quantification of these effects. Exemplarily, Table 2 shows simulated pension benefits[16] for West German men for different policy scenarios.

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[15] The results contain a positive scenario for East Germany. For that scenario we did not only change the estimated coefficients in the simulation but we also adjust the retirement behaviour of East Germans to the observed patterns in West Germany.

[16] As we do not model taxation in this paper, all pension benefits are gross amounts. However, we do substract the own contribution to the health and long-term care insurance. That is, in the terminology of the German pension insurance, we always report the effective amount of pension payment ("Rentenzahlbetrag").

Table 2 about here

This group is particularly suited to disentangle the reform effects in a simple way because we do not find large cohort effects but rather stable careers and wage profiles. This pattern is reflected in scenario I in which the pension benefit is not influenced by a reform and does not show a constant trend. It first increases until cohort 1947-1951, then it decreases and rises again with the youngest cohort. The pension benefit is well above 1000€ for all cohorts. This changes when we introduce the slower growth rate of the CPV. In scenario II, due to the adjustment by the sustainability factor, no cohort reaches the level of the oldest cohort again. The relative difference increases. The right hand side of Table 2 shows the same scenarios with a statutory retirement age that increases to 67. The effect of two more active years compensates partly for the slower growth rate of the CPV. As the transition to the older retirement age is finished in 2029, the younger cohorts experience the largest effect. The extension of the working life reduces the effect of the lower pension growth by 4%-points for the two youngest cohorts.[17] As described above, there would be still a possibility to extend the average working life even further and thus compensate the reduction in the CPV even more.

Individual pension levels and replacement rates

Table 3 shows the individual gross pension and replacement rates stratified by cohort, gender, and region. The level of pension benefits shows remarkable differences across groups. For West German males we observe a slight negative trend which is (see above) mainly driven by the low pension growth. The youngest cohorts receive a pension that is still about 90% of the pension of the oldest cohort. In addition to this relatively stable development pension benefit level is the highest among all groups.

Table 3 about here

The picture is different for West German women. In contrast to all other groups, we find a positive trend. Although the oldest cohort is not affected by the lower growth rate of the CPV all younger cohort have a higher pension level. Even a stable pension level means that these women compensate the whole lowering of the CPV. However, it is also important to note that the average pension is relatively low. Indeed, West German women have the lowest pension level of all groups (with the exception of the youngest cohort).

[17] A complete illustration of the reform effects for all Groups can be found in .

Looking at East Germany we find a completely different structure and development. With the exception of the youngest two cohorts, East German women reach a pension level of about 700€ which is more than 100€ higher than in West Germany and above the level of welfare. This reflects the higher female employment rates and the lower share of part-time employment compared to West German women. Pension benefits for the youngest cohorts, born between 1962 and 1971, decline dramatically to only 450€ for the youngest cohort. They reach only about 65% of the pension benefit of the oldest cohort. About 10%-points are caused by the reduced pension adjustment. Still, that would mean a reduction of 25% mainly because of more unemployment and lower wages. For East German males the development is similar but even more dramatic. At the outset, East German men reach a pension level of more than 900€. But starting with cohort 1952-1956 pension benefits start to decline markedly. This cohort was between 38 and 34 years of age when the wall came down. For all groups of East German men we observe a strong increase in unemployment. In addition, cohorts were affected by that shock at different points on their age profile.

For the calculation of replacement rates we use the average wage in 2005. The average monthly wage in 2005 was 2433€ in West Germany and 2057€ in East Germany. The lower average wage mitigates the differences between East and West Germany slightly. West German men reach a gross replacement rate above 40% which is higher than the target replacement rate of 39.9% for the average earner. This is the only group who remains above that level. The youngest cohort of West German women reaches a replacement rate of 24% which is higher than for most other cohorts but still at a very low level. In East Germany we observe the same development as for pension benefit levels.

The distribution of individual pension benefits

Table 4 shows how individual pension benefits are distributed in groups of 300€. For this table, we pooled the data. The upper part of the table contains the average for all cohorts (1937-1971). The middle part illustrates results for cohorts born between 1937-1951 and the lower part those for the youngest cohorts born between 1952-1971. This allows to identify general trends.

Table 4 about here

A look at the distribution of pensions highlights a fact that is a bit obscured by the negative trend for the younger cohorts in East Germany: the only group who comprises a significant share of persons who earn pension below 300€ is – throughout all cohorts – that of West

German women. However, this share declines from 22% to 11% for the younger cohorts. Interestingly, this share declines for all groups, even in East Germany.

The most remarkable change for East Germany occurs in the income bracket 300€-600€. More than 90% of East German males in the older cohorts have a pension benefit above 600€. That share declines to less than 65%. A similar but less dramatic shift is found for females.

The distribution of individual pension benefits by education

Table 5, Table 6 and Table 7 contain the distribution of pension benefits by education. The three tables compare the same pooled cohorts as Table 4.

Table 5, Table 6 and Table 7 about here

Looking at the results for West German males an interesting detail shows up. This is the only group for which everything so far looks rather good in terms of old age income maintenance. But when we look at the education levels, we can identify a modification of this result. For the cohorts born between 1937-1951 even the 25% percentile of the low educated reached an individual pension above 700€, i.e. well above the margin of subsistence. The younger cohorts show a different picture: now only the 75% percentile of the low educated reaches a pension above 700€. The average pension declines for low educated West German men from 818€ to 675€. The better educated loose less both in relative and absolute terms.

For East German men the picture is a bit different because the pensions of all groups decline markedly. While pensions for the older cohorts were mostly above 700€ the overall average falls below 700€ for the younger cohorts. Still, the better educated receive a higher pension but the difference across educational groups is smaller than in West Germany. For East German women, the situation is similar to their male counterparts on a lower level.

West German women showed the most positive trends and stable or rising pension levels. Analogous to West German males this trend differs across educational groups. The average pension increases from 547€ to 565€ across skill groups but decreases for the low educated from 381€ to 321€.[18]

Pensions at the household level

[18] The share of low educated women decreases over time because younger cohorts are better educated.

Table 8 and Table 9 show simulation results within the household context. Table 8 provides the pure sums of gross pensions within a household. The resulting development is not surprising: the pension level of couple households in West German is relatively high and it shows a strong negative trend in East Germany. The situation for singles is a bit different. In East Germany, the youngest cohorts fall below 700€ and the average West German single female never reaches that amount. Singles account for about 15% of a cohort entering retirement. Table 9 expands the household perspective because here we use equivalised pensions (New OECD scale) to look at their distribution. For couple households, pensions below 600€ virtually disappear and this is in contrast to the very grim picture of Table 4 on the individual level. For singles – particularly female singles - nothing has changed: still a large share of females in the West (50%) and in the East (40%) falls below 600€.

A more optimistic scenario

So far, we simulated a negative outlook for younger East German cohorts. Our estimation of employment, unemployment, and wages is based on a period (1990 – 2005) which was characterised by a very negative labour market development. With the estimated cohort effects we project a trend that we find in these data – what if this trend changes? If that happens, past unemployment cannot be made disappear but future unemployment may not accumulate so strongly. Given the long projection period for the youngest cohorts of more than 30 years, we decided to include a so called optimisitic scenario in the simulation. Basically, we use the average cohort effect over all cohorts to project individual employment patterns. This technique balances the strong negative effects for the younger cohorts. Additionally we raise the effective retirement age of East Germans to the level of West Germans (about one more year).

Table 10 about here

Table 10 contains the results for the individual pension level in this optimistic scenario.[19] The left part of that table shows the pension levels and the right part the percentage increase compared to the baseline scenario. The increases for the youngest cohorts amount to more than 23%. The pension benefit is raised strongly across cohorts. This scenario does not reverse the overall negative trend for males which starts with the cohort 1952-1956. But it

[19] More results of this scenario can be found in .

reduces the magnitude significantly. For East German females we even observe that the negative trend is shifted to a younger cohort. In the baseline scenario of Table 3 we saw that pensions started to decreas already for the cohort 1957-1961. In Table 10 the same development sets in a cohort later (1962-1966). The positive scenario shows an upper corridor for East Germany. It illustrates how sensitive these results are and what needs to happen to improve the pension outlook of these cohorts.

6. Conclusion

The goal of this paper was to show the interaction of pension reforms and changing employment biografies across cohorts. The new adjustment formula which lowers the growth rate of pensions has a strong reducing impact in particular for the younger cohorts. This is because demographic ageing will reach its peak after 2030 and we only look at cohorts that retire within that window. We also showed that the prolongation of the working life has a strong compensating effect. Assuming that the effective retirement age increases with the statutory retirement age, 30% of the effect of the sustainability factor was compensated for by a longer working life for the youngest male cohort in West Germany. Given that the possible early retirement option will be reduced in the future it is not unlikely that the effective retirement age increases even further.

When we look at individual pension levels we observe large regional differences and differences between men and women. West German women seem to catch up, they show a very positive development with the exception of the low educated. However, they still reach only very low pension levels on average. West German men on the other hand reach a high pension level and continue to do so on average. Their profile is mainly influenced by the impact of the sustainability factor, pension levels decrease slightly. For this group we also find that education makes a difference for younger cohorts. While low educated men were able to reach rather high level pensions our simulation results suggest that this will change in the future.

The simulation for East Germany is influenced by two factors: bad labour market conditions that are already visible in individual careers and a projection of how this evolves over time which is based on this “negative” scenario. For both men and women, we observe that at some point in time the unemployment becomes rapidly visible in pension levels. Younger cohorts experience unemployment earlier in their career and long-term unemployment after 2005 does result only in marginal pension entitlements. This was different for older cohorts who experienced a larger fraction of unemployment during their working life before 2005.

Given the individual pension levels, the results seem to be alarming. This conclusion is put into perspective when looking at the household level. Most low and lowest pensions have disappeared – although a large fraction of pension recipients lives with pensions that are near the social minimum if they do not have other sources of income. In this view, singles – with the exception of West German men - are likely to have a pension below that minimum.

A real improvement is brought by the so called positive scenario. Here, pension levels increase markedly and at least for East German women the trend is affected. The question is, whether this scenario is plausible. There is no clear way from our estimation to an exact projection of the East German labour market. However, it does imply a fundamental improvement, a strong reduction in unemployment. We saw that the strongest effects occur for cohorts that still have a considerable number of working years before they reach the retirement age.

We introduced this paper by referring to the poverty debate about future pensioners. Of course, an analysis that is restricted to the analysis of gross public pensions cannot make statements about poverty. But the results show how the most important source of income may change across cohorts in the future. And particularly for East Germany the role of the public pension scheme is very important. In Geyer and Steiner (forthcoming) we ammend our analysis by adding additional information on private pension provision and the wealth situation of the cohorts under study.

7. Tables

Table 1: Simulated wage and pension growth

	2010	2020	2030	2040	2050
% Increase of wage compared to 2002	4,6	21,4	43,7	70,0	101,3
% Increase of pension compared to 2002	2,9	15,7	27,9	48,0	73,4

Table 2: Individual pension benefits of West German males in different scenarios

Men, West Germany						
	Scenario					
Statutory retirement age	**65**			**67**		
Cohort	**I**	**II**	**(II/I-1)*100**	**III**	**IV**	**(IV/I-1)*100**
1937 - 1941	**1.163**	**1.161**	**0%**	**1.163**	**1.161**	**0%**
1942 - 1946	**1.172**	**1.145**	**-2%**	**1.177**	**1.150**	**-2%**
1947 - 1951	**1.226**	**1.156**	**-6%**	**1.240**	**1.169**	**-5%**
1952 - 1956	**1.194**	**1.102**	**-8%**	**1.219**	**1.125**	**-6%**
1957 - 1961	**1.176**	**1.057**	**-10%**	**1.215**	**1.091**	**-7%**
1962 - 1966	**1.144**	**998**	**-13%**	**1.195**	**1.043**	**-9%**
1967 - 1971	**1.217**	**1.045**	**-14%**	**1.271**	**1.091**	**-10%**

Scenario	**Statutory retirement age**	**Lower CPV growth**
I	65	without
II	65	with
III	67	without
IV	67	with

Table 3: Pension benefit levels and replacement rates by cohort, region and gender.

	Pension benefits*					Replacement rates**				
		West		East			West		East	
	Total	Men	Women	Men	Women	Total	Men	Women	Men	Women
1937 - 1941	777	1.169	436	918	693	0,33	0,48	0,18	0,45	0,34
1942 - 1946	823	1.151	552	955	693	0,35	0,47	0,23	0,46	0,34
1947 - 1951	848	1.166	608	938	738	0,36	0,48	0,25	0,46	0,36
1952 - 1956	784	1.123	543	759	742	0,34	0,46	0,22	0,37	0,36
1957 - 1961	768	1.091	543	718	690	0,33	0,45	0,22	0,35	0,34
1962 - 1966	772	1.042	589	625	599	0,33	0,43	0,24	0,30	0,29
1967 - 1971	767	1.091	585	596	454	0,32	0,45	0,24	0,29	0,22
Total	794	1.117	558	799	674	0,34	0,46	0,23	0,39	0,33

*** Scenario and sample: statutory retirement age increases to 67, CPV grows slower than wages. Includes only persons who were not civil servants or self-employed in 2005.**

**** Replacement rates are computed with respect to the average wage in 2005, i.e. 2433€ in West Germany and 2057€ in East Germany.**

Table 4: Distribution of pension benefits by cohorts, region, and gender.

Cohort 1937 - 1971		West		East	
	Total	Men	Women	Men	Women
0-300	7,6	0,2	16,0	1,6	4,3
301-600	25,3	2,4	41,5	21,0	39,4
601-900	31,2	21,4	32,8	48,4	40,5
901-1200	20,8	39,3	7,8	20,1	13,2
1201-1500	10,7	25,0	1,8	7,5	2,4
1501+	4,4	11,7	0,1	1,4	0,2
Cohort 1937 - 1951		**West**		**East**	
	Total	**Men**	**Women**	**Men**	**Women**
0-300	10,9	0,7	22,0	3,4	5,8
301-600	20,3	1,5	39,2	2,9	21,6
601-900	29,6	21,5	25,8	48,1	54,0
901-1200	19,4	29,6	9,8	28,8	15,8
1201-1500	13,6	30,3	2,9	14,0	1,7
1501+	6,3	16,4	0,3	2,8	1,1
Cohort 1952 - 1971		**West**		**East**	
	Total	**Men**	**Women**	**Men**	**Women**
0-300	5,4	0,0	11,5	0,5	3,3
301-600	28,9	3,0	43,5	35,4	49,5
601-900	32,4	20,8	37,9	50,2	33,0
901-1200	22,0	46,6	6,4	11,5	12,2
1201-1500	8,4	21,4	0,8	2,0	1,7
1501+	3,0	8,1	0,0	0,4	0,3

Table 5: Distribution of pension benefits by education. Cohort 1937 – 1971.

	mean	p5	p10	p25	p50	p75	p95
Men West							
Low educated	754	506	563	633	742	807	1.129
Middle educated	1.077	742	810	908	1.046	1.225	1.516
High educated	1.276	844	950	1.073	1.259	1.479	1.716
Total	1.117	677	766	908	1.091	1.313	1.631
Men East							
Low/middle educated	737	356	455	583	689	861	1.243
High educated	914	491	531	759	891	1.073	1.368
Total	799	390	482	616	759	940	1.304
Women West							
Low educated	353	207	231	265	309	371	710
Middle educated	576	244	278	378	573	728	1.004
High educated	636	263	338	445	643	777	1.103
Total	558	233	267	347	537	719	1.004
Women East							
Low/middle educated	597	287	380	489	580	709	901
High educated	789	430	518	591	753	973	1.205
Total	674	338	412	520	638	798	1.115
Total	794	269	331	517	753	1.037	1.474

Table 6: Distribution of pension benefits by education. Cohort 1937 – 1951.

	mean	p5	p10	p25	p50	p75	p95
Men West							
Low educated	818	633	646	724	786	878	1.247
Middle educated	1.148	718	810	941	1.167	1.343	1.567
High educated	1.330	813	969	1.139	1.319	1.532	1.776
Total	1.162	681	767	908	1.172	1.391	1.671
Men East							
Low/middle educated	886	495	632	719	860	1.001	1.287
High educated	1.015	608	709	859	1.009	1.212	1.414
Total	939	524	665	758	892	1.073	1.403
Women West							
Low educated	381	223	242	265	316	393	818
Middle educated	575	226	251	338	543	761	1.060
High educated	633	130	209	398	604	808	1.261
Total	547	216	245	313	486	741	1.081
Women East							
Low/middle educated	658	180	370	566	656	764	965
High educated	813	325	543	660	790	1.031	1.189
Total	714	295	420	583	701	818	1.133
Total	823	244	290	507	790	1.101	1.529

Table 7: Distribution of pension benefits by education. Cohort 1952 – 1971.

	mean	p5	p10	p25	p50	p75	p95
Men West							
Low educated	675	481	523	575	663	730	962
Middle educated	1.021	751	809	886	989	1.132	1.365
High educated	1.246	855	944	1.060	1.220	1.441	1.685
Total	1.085	676	763	905	1.059	1.241	1.583
Men East							
Low/middle educated	638	339	419	522	631	704	995
High educated	807	417	523	603	830	949	1.159
Total	689	357	445	541	657	826	1.095
Women West							
Low educated	320	203	214	265	304	363	448
Middle educated	578	270	314	409	585	702	937
High educated	637	337	364	459	649	772	993
Total	565	259	289	380	565	713	937
Women East							
Low/middle educated	551	292	380	458	528	630	839
High educated	775	467	518	580	720	948	1.210
Total	646	358	406	495	588	759	1.115
Total	773	293	358	521	722	993	1.406

Table 8: Household pension benefit levels by cohorts, region, gender, and type of household.

	Couples		Singles			
			West		East	
Cohort	West	East	Men	Women	Men	Women
1937 - 1941	1.580	1.591	1.173	427	885	721
1942 - 1946	1.739	1.665	1.114	551	829	677
1947 - 1951	1.769	1.660	1.103	670	766	737
1952 - 1956	1.679	1.535	1.131	571	704	717
1957 - 1961	1.674	1.412	1.069	581	689	748
1962 - 1966	1.642	1.225	1.013	590	602	649
1967 - 1971	1.643	1.152	1.100	601	577	407
Total	1.687	1.504	1.094	566	705	669

Table 9: Distribution of pension benefits by region, type of household, and gender. Cohort 1937 – 1971. Equivalized pension benefit per household (New OECD scale).

	Individual					Households			
Cohort 1937 - 1971	West		East			West		East	
	Men	Women	Men	Women		Men	Women	Men	Women
0-300	0,2	16,0	1,6	4,3		0,0	6,6	1,6	1,6
301-600	2,4	41,5	21,0	39,4		1,9	15,4	6,6	13,7
601-900	21,4	32,8	48,4	40,5		22,4	29,0	37,0	29,5
901-1200	39,3	7,8	20,1	13,2		33,7	23,4	37,1	37,6
1201-1500	25,0	1,8	7,5	2,4		29,8	18,8	14,2	15,1
1501+	11,7	0,1	1,4	0,2		12,2	6,8	3,5	2,5
	Singles					Couples			
	West		East			West		East	
	Men	Women	Men	Women		Men	Women	Men	Women
0-300	0,0	15,4	5,0	4,4		0,0	0,2	0,0	0,0
301-600	4,8	35,4	17,4	35,4		0,6	0,9	1,5	1,5
601-900	21,5	37,3	53,7	37,4		22,8	23,0	29,1	25,0
901-1200	33,6	8,5	19,5	20,6		33,8	34,3	45,4	47,3
1201-1500	27,0	3,4	4,1	2,0		31,0	30,0	19,1	22,5
1501+	13,1	0,0	0,3	0,2		11,8	11,7	5,0	3,7

Table 10: Positve scenario: Pension benefit levels for East Germany and changes to the base scenario

	Positive scenario			Changes to the base scenario		
	Total	Men	Women	Total	Men	Women
1937 - 1941	823	902	703	-0,68%	-1,74%	1,44%
1942 - 1946	845	963	721	2,20%	0,87%	4,10%
1947 - 1951	856	973	770	4,03%	3,66%	4,38%
1952 - 1956	806	818	796	7,48%	7,78%	7,22%
1957 - 1961	785	804	768	11,68%	11,95%	11,42%
1962 - 1966	719	733	707	17,68%	17,21%	18,09%
1967 - 1971	644	736	564	23,73%	23,45%	24,06%
Total	789	854	733	7,66%	6,91%	8,79%

8. Literature

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