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**Working Paper**

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# The joint distribution of net worth and pension wealth in Germany

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**Abstract.** Research on wealth inequality usually focuses on real and financial assets, while pension wealth – the present value of future pension entitlements from public and company pension schemes – receives little attention. This is astonishing, given that pension plans play an important role for material security and well-being for an overwhelming part of the population and, thus, should be accounted for in peoples' wealth portfolios. Using novel data from the Socio Economic Panel (SOEP), we show the incidence, relevance, and distribution of individual pension wealth, net worth, and augmented wealth (the sum of the two) in Germany. Further, we investigate age-wealth-profiles and differences between East and West Germany.

JEL codes: D31, H55, J32

Keywords: net worth, pension wealth, augmented wealth, SOEP, age wealth profiles

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# 1 Introduction

In economics and neighboring disciplines, the rising inequalities in many societies is regarded as one of the most important problems and pressing matters we are facing today (OECD 2015a, Stiglitz 2012, Atkinson 2015). Thus, a broad empirical literature investigates inequalities in incomes. Empirical studies on wealth inequalities – another crucial dimension of economic inequalities – are considerably rarer. This is surprising given that wealth is a powerful indicator of the capability to participate in societal life: It reflects a household's total material resources to secure a standard of living, permits consumption-smoothing in presence of income volatilities, enables the inter-generational transmission of social status, and, in general, provides financial security and income. Finally, high wealth can be used to influence political decision processes.

Research on the distribution of private wealth requires high-quality micro data. Initiatives undertaken by the European Central Bank (ECB) and the Cross National Data Center in Luxembourg (LIS) are important steps in this direction. The ECB's "Eurosystem Household Finance and Consumption Survey" (HFCS)[1] provides detailed information on real and financial assets for the Euro area. Likewise, LIS's Luxembourg Wealth Study (LWS)[2] contains harmonized wealth microdata from high- and middle-income countries around the world. Neither of the two scientific surveys, however, collects information on entitlements in statutory and company pension schemes, at least for the non-retired population. Such entitlements are the basis for determining pension wealth, the present value of the stream of future pensions (see OECD 2013a). Administrative microdata from statutory pension institutions, conversely, lack information on company pensions, financial and real assets.[3]

Reasons to consider pension wealth in wealth analysis are manifold. Most importantly, entitlements from statutory and company pension insurance plans play an important role for material security and well-being for the insured population. Further, if pension entitlements are a substitute for private savings schemes, differences in pension institutions (generosity, subsidization of pension plans, coverage, etc.) might jeopardize the comparability of standard wealth aggregates across countries. Similarly, a pension system may undermine the comparability of standard wealth aggregates between non-covered and covered individuals

[1] https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html
[2] http://www.lisdatacenter.org/our-data/lws-database/
[3] Matching survey and administrative data is difficult given the limited set of potential matching variables in administrative datasets.

or households within a country. A vast literature examines the interplay between pension wealth, household savings, and wealth accumulation (i.e. Dicks-Mireaux 1984, Gustman and Steinmeier 1999, Bottazzi et al. 2006). Further, subsidization schemes for private retirement savings might affect peoples' savings decisions, both the savings levels and the composition of portfolios. Case studies for the German case include Coppola and Reil-Held (2009), Corneo et al. (2009), Corneo et al. (2010) and Pfarr and Schneider (2011); see Engen et al. (1996) for the US, and Chetty et al. (2013) for Denmark.

In the waves collected in 2012 and 2013, the Socio-economic Panel (SOEP) collected in-depth information on individual pension entitlements in Germany both for the retired and non-retired population. For the first time, the non-retired population was asked to report its current entitlements according to the obligatory official annual information issued by the insurers. With the entitlements of the retired and non-retired population, we define pension wealth following the "accrual method" (see Wolff 2015)[4] as the expected capitalized value of entitlements. For the retired, the entitlements are defined by the pension stream from "today," defined as 2012, to death. For the non-retired, it is the pension stream from retirement age to death – based on accumulated remuneration points until "today," again defined as 2012. With individual pension wealth for the whole population at hand, we broaden previous wealth inequality analyses for Germany by computing an augmented wealth aggregate, the sum of individual net worth and individual pension wealth; measuring and decomposing wealth inequalities; as well as studying wealth accumulation processes over the life course of residents in East and West Germany.

Augmented wealth is defined as the sum of two broad wealth components: net worth and pension wealth. Net worth includes real and financial assets (net of debt) plus current values of private-pension plans (including so-called Riester- and Rürup pensions).[5] Pension wealth is the sum of present values of statutory-pension, civil-servant, and company-pension entitlements. For the interpretation of the level and distribution of augmented wealth, three aspects should be noted. First, financial wealth in the form of standard monetary deposits is not subject to taxes and social security contributions in Germany. However, when converting

[4] An alternative approach is the "on-going concern" treatment. It derives pension wealth under the assumption that employees continue to work at their place of employment until expected date of retirement. We abstain from implementing this approach as it requires strong assumptions about employees' future employment biographies and retirement decisions.

[5] We have included private-pension plans in net worth as those plans can hardly be distinguished from other types of private savings.

assets or real wealth into money, taxes may arise. The tax burden then depends on many unobserved tax-relevant characteristics (i.e., acquisition value, speculation and holding periods). Second, the current and the liquidation value of an insurance contract (e.g., of a life-risk insurance or private pension) can be different. This is because of, for example, insurance fees or repayment of tax reliefs or allowances (i.e., Riester and Rürup pensions). Third, if a wealth aggregate is determined by the present value of a future income stream (e.g., statutory or company pension) the future incomes are subject to social security contributions and/or taxes. We refrain from an approximation of present values net of taxes and contributions, given that this would require us to make numerous assumptions about the future income composition, the future family status, etc. So, augmented wealth is comprised of wealth components that differ with respect to tax- and social-security burdens. This implies that, de facto, the convertibility of the different components is limited, an issue which, for the aforementioned reasons, is not reflected in the subsequent analysis. This is a common issue in wealth analysis.

The results of our analysis can be summarized as follows. From a survey-methodological perspective, we provide affirmative evidence that the pension entitlements reported by the interviewees are credible by cross-checking SOEP averages with official numbers from Germany's statutory pension insurance (external validity). Further, we contribute to the empirical research of wealth inequality by taking an individual-level perspective. First, we show that individual pension wealth is a crucial component of individual wealth in Germany: In 2012, average pension wealth was 91,440 EUR, compared with 85,348 EUR net worth. Second, a sizeable reduction of about 25% in measured wealth inequality, in terms of the Gini coefficient, occurs if pension wealth is incorporated into individual net worth results: For 2012, it is 0.785 for individual net worth without pension wealth, but 0.594 if augmented with this wealth. Third, we find a sizeable regional divide in wealth levels. For example, at age 40, East German individuals hold an average augmented wealth worth of 65% of their West German counterparts.

The paper is structured as follows: Section 2 provides an overview of the pension system in Germany. A literature review of estimates of pension wealth in Germany follows in Section 3. Section 4 explains the data and the accounting framework for the derivation of pension wealth and the empirical implementation. Section 5 provides an empirical analysis of the

German wealth distribution with and without considering individual pension wealth, and Section 6 concludes.

## 2 Institutional setting and pension levels in Germany

### 2.1 Institutional setting

The German pension system comprises three pillars. The first pillar covers the statutory pension insurance, i.e., statutory PAYG, civil-servants, and liberal-professions pensions, while the second pillar subsumes company pension plans. In both pillars, the insured acquire pension entitlements throughout their working career. Following the principle of equivalence, pension entitlements from the first and second pillars are proportionate to overall lifecycle earnings during the active phase. The third pillar covers private voluntary insurance plans.

#### *2.1.1 Entitlements from the mandatory public-pension scheme for employees*

In 2014, about 78% (or 36.1 million) of the German working-age population (20-65 years) was insured through the statutory pension insurance (Gesetzliche Rentenversicherung, GRV) (Deutsche Rentenversicherung Bund 2015). The legal framework of Germany's statutory pension is defined in Book 6 of the Social Security Code (SSC VI). Following the equivalence principle, a close relation between the sum of earnings liable to compulsory insurance from contribution periods and monthly pension entitlement after retirement is established: If earnings in a year coincide with average earnings of all employed workers in the same year (50% of the national average), 1.0 (0.5) remuneration points are credited. In addition, pension entitlements can be gained during non-contribution periods. For example, when a mother withdraws from the labor market after the birth of a child, pension contributions (and corresponding entitlements) are credited for a limited period. Non-contribution periods can be credited for the following reasons: (i) sickness, rehabilitation, studies or higher education, and others (Anrechnungszeiten); (ii) military service or detention due to political reasons[6] (Ersatzzeiten); and (iii) child-raising or care of family members (Berueckichtigungszeiten).

[6] In particular, this applies to former political prisoners in the GDR.

Several types of statutory pensions are granted, with regular old-age pensions and pensions for long-term insured people being the most frequent types.[7] In addition, there are reduced-earnings capacity pensions, pensions for long-term unemployed, disability pensions, and special pensions for women, to name a few. Pension entitlements are defined by the pension formula. According to SSC VI, section 64, the annual pension entitlement from the statutory PAYG pension scheme is:

$$pension^{stat} = 12 \times A \times E \times R \quad (1)$$

The multiplier $A$ denotes the actual pension value, a monetary amount that links up the pension entitlement with several macro variables including the wage sum, the nation-wide sum of pension contributions, and the demographic structure of the population, etc. In 2012, the current pension level in the West (East) German Federal States was EUR 28.07 (EUR 24.92). The multiplier $E$ is the number of personal remuneration points a beneficiary has accrued over their lifetime. Finally, $R$ is a pension-type-specific factor; in case of an old-age pension this is set to 1.[8] According to §§ 50-53 SSC VI, an individual is vested in their pension plan after having contributed for five years, or 60 months..[9]

*2.1.2 Entitlements from the civil servant pension scheme*

In the spirit of the equivalence principle, civil-servant pensions primarily depend on the overall tenure and average salaries in the last position that a civil servant has filled for at least two years. For each year of full-time service, a civil servant collects 0.0179375 replacement points. The regular maximum replacement rate is limited to 0.7175. The annual pension entitlement for civil servants is calculated according to equation (2),

$$pension^{civil} = salary \times r \quad (2)$$

[7] Currently individuals are eligible for a full pension after having worked for 45 years, even if they have not yet reached the official retirement age (so called pension for the long term insured).

[8] For other pensions, such as e.g. pensions for reduced earning capacity, the respective factor is 0.5.

[9] Several separate, specific, pension plans, covering the members of specific occupational groups, fall under the GRV, including the miners' association (Knappschaft), seamen's insurance association (Seekasse), and the agriculture pension scheme (Landwirtschaftliche Alterskasse).

with $salary$ denoting average annual salaries, as defined above, and $r$ denoting the rate of replacement. It is possible that a civil-servant pension is credited in addition to a statutory pension. In this case, particular deduction rules apply.[10]

*2.1.3 Entitlements from compulsory pension schemes of liberal profession associations*

The liberal professions are not insured in the standard statutory pension insurance but are compulsory insured through separate pension schemes, according to public law of the Laender. The pension schemes of the liberal professions provide benefits as a compulsory system for members of special professional associations (Berufskammern): architects, chartered accountants, dentists, lawyers, notaries, pharmacists, physicians, and psychological psychotherapists. In total, there are 85 pension schemes serving the liberal professions, providing old age pensions, disability benefits, and survivors benefits. Consequently, entitlements cannot be determined by simple rules, but rather are highly individual.[11]

*2.1.4 Entitlements from occupational pension schemes*

Occupational pension schemes (Betriebliche Altersvorsorge) belong to the second pillar and are granted by a company to its employees. In Germany, these pension schemes date back to the 1974 Company Pensions Law (Betriebsrentengesetz), and comprise defined benefits (Leistungszusagen), defined contributions (beitragsorientierte Leistungszusagen), and also contributions with minimum benefit.[12] About 56 percent of the mandatory insured employees aged between 25 and 65 in 2011[13] are covered under these programs.[14]

**2.2 Pension levels at a glance**

[10] In 2011 roughly 2.9 million persons had entitlements from the civil servant pension scheme (BMAS 2012a).
[11] In 2014 about 1.4 million persons had entitlements from the liberal professions pension scheme (ABV 2016).
[12] There exist at least five different company pension plans in Germany starting with direct benefit plans, support funds (Unterstützungskasse), direct insurance (Direktversicherung), staff pension fund (Pensionskasse), and pension funds (Pensionsfonds), each with slightly different financing rules and benefit levels.
[13] According to BMAS (2012b), around 14.1 out of 25 million employees mandatorily insured aged between 25 and 65 have entitlements to a company pension. In SOEP, this number amounts to 13.1 million. Hence, coverage is quite accurately reflected.
[14] As is the case in many OECD countries, there is also a general trend from DB to DC pension plans in Germany. However, with the available SOEP-data, we are not able to differentiate the different types of company pension plans.

For the retired population, aged 65 or older, average monthly pensions vary markedly. By far the most important scheme is the statutory pension insurance, which covers 90% of the retired population and grants, on average, a gross monthly payment of 890 Euro in 2011 (Table 1). In contrast, only 5% are entitled to civil-servant pensions, with a mean value of little over 2,700 Euro. One principle reason for the higher average pension levels of civil servants is a usually rather continuous occupational career without unemployment spells and with higher educational achievement. Additionally, the replacement rates of the civil servant pension scheme are more generous compared to the statutory pension scheme. Retirees who are covered by one of the liberal profession schemes also enjoy a relatively high monthly pension, about 2,100 Euro on average.

**Table 1**. Pension by pension scheme (retired 65 years and older) in 2011

| Pension scheme | Mean gross pension (Euro / month) | Share of recipients* (in %) |
|---|---|---|
| Statutory pension | 890 | 90 |
| Civil servant | 2,714 | 5 |
| Liberal professions | 2,140 | 1 |
| Company (private sector) | 491 | 15 |
| Company (public sector (VBL)) | 315 | 10 |

Note: * Relative to all retired individuals living in Germany 65 year and older. Source: BMAS (2012a: 82). Shares sum up to more than 100% because individuals can have multiple pensions.

Company pensions are typically voluntary and complement the statutory pensions. Thus company pensions are notably smaller than pensions in the other schemes, on average. One can differentiate between company pensions in the private and public sector. In the private sector, the mean pension amounts to about 500 Euro and 15% of the retired population have an entitlement, in the public sector the respective share is 10% and the monthly pension amounts to 300 Euro. This difference in levels is partly driven by a higher share of female earners in the public sector (Federal statistical office 2015a).[15]

## 3 Previous studies on pension wealth in Germany

Most empirical wealth analyses for Germany do not consider pension wealth, probably due to a lack of adequate micro-data: direct information on actual pension entitlements, at least

[15] Lower company pensions also originate from, on average, lower remuneration of female compared to male employees. Compared to their overall population share, women are especially underrepresented in certain professions, sectors, and prestigious well-paid positions. Further, women interrupt their careers and reduce their working time for family reasons more frequently and for longer periods than men (BMFSFJ 2009).

for the non-retired part of the population, is not recorded in the Income and Expenditure Survey (EVS), the SAVE-study, or the German part of the HFCS,[16,17] Only the 2012/13 wave of the Socio-Economic Panel study (SOEP) provides this information. Hence, few studies analyze pension wealth in Germany and even fewer consider pension wealth to obtain a comprehensive wealth measure, namely augmented wealth.

One strand of this research deals with the role of pension wealth for retirement decisions. For example, Börsch-Supan (2000) uses an option value framework to approximate changes of pension wealth if retirement is postponed by one year. Therein, pension wealth is constructed from an unbalanced panel of SOEP respondents aged 55 through 70 in West Germany. In a follow-up study focusing on older workers, Berkel and Börsch-Supan (2004) investigate the effects of several reform scenarios on retirement-entry decisions. In these studies, the level, distribution of pension wealth or augmented wealth is not considered. In addition, these studies do not address younger population groups.

Another strand of literature examines the role of pension wealth for saving decisions. Alessie et al. (2013) uses retrospective survey data from the Survey of Health, Ageing and Retirement in Europe (SHARELIFE) to estimate the displacement effect of pension wealth on household savings. Specifically, they quantify the present value of past earnings, future earnings, and pension wealth at the individual level. Pension wealth – the expected discounted stream of benefits for the retired – is calculated using the level of reported benefits in SHARELIFE. For the employed, the self-assessed expected replacement rate is used.[18] They estimate a net worth of about 221,000 EUR. Again, the actual present value of pension wealth and its distribution is not an issue in their analysis.

[16] A shortcoming of the German part of the HFCS – the PHF survey – for our purposes is that information on pension entitlements from the statutory pension is collected for future expected pensions only. These are approximated on the assumption of an ongoing earnings history mirroring the previous five years until the official retirement age instead of the actual accumulated entitlements used in this study. Additionally, there is not sufficient information on company pension entitlements or the employment histories for civil servants; thus no entitlements for civil servants can be derived. Finally, information about net worth is collected at the household level, which does not facilitate the analyses of augmented wealth at the individual level.

[17] A fourth German survey exists, the German SHARE, where a subset of observations is directly linked with information from the German pension register. However, the linked number is 1,100 individuals per wave. SHARE is not representative for the total population as only persons aged 55 or older are surveyed and information about company pensions is not available.

[18] Self-assessments are derived from answers to the question: “Please think about the time in which you will start collecting this pension. Approximately, what percentage of your last earnings will your pension amount to?”

A third strand of research aims at deriving pension wealth. It can further be subdivided into two categories of papers, one dealing with pension wealth but not augmented wealth, and another with pension wealth in an augmented-wealth context.

Beckers et al. (2012), using the number of accumulated remuneration points in Germany's statutory pension insurance as a proxy for social-security wealth, falls into the first category. They restrict their attention to the 1939-1953 and 1978-2003 birth cohorts. Inequality in their social-security wealth measure is markedly lower compared to other types of wealth. For example, in 2003 for the 1949-53 birth cohort, the Gini coefficient for gross financial wealth is 0.675 and for the number of cumulated remuneration points it is 0.442. However, present values of pension entitlements are not derived. Braakmann and Haug (2007) use the so-called "on-going concern" method to approximate pension wealth at the macro level for various socio-economic groups. Their estimate for the aggregate pension wealth of the statutory pension insurance –using a discount rate of 5% – amounts to 5.3 trillion Euro in 2005, which is 2.3 times the GDP. However, pension entitlements for civil servants as well as entitlements from company pensions are not considered in their measure. In addition, combinations with standard net worth is not the topic of the paper.

The OECD (2013b) provides estimates of pension wealth, defined as the lifetime discounted value of the flow of retirement benefits in mandatory pension schemes at the point of retirement age. They rely on prototypical hypothetical insurant profiles and projections on future earnings growth real discount rates. According to their calculations, the gross pension value of a typical male earner with average income in 2012 is about 367,360 Euro.[19] The distribution of pension wealth is not an issue.

Frick and Headey (2009) provide a cross-country comparison of German and Australian retirees (aged 65 and over) before and after considering pension entitlements in the measure of net worth. Concerning levels of extended wealth, the authors find similar results for both countries. For standard net worth, the level is markedly higher in Australia. Furthermore, while net worth is clearly less equally distributed in Germany than in Australia, taking public pension wealth into consideration in the extended wealth measure brings inequality down to similar levels in the two countries.

[19] The applied method yields rather different results when another base year is assumed. For 2014 (OECD 2015b) the respective gross pension value amounts to 666,304 Euro instead of 367,360 Euro in 2012: an increase of more than 81%.

The only two studies – at least to our knowledge – deriving a broad wealth measure for the total population is Frick and Grabka (2010, 2013). Their analysis is based on statistically-matched data from the SOEP with individual insurance histories from German Statutory Pension Insurance. According to their estimate, the present value of total pension and state annuity entitlements amounts to an average of roughly 67,000 euros per adult, yielding augmented wealth exceeding 155,000 euros. The Gini coefficient is 0.799 for individual net worth and 0.637 for augmented wealth. In addition to the uncertainties regarding the matching process' precision, information on company pensions is only considered for retired pensioners.

## 4 Data and framework

### 4.1 Survey and questionnaire

The database used in the present study is the German Socio-economic Panel (SOEP).[20] SOEP is an ongoing longitudinal survey of approximately 21,000 adult respondents, conducted annually since 1984 (see Wagner et al., 2007). A wide spectrum of topics, including household composition, employment, income, and so forth, is covered by SOEP. Information about private wealth was surveyed four times, in 1988, 2002, 2007, and 2012. Surveyed real and financial assets include property wealth, financial assets, business assets, private pension entitlements, building-loan contracts, collectables, and outstanding debt (from property or consumer credits).[21] Since SOEP version v30 (survey year 2013), it consists of ten sub-samples, with seven pure random samples drawn in different survey years. The remaining three include two special migrant samples and a high-income sample to better capture the particulars of these populations. In contrast to other wealth surveys, the SOEP asks each adult respondent to provide information about her/his individual assets and debts.[22] The individual-level concept is also the basis of our empirical analysis.

Our computations rely on SOEP respondents living in private households participating in the 2012 and 2013 waves, and who were 18 or older in 2013. The need for the participation restriction arises because standard wealth variables are collected every five years; most

[20] Here we use the SOEP data version SOEPv30, DOI: 10.5684/soep.v30.

[21] See for a documentation of the SOEP wealth information (Grabka and Westermeier, 2015).

[22] A potential benefit of surveying wealth information at the individual level is higher accuracy in contrast to surveys that exclusively rely on the answers of the reference person. This is particularly true for multi-person households. A potential drawback of the individual approach is higher probability of non-response.

recently in the 2012 wave (with asset values at the interview month). The current pension entitlements of the non-retired were only collected in 2013 (retrospectively for the previous year). Thus all information refers to 2012. We exclude observations lacking valid information.[23] This leaves a sample of 16,285 observations, representing a total weighted number of about 68.9 million individuals.

Pertaining to pension entitlements, we distinguish between the retired and non-retired population. For the retired population, SOEP regularly collects monthly incomes from the following eight types of pensions: the statutory German pension insurance (GRV, including Knappschaft), civil servant pensions, company pensions from the public (supplementary insurance for public sector employees (VBL)) and private sectors (occupational pensions), private pensions (e.g., whole life insurance or Riester pension), accident insurance pensions, compensation and assistance for war victims pensions (Kriegsopferversorgung), and other pensions (in particular those from abroad).[24] In addition, the panel structure of SOEP, with its information on earnings and family biographies, combined with the pension law, allows for a validity assessment of the reported statutory pension entitlements for the retired population.[25] In particular, if the stated statutory pension exceeded the maximum pension in 2012 (about EUR 2,500 per month), we assume that the respondents included their company pensions in the stated statutory pension.[26] We then replace the stated pension with the 2012 maximum, shifting the remainder to the stated company pensions.[27]

### 4.2 Pension entitlements for the non-retired population

For the non-retired population, SOEP collects information on two types of pension entitlements: those from statutory pension insurance and those from public and private company pension insurance plans.[28] Thereby, the respondents are asked to report the exact

[23] In particular, we exclude Sample M (the migration sample) and Sample K, as for those respondents no information on wealth in 2012 was collected. Additionally, we exclude all observations with individual weighting factors of zero. An appropriate weighting scheme is available in SOEP to account for these exclusions.

[24] The validity of this information is documented in Grabka (2007).

[25] For all other types of pensions, SOEP data do not contain sufficient information to assess the validity of stated entitlements by means of internal or external consistency checks. In case of company pensions, we recoded 9 observations having exceptionally high entitlements compared with the earnings biography.

[26] In 2013, among those receiving a statutory pension, 24% also enjoy payments from a company pension.

[27] This was true for 17 observations.

[28] Due to the diversity of the liberal-professions scheme, entitlements are not surveyed for the non-retired population. Further, the questionnaire does not distinguish the various branches subsumed under the statutory pension insurance, namely entitlements from the miners' association (Knappschaft), seamen's

information provided by the insurance (public and private alike) in an obligatory annual statement to the insured. Amongst others, the statement includes the current value of accumulated entitlements (see Figure A1 for the design of the questionnaire). As the data is collected for the first time, two aspects are important assessing the quality of this new data on pension entitlements: item-non response (INR) and validity of responses.

In general, INR for the newly included pension related questions is small. For example, INR is 1.3% for the introductory filter variable on having statutory pension entitlements. Among those with an entitlement, only 0.3% did not provide the actual level of the entitlement in the follow-up questions. Thus, unwillingness to respond should not be a major obstacle for our analysis.[29]

For the validity of responses on current entitlements of the non-retired, it is essential that respondents followed the questionnaire's instruction exactly: to consult their annual official pension information letters. If respondents did not report directly from the information letters and only guessed, then they are unlikely to provide meaningful values regarding their entitlements due to the complexity of the statutory German pension law. Fortunately, the data enables a distinction between the types of respondents,[30] with 41% of the sample reporting the exact amount according to the official information.[31]

Like it is the case for the retired, the panel structure of the SOEP with its information on earnings and family biographies in combination with pension law and regulations allows an assessment of the validity of the reported statutory pension entitlements.[32] For the non-retired population, we use the biographical information to determine if a pension entitlement exists. If the biography indicates an entitlement but it is not reported by the respondent, the entitlement is imputed (see details in the Appendix). If the biography indicates no statutory pension entitlement but the person reports such an entitlement, the entitlement is set to zero (a typical example is a person who has always worked as a civil servant). Third, we compute an upper bound of the individual statutory pension

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insurance association (Seekasse), pension insurance for artists (Kuenstlersozialversicherung), and agriculture pension scheme (Landwirtschaftliche Alterskasse).

[29] For INR in the standard SOEP wealth questions see Grabka and Westermeier (2015).

[30] Respondents were asked to indicate if the reported entitlement was exact or an estimate (see Figure A1).

[31] The respective share of INR for company pensions is 1.1% for the filter question and 2.5% for the amount. Overall, 66% provided only a rough estimate for their pension level, while 34% provided the exact amount.

[32] For all other types of pensions, SOEP data do not contain sufficient information to assess the validity of stated entitlements. In case of company pensions, fewer than ten observations with exceptionally high entitlements, given the earnings biography, are recoded.

entitlements. The upper bound is determined by the individual employment biography, valuing employment periods with the maximum possible remuneration points for those insured in East and West Germany, considering periods of military and civilian service as well as parental leave. If the difference between the stated entitlement and the upper bound is "small,"[33] we rely on the stated entitlements. Otherwise, we replaced the stated entitlement with an imputed value.

Running a linear regression of the difference between upper bound and reported entitlement on a dummy of approximate answer, level of entitlement and the interaction indicates that approximated values are larger than the exact values (coefficient of dummy: EUR 204), i.e., an upward bias in responses. Further, the difference is not random but slightly decreases in the reported entitlement. Hence, we treat approximated statutory pension entitlement as INR. For the same reasons, we also treat approximated company pensions as INR.

For the non-retired population who gave an approximation of their entitlement and those with INR on the respective question, we implement a predictive mean matching using multiple imputation (Rubin 1987, Schenker and Taylor 1996).[34] Our matching relies on the following set of variables: individual employment histories (number of years working full / part time or unemployed), earnings histories for the last 10 years, industry sector, firm size, age, sex, number of children, region of residence (east/west), immigration year, marital status and education level.[35]

We assess the quality of the imputed entitlements by means of trace plots (Figures A2, A3) that show the stability of the imputation over iterations (here $i = 100$), and QQ-plots of observed and imputed values (Figure A4 to A7). The trace plots show no apparent trends in the summaries of the imputed values, suggesting that the number of burn-in iterations seems adequate.[36] The QQ-plots were performed for pension entitlements from the statutory pensions and company pensions as well as for those cases with exact and

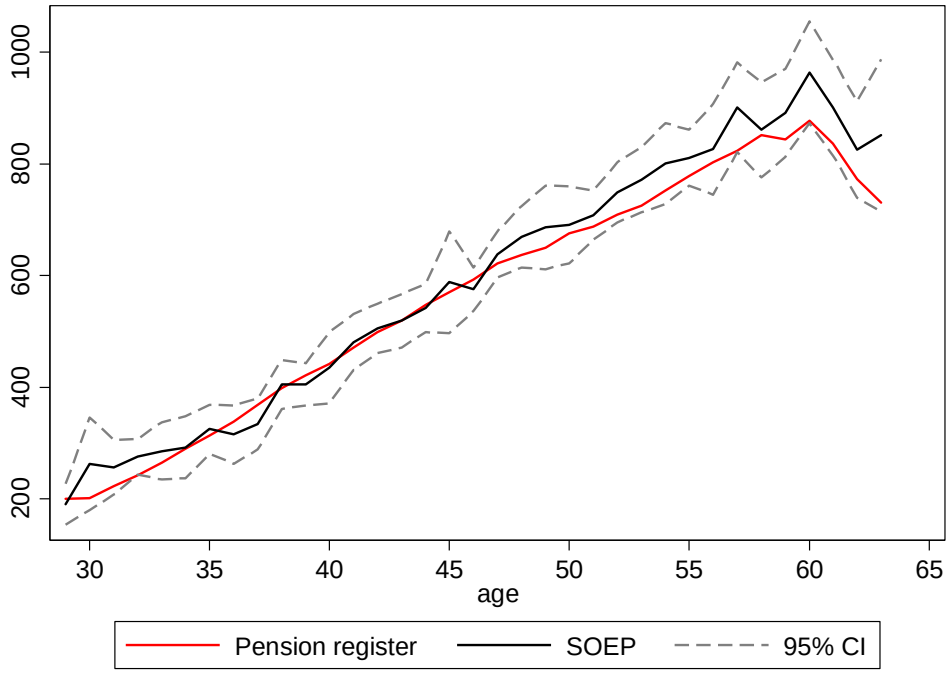
[33] The difference is assumed to be "small" if the absolute difference is below EUR 300 per month and the relative difference is also below 30 percent. A correction has been applied to only 28 observations.

[34] The imputation is performed with the Stata package "mi impute chained pmm." INR on pension information for the retired population is already imputed by SOEP data providers. The respective share of INR is less than 2%.

[35] For the imputation of entitlements of company pensions, information about the financing scheme, number of jobs, and occupational status is used.

[36] To check convergence and stability of the matching algorithm, we also look at several chains, each obtained from a different set of initial values. The chains show no apparent trends and oscillate around the mean, suggesting convergence of the algorithm.

approximated answers. For the exact answers, the plots indicate no systematic deviations. For the approximated answers, consistent with the aforementioned upward bias, the imputed values are smaller than the reported entitlements, thus reinforcing our assumption to impute these cases.




Note: All active insured with GRV pension entitlements; 95% CI based on 200 bootstrap replication weights. Source: German Statutory Pension Insurance (2016) – Versichertenstatistik (Table: Tabelle: 015.30), SOEPv30, respondents of the 2012 and 2013 waves, own calculations.

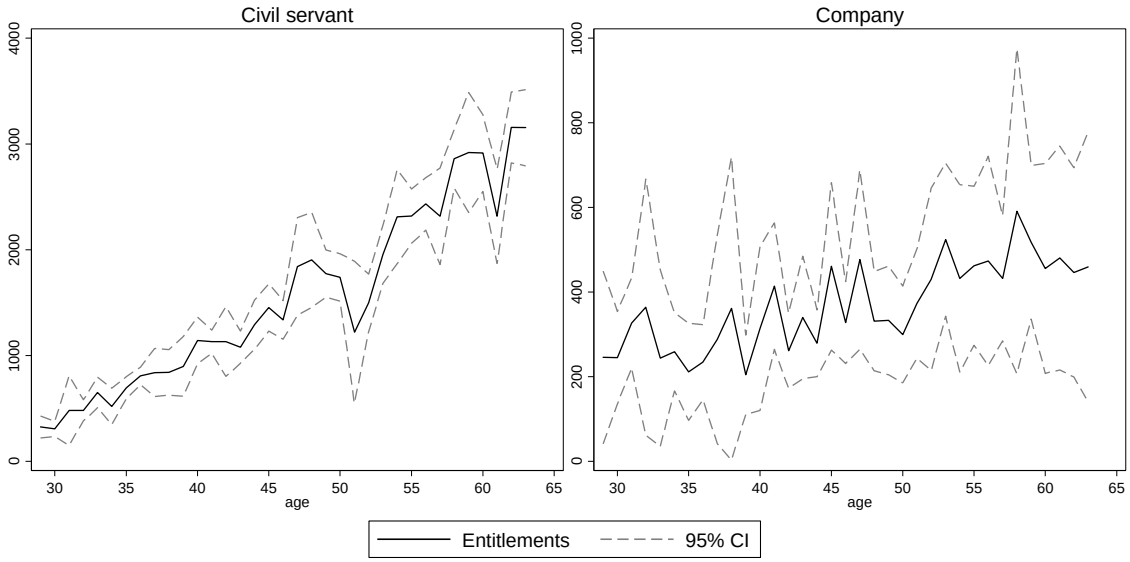
**Figure 1.** Age-profiles for gross statutory pensions, SOEP and register data (in Euro/month)

Figure 1 provides age-entitlement profiles for the non-retired population from the SOEP data after imputation and register data from the statutory pension insurance. Both profiles show a hump-shaped accumulation process. The highest average monthly gross pensions are reached at the age of 60. For older age groups the respective figure declines. This is the result of the transition of various sub-groups of the statutory pension insurance, including members of the miners' association, pensioners with reduced earning capacity, disability pensioners or long-term unemployed, which are eligible to enter retirement before the official retirement age of 65. The remaining active insured consist, to a great extent, of those with low labor market integration, such as housewives or self-employed with short periods of dependent employment in their working career. This population typically holds lower

pension entitlements on average than the once eligible opt out earlier. Most importantly, the 95% confidence band for the SOEP entitlements reveals no significant differences.[37]

Figure 2 provides SOEP-based age-profiles for company pensions and civil servant pensions, again for the non-retired population only. Unfortunately, due to lack of data (at least to our knowledge), we cannot provide register-data based profiles to check for plausibility of the SOEP-based findings. However, for civil servants the general picture is as expected. Due to the rather strict pension formula for civil servants there is a strong correlation between age (which highly match to tenure) and pension level. The spike at the age of 52 seem to be the result of the re-unification, given that civil servants in East Germany – at least during the 1990s– had lower salaries than their West German counterparts (see also Figure 5).

For company pensions the confidence bands reflect not only the greater uncertainty due to smaller numbers of eligible persons but also the diversity of forms this pension type takes.




Note: Results based on first imputation. 95% CIs obtained via bootstrapping with 200 runs.
Source: SOEPv30, respondents of the 2012 and 2013 waves, own calculations.

**Figure 2.** Age-profiles for gross civil servant and company pensions (in Euro/month)

### 4.3 Derivation of present values

We compute gross present values of pension entitlements accumulated though and for 2012 from the first and second pillar in real terms (present value or $PV$ from now and on). *Gross*

[37] In addition to imputation, there were also systematic in-depth consistency checks, using all pension relevant information available in SOEP in order to validate the collected and imputed information about statutory pension entitlements in SOEP and, if possible, for civil servant pensions and company pensions.

means that pension entitlements are considered before taxes and social security contributions.[38] The value of expected capitalized pensions from a particular pension scheme $p = stat, civil, comp$ is the current pension entitlement adjusted for real interest rates and average survival probabilities. The present value of entitlements from a pension scheme $pension^p$ in 2012 is,

$$PV_p = \sum_{t=0}^{T-a} s_{a,t} \times \frac{1}{(1+i)^t} \times pension_t^p, \tag{3}$$

with $s_{a,t}$ denoting the probability of a person of age $a$ in year 2012 surviving until year $t$; $T - a$, indicating the remaining maximum lifespan differentiated by sex and birth cohort;[39] $i$ a constant discount rate (here a rate of 3%);[40] and $pension_t^p$ the pension entitlement from pension scheme $p$. A retired person (including those with pensions for reduced earning capacity) receives the pension from period $t = 0$ (year 2012) onward. A non-retired person receives the pension starting in a future period $t > 0$, defined by the person's age and the official retirement age.[41] The above generation of present values for today's entitlements follows the so-called "accrual method" (see Wolff 2015). For the interpretation of the present values, two aspects should be mentioned. First, entitlements from the liberal-professions scheme are not comprised in present values for the non-retired population but only for the retired. The same holds for pension entitlements from abroad. Second, as we are interested in own pension entitlements, we refrain from considering any entitlements from survivor pensions.

[38] Augmented wealth is an aggregate of several wealth components. For the interpretation of the level and distribution of augmented wealth, three aspects should be noted. First, financial wealth in the form of standard monetary deposits is not subject to taxes and social security contributions in Germany. However, when converting assets or real wealth into money, taxes may arise. The tax burden then depends on many unobserved tax-relevant characteristics (i.e., acquisition value, speculation and holding periods). Second, the current and the liquidation value of an insurance contract (e.g., of a life-risk insurance or private pension) can be different. This is because of, for example, insurance fees or repayment of tax reliefs or allowances (i.e., Riester and Rürup pensions). Third, if a wealth aggregate is determined by the present value of a future income stream (e.g., statutory or company pension) the future incomes are subject to social security contributions and/or taxes. We refrain from an approximation of net present values, given that it requires numerous assumptions about the future income composition, the future family status, etc. So, augmented wealth is comprised of wealth components that differ with respect to tax- and social-security burdens. This implies that, de facto, the convertibility of the different components is limited, an issue which, for the aforementioned reasons, is not reflected in the subsequent analysis.

[39] Numbers provided by Federal Statistical Office (2015b). Previous literatures also point to differences in life expectancy between social groups (Shkolnikov et al., 2008). However, official statistics are not sufficiently detailed.

[40] For the impact of alternative interest rates on substantive findings see Table A1.

[41] The official retirement age differs over birth cohorts between 65 and 67.

# 5 Results

## 5.1. Wealth composition and prevalence of ownership: the broad picture

In the following, we present our estimates of individual net worth, total pension wealth, augmented wealth, and of the three sub-components of total pension wealth.

Table 2 shows the medians and means of the wealth aggregates along with the fractions of the adult population holding a positive amount.[42] The median is always derived from the specific wealth distribution under consideration. Median individual net worth is about EUR 18,000. The respective mean is about EUR 85,000, about five times higher. About 73% of the adult population holds positive net worth.[43] Total pension wealth turns out as an important component of individual economic resources. Its median is about EUR 59,000, thus three times the level of median net worth. Further, the prevalence is markedly higher: about 89% of the adult population possesses pension wealth. Thus, statutory pension entitlements are by far the most important source of pension wealth: the median (mean) over all individuals amounts to about EUR 44,000 (EUR 68,000). Median entitlements from civil servant or company pensions amount to zero, due to the relative small population share of beneficiaries: about 6% of the adult population holds entitlements from civil servant and about 24% from company pensions. For the same reason the unconditional means are small: about EUR 14,000 for entitlements from civil-servant pensions and EUR 10,000 for entitlements from company pensions. The conditional means, however, are sizeable: about EUR 211,000 for civil-servant and EUR 42,000 for company pensions.

The last row of Table 2 gives key figures for augmented wealth. Its median is about EUR 107,000 and thus about six times larger than median net worth. Its mean is about EUR 177,000, about twice as much as mean net worth. For about six percent of the adult population, augmented wealth is negative or zero; these are predominantly young adults who have not yet obtained the necessary number of contribution years that the statutory pension insurance requires for pension entitlements to be granted.

[42] All bootstrapped estimates rely on 200 bootstrap runs using the first implicate. The four other implicates do not differ with respect to a 95% confidence interval.

[43] Aggregating personal net worth at the household level allows a comparison with alternative German data sources. Here we find value of about EUR 148,000. According to the German Income and Expenditure Survey (EVS) conducted by the Federal Statistical Office, mean household net worth in 2013 is about EUR 123,000 (see Federal Statistical Office, 2014). According to the German part of HFCS, household net worth in 2010 was about EUR 195,200 (see ECB, 2013). Note that the definitions of net worth are not exactly the same across datasets. For example, the wealth aggregate from EVS, as opposed to SOEP, does not consider business assets, while the aggregate from ECB includes the value of vehicles, which is not included in SOEP's questionnaire.

To gain an initial impression of wealth inequalities, Table 3 provides the decile-specific means of the six wealth aggregates. Deciles are wealth-concept specific: individuals are sorted in increasing order of the particular wealth concept under consideration.

**Table 2.** Median and mean wealth by wealth aggregate

| Wealth aggregate | Median (in Euro) | Mean (in Euro) | Cond. Mean (in Euro) | Fraction (in %) |
|---|---|---|---|---|
| | Total population | | of those with positive wealth component | |
| Net worth | 18,000 | 85,348 | 119,449 | 72.58 |
| | | (2,082) | (2,791) | (0.42) |
| Pension wealth | | | | |
| - Total | 58,990 | 91,440 | 102,766 | 88.98 |
| | | (1,133) | (1,200) | (0.37) |
| - Statutory | 43,617 | 67,500 | 81,348 | 82.98 |
| | | (745) | (807) | (0.41) |
| - Civil servant | 0 | 13,740 | 210,993 | 6.51 |
| | | (576) | (7,164) | (0.21) |
| - Company | 0 | 10,200 | 42,191 | 24.18 |
| | | (506) | (1,980) | (0.40) |
| Augmented wealth | 107,392 | 176,789 | 188,959 | 93.85 |
| | | (2,370) | (2,429) | (0.30) |

Note: Medians based on first imputation (for robustness over imputations see Table A2). For all other statistics, results based on multiple imputed data and 200 bootstrap replicate weights; standard deviation in parentheses. Source: SOEPv30, persons living in private households age 18 and above in 2013 and respondents of the 2012 and 2013 waves.

For the bottom decile, average net worth is negative, about negative EUR 13,000. In the fifth decile, the value is still moderate at about EUR 11,000. From the 6th to the 10th decile, we find a pronounced increase from about EUR 29,000 in the 6th to nearly EUR 500,000 in the 10th decile. In other words, the 10th decile possesses about 60 percent of total net worth in Germany. This confirms previous SOEP-based studies on net worth in Germany (i.e., Grabka and Westermeier, 2014). For pension entitlements, the distribution is flatter and, in principle, not negative. Further, in the bottom 9 deciles average total pension wealth is always higher than net worth, which underscores the relevance of pension wealth in Germany. As an example, for the $5^{th}$ decile the average is about EUR 48,000, thus about four times the level of net worth. This ratio decreases over the deciles, but only in the highest decile does the average value of net worth exceeds the average of total pension wealth. For the three sub-components of pension wealth, we find that entitlements from statutory pensions are, by far, the most equally distributed component. Its mean is zero for the

bottom decile, about EUR 35,000 in the 5th decile, EUR 146,000 in the 9th and EUR 228,000 in the top decile. Because of the low incidence of eligible persons, civil servant pensions and company pensions are exclusively clustered in the top / top three deciles, respectively.

**Table 3.** Means of wealth aggregates by respective deciles (in Euro)

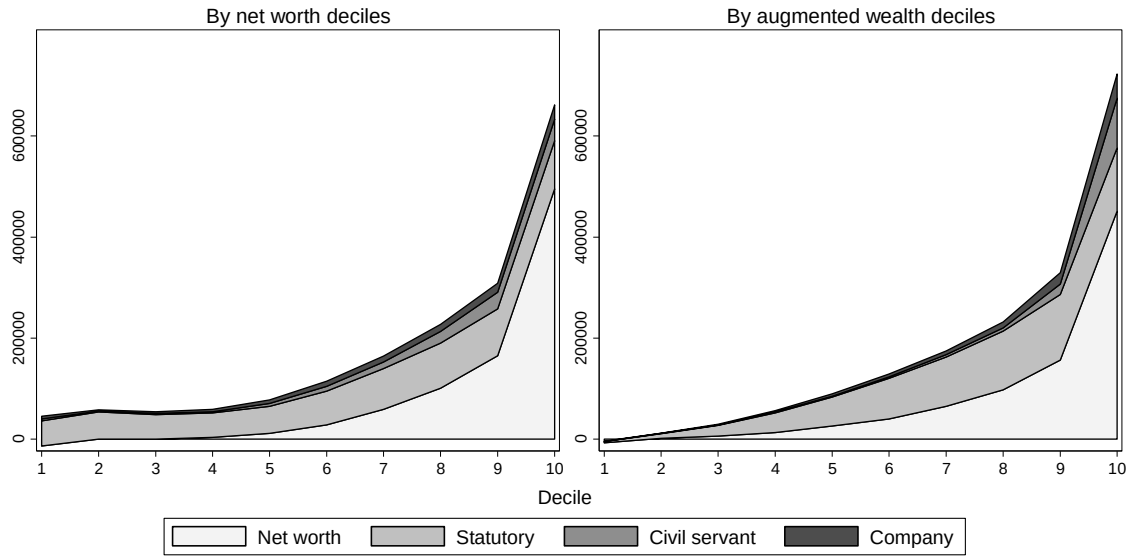
| Decile* | Net worth | Pension wealth | | | | Augmented wealth |
|---|---|---|---|---|---|---|
| | | Total | Statutory | Civil servant | Company | |
| 1 | -13,378 | 0 | 0 | 0 | 0 | -4,314 |
| | (1,939) | (0) | (0) | (0) | (0) | (1,837) |
| 2 | 0 | 6,028 | 1,094 | 0 | 0 | 11,653 |
| | (0) | (0,446) | (239) | (0) | (0) | (572) |
| 3 | 121 | 17,044 | 10,460 | 0 | 0 | 29,522 |
| | (38) | (551) | (472) | (0) | (0) | (1,068) |
| 4 | 3,439 | 30,091 | 21,096 | 0 | 0 | 56,393 |
| | (241) | (768) | (600) | (0) | (0) | (1,567) |
| 5 | 11,218 | 48,102 | 35,041 | 0 | 0 | 89,828 |
| | (530) | (996) | (789) | (0) | (0) | (1,605) |
| 6 | 28,502 | 69,622 | 54,342 | 0 | 0 | 128,811 |
| | (966) | (970) | (1,014) | (0) | (0) | (1,824) |
| 7 | 59,256 | 95,982 | 76,630 | 0 | 0 | 174,367 |
| | (1,570) | (1,245) | (976) | (0) | (0) | (2,058) |
| 8 | 101,139 | 130,485 | 105,767 | 0 | 1,228 | 231,957 |
| | (1,754) | (1,434) | (1,205) | (0) | (225) | (2,476) |
| 9 | 165,046 | 183,610 | 145,863 | 0 | 16,459 | 329,425 |
| | (2,590) | (2,065) | (1,431) | (0) | (691) | (3,787) |
| 10 | 495,184 | 339,996 | 227,892 | 137,385 | 87,117 | 722,945 |
| | (16,553) | (4,698) | (2,341) | (5,750) | (2,961) | (16,701) |

Note: *Decile of respective wealth aggregate. All results based on multiple imputed data and 200 bootstrap replicate weights; standard deviation in parentheses. Source: SOEPv30, persons living in private households age 18 and above in 2013 and respondents of the 2012 and 2013 waves.

Decile-specific means of augmented wealth are always markedly higher than means of net worth. Further, augmented wealth is more equally distributed than net worth. In the third (5th, 10th) decile, the average of the former is about EUR 29,000 (EUR 90,000; EUR 723,000), thus about 240 (8; 1.5) times higher than the latter.

While Table 3 provides information on the decile-specific means for the wealth-type specific distributions, we next turn to the composition of augmented wealth. It is depicted in Figure 3 in the form of two graphs. The left graph gives the composition of augmented wealth along the deciles of the net worth distribution. The right graph gives the decile-specific amounts of

the wealth aggregates along the augmented wealth distribution. The upper part of Table 4 complements the left graph in Figure 3 by providing wealth aggregate means by decile and the relative share by net worth deciles. For the bottom decile, net worth is negative and thus the relative share amounts to -30%. In contrast statutory pensions contribute the major share to augmented wealth. This share systematically decreases over the net worth deciles: from 93% in the 2nd, to 70% in the 5th and 14% in the 10th decile. Almost parallel to the decline of the share of statutory-pension entitlements is the rise of the share of net worth: from 0% in the 2nd and 3rd to 14% in the 5th and 75% in the 10th decile. The share of entitlements from civil-servant pensions and company pensions show opposed trends. While for civil servant pensions the relative share is higher for upper net worth deciles (up to 11% in the 9th decile), company pensions have a somewhat higher relative importance in the middle and at the bottom of the net worth distribution (9%-12%).




Note: Deciles of respective wealth aggregate. Results based on multiple imputed data. Source: SOEPv30, persons living in private households age 18 and above in 2013 and respondents of the 2012 and 2013 waves.

**Figure 3.** Composition of augmented wealth/ joint distributions (in Euro)

The right panel of Figure 3 and the lower part of Table 4 give the composition of augmented wealth along the deciles of augmented wealth, thus also shedding light on its correlation with net worth (0.937). Again – as is the case when ordering by net worth deciles – the relative importance of net worth increases over deciles while statutory pension wealth decreases.

The most noticeable difference between the two ordering concepts concerns the decile-specific shares of entitlements from civil-servant pensions: for the people in the top decile of the augmented wealth distribution, entitlements from civil-servant pensions have a markedly higher share (14%) in total augmented wealth than for the people in the top decile of the net worth distribution (6%). Another common pattern of both graphs in Figure 3 is that the relative importance of statutory pension wealth is significantly smaller for the top two deciles. This result is mainly driven by the upper contribution ceiling in the statutory pension insurance in Germany, which cap the entitlements to this upper bound.

**Table 4.** Composition of augmented wealth along the distributions of net worth and augmented wealth, respectively

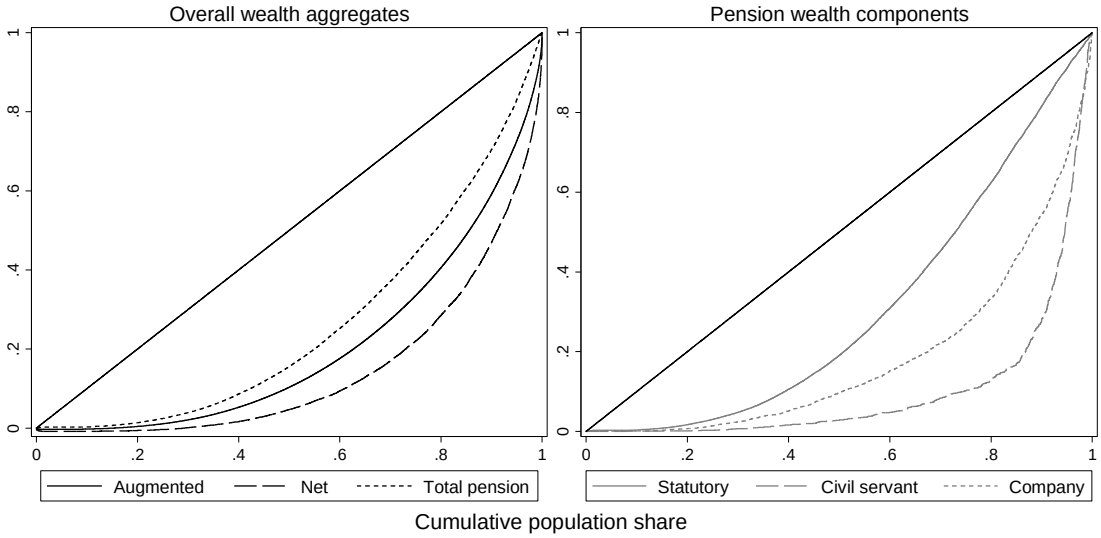
| Decile* | Mean (in Euro) | | | | | Share of augmented wealth (in %) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Net worth | Pension wealth | | | | Augmented wealth | Net worth | Pension wealth | | | |
| | | Total | Statutory | Civil-servant | Company | | | Total | Statutory | Civil-servant | Company |
| | | | | | | By net worth deciles | | | | | |
| 1 | -13,378 | 58,576 | 49,390 | 3,678 | 5,508 | 45,198 | -29.60 | 129.60 | 109.27 | 8.14 | 12.19 |
| 2 | 0 | 58,027 | 53,992 | 1,461 | 2,574 | 58,027 | 0.00 | 100.00 | 93.05 | 2.52 | 4.44 |
| 3 | 121 | 53,912 | 48,366 | 2,664 | 2,882 | 54,033 | 0.22 | 99.78 | 89.51 | 4.93 | 5.33 |
| 4 | 3,439 | 55,703 | 48,786 | 2,213 | 4,704 | 59,142 | 5.81 | 94.19 | 82.49 | 3.74 | 7.95 |
| 5 | 11,218 | 66,244 | 53,473 | 6,163 | 6,608 | 77,462 | 14.48 | 85.52 | 69.03 | 7.96 | 8.53 |
| 6 | 28,502 | 86,063 | 66,775 | 9,154 | 10,134 | 114,565 | 24.88 | 75.12 | 58.29 | 7.99 | 8.85 |
| 7 | 59,256 | 105,350 | 80,100 | 13,298 | 11,951 | 164,606 | 36.00 | 64.00 | 48.66 | 8.08 | 7.26 |
| 8 | 101,139 | 125,739 | 89,040 | 22,911 | 13,788 | 226,879 | 44.58 | 55.42 | 39.25 | 10.10 | 6.08 |
| 9 | 165,046 | 143,837 | 92,702 | 33,195 | 17,939 | 308,882 | 53.43 | 46.57 | 30.01 | 10.75 | 5.81 |
| 10 | 495,184 | 166,675 | 95,429 | 42,566 | 28,680 | 661,859 | 74.82 | 25.18 | 14.42 | 6.43 | 4.33 |
| Overall | 85,348 | 91,440 | 67,500 | 13,740 | 10,200 | 176,789 | 48.28 | 51.72 | 38.18 | 7.77 | 5.77 |
| | | | | | | By augmented wealth deciles | | | | | |
| 1 | -7,089 | 2,776 | 2,540 | 82 | 153 | -4,314 | 164.35 | -64.35 | -58.89 | -1.91 | -3.55 |
| 2 | 1,961 | 9,692 | 8,947 | 159 | 586 | 11,653 | 16.83 | 83.17 | 76.78 | 1.36 | 5.03 |
| 3 | 6,133 | 23,389 | 20,910 | 665 | 1,814 | 29,522 | 20.78 | 79.22 | 70.83 | 2.25 | 6.14 |
| 4 | 12,703 | 43,691 | 39,536 | 1,339 | 2,815 | 56,393 | 22.53 | 77.47 | 70.11 | 2.38 | 4.99 |
| 5 | 26,063 | 63,765 | 57,322 | 1,590 | 4,853 | 89,828 | 29.01 | 70.99 | 63.81 | 1.77 | 5.40 |
| 6 | 39,994 | 88,816 | 80,380 | 2,688 | 5,748 | 128,811 | 31.05 | 68.95 | 62.40 | 2.09 | 4.46 |
| 7 | 64,994 | 109,373 | 97,266 | 4,940 | 7,168 | 174,367 | 37.27 | 62.73 | 55.78 | 2.83 | 4.11 |
| 8 | 97,612 | 134,345 | 116,344 | 6,213 | 11,787 | 231,957 | 42.08 | 57.92 | 50.16 | 2.68 | 5.08 |
| 9 | 156,788 | 172,636 | 129,741 | 20,771 | 22,125 | 329,425 | 47.59 | 52.41 | 39.38 | 6.31 | 6.72 |
| 10 | 451,183 | 271,762 | 125,167 | 98,868 | 47,727 | 722,945 | 62.41 | 37.59 | 17.31 | 13.68 | 6.60 |
| Overall | 85,348 | 91,440 | 67,500 | 13,740 | 10,200 | 176,789 | 48.28 | 51.72 | 38.18 | 7.77 | 5.77 |

Note: *Decile of respective wealth aggregate. All results based on multiple imputed data. Overall is the average over the whole distribution. Source: SOEPv30, persons living in private households age 18 and above in 2013 and respondents of the 2012 and 2013 waves.

### 5.2 Wealth inequalities

An additional insight in wealth inequality is presented by Lorenz and concentration curves (Figure 4). The left-hand graph provides the Lorenz curve of augmented wealth and the concentration curves for net worth and total pension wealth. The right-hand graph provides concentration curves for each of the three pension wealth subcomponents separately.

The Lorenz curve of augmented wealth gives the cumulated proportion of total augmented wealth, with individuals being sorted in increasing order of augmented wealth. The concentration curves give the cumulative share of a particular wealth aggregate but the ordering criterion is always augmented wealth. Accordingly, as opposed to the Lorenz curve that cannot lie above the line of perfect equality (45° line), concentration curves can either lie above or below the 45° line. If a concentration curve lies above the 45° line, then individuals with low augmented wealth hold a disproportionally high share of the underlying component of augmented wealth.




Note: Results based on first imputation. Ordering is calculated on the basis of augmented wealth.
Source: SOEPv30, persons living in private households 18 years and older, respondents of the 2012 and 2013 waves.

**Figure 4.** Lorenz and concentration curves

As can be seen from the left graph of Figure 4, the Lorenz curve of augmented wealth (pattern: solid) falls far below the equal distribution line, suggesting sizeable wealth inequalities. The concentration curve for net worth suggests even higher inequalities while the opposite is true for total pension wealth. Concerning pension wealth, the right graph further provides the subcomponent-specific concentration curves. Closest to the equal-

distribution line is the concentration curve for statutory pensions, followed by company pensions and civil-servant pensions.

Actual numbers on wealth inequalities, as measured by the Gini coefficient and the Coefficient of Variation (CV), are presented in Table 5. We provide both unconditional indices for the full sample (left column) and conditional indices based on individuals holding a strictly positive amount of the wealth component under investigation (right column).

Consistent with previous studies for Germany, the distribution of net worth is very unequal. Here the Gini coefficient is 0.785 (CV: 3.378).[44] The inclusion of pension wealth leads to a marked reduction of the Gini coefficient of roughly 25% to 0.594 for augmented wealth (CV: 1.832). Total pension wealth itself has a Gini coefficient of 0.566, indicating a pronounced lower level of inequality than for net worth. For the subcomponents of pension wealth, Gini indices are 0.560 for statutory pensions (CV: 1.077), 0.967 for civil servant pensions (CV: 5.195) and 0.905 for company pensions (CV: 3.920). High inequalities in the distributions of entitlements from civil-servant or company pension wealth are primarily the result of their low prevalence among the total population (see Table 2). For the same reason, the conditional indices are markedly lower than the unconditional ones. The effect is most pronounced for entitlements from civil-servant pensions and company pensions. The conditional Gini coefficient for the former is only 0.496, whereas it is 0.605 for company pensions. Conditional and unconditional Gini coefficients for augmented wealth differ little, because of the high prevalence of ownership.

[44] In all calculations of the Gini index, we included observations with negative or zero wealth. Note that the inclusion of negative values means that the Gini index is no longer bounded between 0 and 1.

**Table 5.** Inequality of wealth aggregates

| Wealth aggregate | Total population | | Population with positive wealth component | |
|---|---|---|---|---|
| | Gini | | Conditional Gini | |
| Net worth | 0.785 | (0.007) | 0.666 | (0.007) |
| Pension wealth | | | | |
| - Total | 0.566 | (0.004) | 0.512 | (0.004) |
| - statutory | 0.560 | (0.004) | 0.470 | (0.004) |
| - civil servant | 0.967 | (0.001) | 0.496 | (0.012) |
| - company | 0.905 | (0.004) | 0.605 | (0.014) |
| Augmented wealth | 0.594 | (0.006) | 0.562 | (0.006) |
| | CV | | Conditional CV | |
| Net worth | 3.378 | (0.454) | 2.763 | (0.392) |
| Pension wealth | | | | |
| - Total | 1.186 | (0.014) | 1.069 | (0.013) |
| - statutory | 1.077 | (0.011) | 0.890 | (0.011) |
| - civil servant | 5.195 | (0.098) | 0.907 | (0.027) |
| - company | 3.920 | (0.133) | 1.719 | (0.070) |
| Augmented wealth | 1.832 | (0.205) | 1.743 | (0.201) |

Note: All results based on multiple imputed data and 200 bootstrap replicate weights; standard deviation in parentheses. Source: SOEPv30, persons living in private households age 18 and above in 2013 and respondents of the 2012 and 2013 waves.

We complete the inequality analysis with a factor decomposition of augmented wealth. Here we follow Shorrocks (1982) for the coefficient of variation and Lerman and Yitzhaki (1985) for the Gini. Define inequality of total wealth, W, into inequality contributions from each of the factor components of total wealth, $\mathrm{W}^1, \ldots, \mathrm{W}^F$. The coefficient of variation can be decomposed as,

$$\mathrm{CV} = \sum_{f=1}^{F} cor(W^f, W) S_f CV_f,$$

where $cor(W^f, W)$ is the correlation between wealth component $f$ and total wealth, $S_f$ is the share of $f$ in total wealth (Table 4), and $CV_f$ is the coefficient of variation for component $f$ (Table 5). Similarly, the Gini coefficient can be written as,

$$\mathrm{G} = \sum_{f=1}^{F} R_f G_f S_f,$$

where $R_f$ is the Gini correlation between wealth component $f$ and total wealth, and $G_f$ is the relative Gini of component $f$ (Table 5). The products in the sum, the absolute contributions to inequality, $cor(W^f, W) S_f CV_f$, respectively $R_f G_f S_f$, are presented in the

first column of Table 6, while the second column shows the relative contributions, $cor(W^f, W)S_f CV_f/CV$ and $R_f G_f S_f/G$. Further, Table 6 displays for each measure two decompositions. The first approach decomposes total augmented wealth inequality in two components: net worth and total pension wealth. The second approach breaks pension wealth into its three subcomponents.

Both indices show that net worth plays a key role in explaining augmented wealth inequality. In case of the coefficient of variation, the relative contribution to overall net worth inequality is 84%, and 58% in case of the Gini index. Both civil-servant and company pensions, despite high factor-specific inequalities, contribute little to total inequality due to the relatively small share in total wealth. This is different for statutory pension wealth: its contribution to overall inequality is about 25% for the Gini and about 7% for the coefficient of variation, a relatively small share compared to its 38% share in augmented wealth.

**Table 6.** Factor decomposition of augmented wealth inequality

| Wealth aggregate | Absolute contribution | | Relative contribution (in %) | |
|---|---|---|---|---|
| | | Gini | | |
| Net worth | 0.345 | (0.060) | 58.15 | (1.25) |
| Total pension wealth | 0.248 | (0.042) | 41.85 | (1.25) |
| Total inequality | 0.594 | | 100 | |
| | | | | |
| Net worth | 0.345 | (0.060) | 58.15 | (1.25) |
| Pension wealth | | | | |
| - Statutory | 0.150 | (0.025) | 25.22 | (0.86) |
| - Civil servant | 0.062 | (0.011) | 10.46 | (0.70) |
| - Company | 0.037 | (0.007) | 6.17 | (0.48) |
| Total inequality | 0.594 | | 100 | |
| | | CV | | |
| Net worth | 1.539 | (0.239) | 83.95 | (3.69) |
| Total pension wealth | 0.293 | (0.036) | 16.05 | (3.69) |
| Total inequality | 1.832 | | 100 | |
| | | | | |
| Net worth | 1.539 | (0.239) | 83.95 | (3.69) |
| Pension wealth | | | | |
| - Statutory | 0.127 | (0.016) | 6.93 | (1.62) |
| - Civil servant | 0.101 | (0.013) | 5.52 | (1.30) |
| - Company | 0.066 | (0.010) | 3.59 | (0.89) |
| Total inequality | 1.832 | | 100 | |

Note: All results based on multiple imputed data and 200 bootstrap replicate weights; standard deviation in parentheses. Source: SOEPv30, persons living in private households age 18 and above in 2013 and respondents of the 2012 and 2013 waves.

### 5.3 Age-wealth profiles

According to the life-cycle hypothesis, wealth increases up to retirement age and decreases smoothly thereafter, implying a hump-shaped age-wealth profile. The estimation of the profile requires the distinction of age, period and cohort effects. This is not possible with a single cross section, as is the case with the present data. Thus, we simply provide estimates of the profiles using variation over age in the 2012 cross section.

We estimate age-wealth profiles for adult residents of West and East German States separately. The German reunification was a large economic shock for East Germans, and had substantial implications for labor-force participation, income, savings, social-security entitlements, and, presumably, both wealth levels and profiles (see, for example, Fuchs-Schündeln and Schündeln, 2005).

Profiles are derived for each of the six wealth aggregates. Further, we estimate unconditional and conditional profiles. Unconditional profiles consider all valid cases, while conditional profiles exclusively consider persons with a strictly positive wealth level for the particular aggregate. Predictions of wealth-age profiles rely on OLS-regressions for multiply imputed data. Suppressing an index for wealth aggregate, the specification is,

$$W_i^f = \alpha + \beta \times age_i + \gamma \times (age_i)^2 + \delta \times (age_i)^3 + \varepsilon_i \qquad (4)$$

with $W_i^f$ denoting wealth aggregate owned by individual $i$ of wealth aggregate $f$ (net worth, statutory pension wealth, …), $age_i$ age in years, and $\varepsilon_i$ the error term. Age is considered with a quadratic term, which considers the typical dissaving effect after retirement, while the polynomial of the third order is used for robustness purposes.

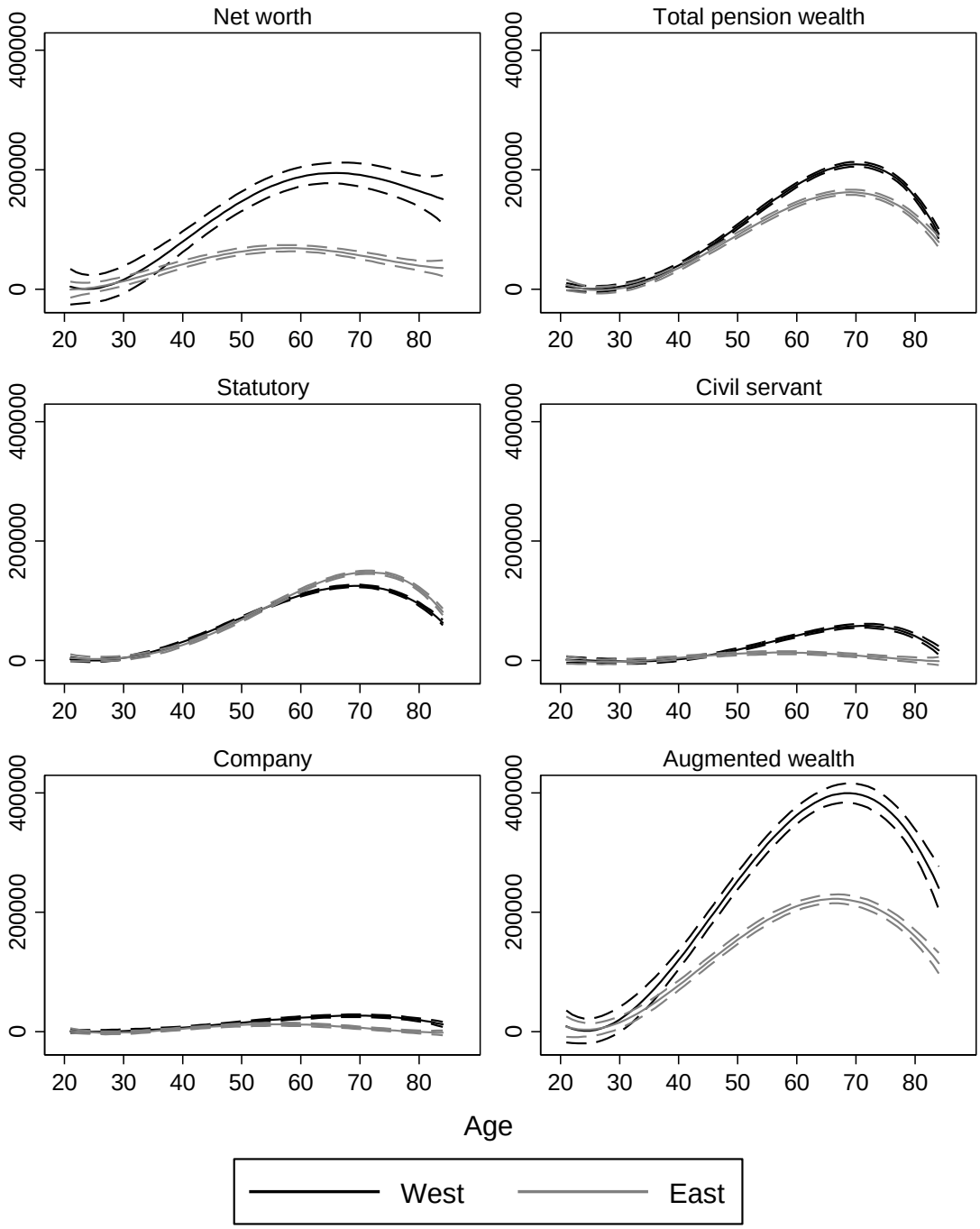
Unconditional profiles are presented in Figure 5. Consistent with the life-cycle hypothesis, we find hump-shaped age profiles for all wealth aggregates. The typical profile shows that while individuals have little wealth at younger ages (around zero), they start accumulating sizeable amounts at around age 30-35, then wealth peaks around age 60-65, and declines thereafter. It is also transparent that, except for entitlements from statutory pensions, wealth profiles are steeper and peak at higher levels for West German residents.

Among residents in the western part, the unconditional value of average net worth at age 40 / 50 / 60 is about EUR 80,000 / EUR 147,000 / EUR 186,000. Among those living in the East, the corresponding values are about EUR 42,000 / EUR 63,000 / EUR 68,000, which reflects the historically different conditions for wealth accumulation in the two parts of Germany

before the wall came down. It is also interesting to note that the east-west divide, the ratio of average net worth owned by residents in the respective region declines in age: East German residents at age 40 / 50 / 60 / 70 / 80 only possess approximately 52% / 43% / 36% / 29% / 24% of the net worth held by residents in the west. The decline suggests that, in particular, the earlier birth cohorts of East German residents have not managed to accumulate sizeable stocks of net worth. For augmented wealth, we also find a widening gap over age, with a maximum difference amounting to almost EUR 181,000 around age 71. The east-west ratio, however, is larger: East German residents of age 40 / 60 / 80, on average, hold approximately 65% / 58% / 51% of augmented wealth owned by West German residents. The narrowing of the regional divide for younger cohorts is basically driven by statutory pension entitlements: here the age-wealth profiles are rather similar for east and west residents, and significantly higher for residents in the east at later ages after retirement. The latter finding is driven by a higher share of the population entitled to statutory pensions among residents in the east, as can be seen from the conditional age profiles in Figure 6. One important reason is the higher labor-market participation of females in East Germany. Another reason is that unemployment was a rare event in the GDR.[45]

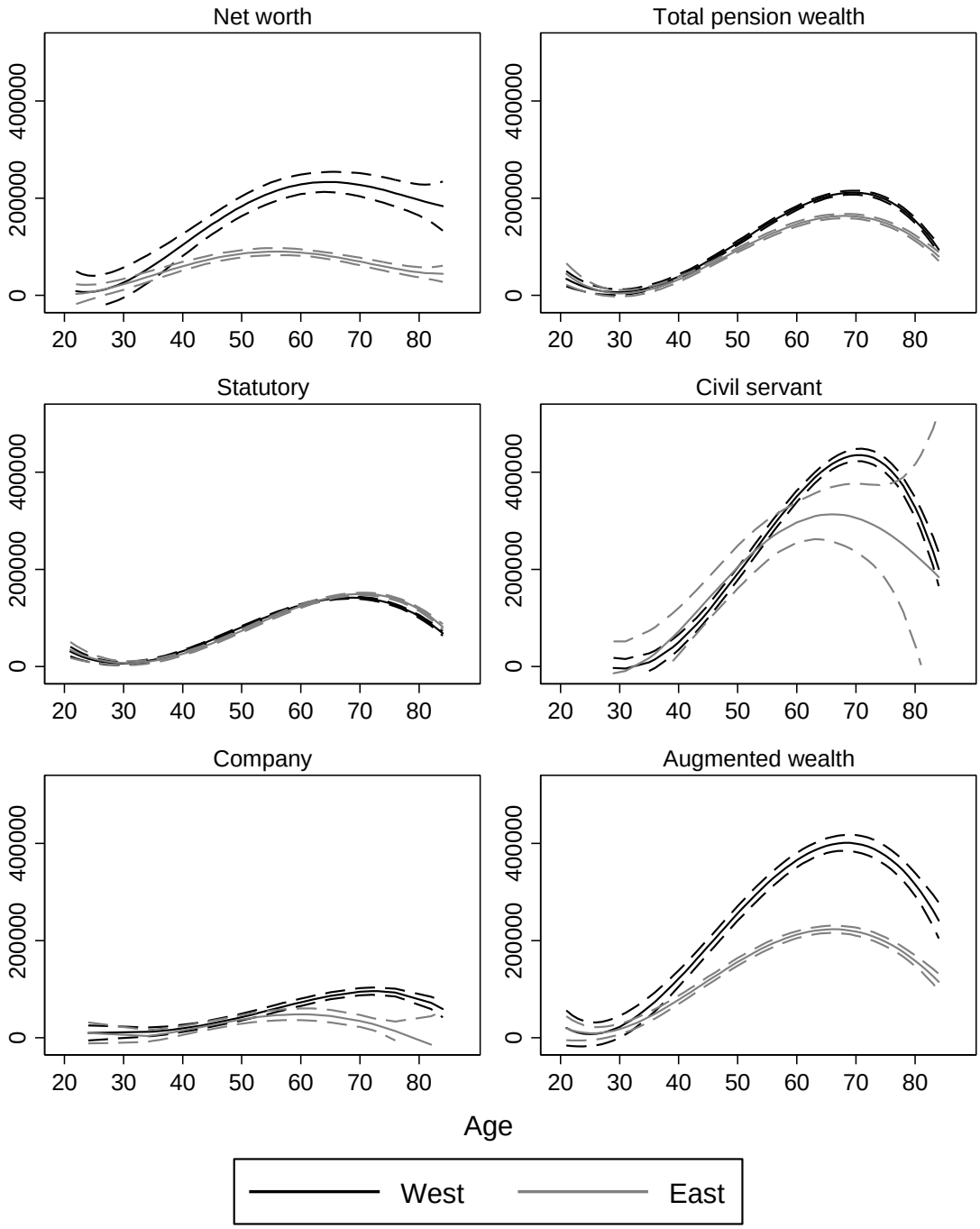
Conditional profiles –based on the respective wealth aggregate– are provided in Figure 6. For net worth and augmented wealth, the profiles are similar to the unconditional profiles. This is because of the high incidence of positive values in the population. The conditional profiles for the three pension wealth measures are noticeably different from their unconditional counterparts. For West Germany, the conditional predicted value for total pension wealth at age 70 amounts to EUR 211,000 and 162,000 in the East. At the same age, the conditional average of net present value of statutory pensions entitlements in West (East) Germany is about EUR 141,000 (EUR 150,000), of civil servant pensions EUR 435,000 (EUR 306,000) and of company pensions EUR 95,000 (EUR 35,000). The generally higher age-wealth profiles in West Germany mirror the still existing earnings gap between the two regions.

[45] After reunification, the basic features of the West German pension law were transferred to East Germany, and East-German employment biographies were translated into West German ones.




Note: Results based on multiply imputed data and 200 bootstrap replicate weights. Region is region of residence in 2012.
Source: SOEPv30, persons living in private households 18 years and older, respondents of the 2012 and 2013 waves.

**Figure 5.** Age-wealth profiles by region 2012 (in Euro)




Note: Results based on multiply imputed data and 200 bootstrap replicate weights. Region is region of residence in 2012.
Source: SOEPv30, persons living in private households 18 years and older, respondents of the 2012 and 2013 waves.

**Figure 6.** Conditional age-wealth profiles by region 2012 (in Euro)

## 6 Conclusion

To our knowledge, this is the first analysis for Germany that considers pension wealth in an analysis of wealth inequalities for the entire retired and non-retired German population. It turns out that the consideration of pension wealth has important implications for the distribution and level of wealth. In Germany, augmented wealth inequality, as measured by the Gini coefficient, is about one quarter smaller than that of net worth. Further, median augmented wealth is about six-times larger than median net worth, while the mean is only twice as high due to the high concentration of pension wealth in the lower half of the net worth distribution: up to the $4^{th}$ decile pension wealth accounts for more than 90% of augmented wealth. Finally, following the life-cycle hypothesis, our findings confirm the typical pattern of a wealth accumulation process over the working career with the highest wealth levels around retirement age. Thereafter augmented wealth slightly decreases on average. This life-cycle pattern can be observed in both East and West Germany, although at a much higher level for the latter region.

When interpreting these results, one should not forget that pension entitlements cannot be easily traded or used as collateral. Further, there is no standard market interest rate (such as interest and dividends from capital) and there are limits to bequeathing (which goes beyond survivors pensions). This means that pension wealth might not be viewed as a perfect substitute for financial or real wealth. At the same time, numerous previous works demonstrate a negative relationship between the generosity of public pension schemes and private savings (and wealth accumulation). Thus, comparisons of standard wealth measures across countries with pensions systems of different generosity might fail to appropriately capture individual overall material resources.

While the OECD abstracts from considering pension wealth in their wealth analyses, primarily for practical reasons (OECD 2013a:71), our analysis should encourage data providers to include measures of pension wealth in their databases. The inclusion is important against the background of deep pension reforms in nearly all OECD-countries – typically increasing the relevance of private provision and shifting from defined benefits to defined contributions –as it permits rigorous cross-country comparisons on the wealth levels of nations.

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## Appendix

**Do you have pension claims *(Anwartschaften)* from the statutory pension insurance *(gesetzlichen Rentenversicherung)*?**

Yes ☐ ⇩ No ☐ → *Question **104!***

Does not apply, I am already receiving pension payments ☐

**How high are the monthly pension claims that you have accrued so far? In other words, how much would you receive in monthly pension payments according to your current information from the German Pension Insurance?**

☞ *This value is the second value in the box on the right-hand margin of your pension information from the German Pension Insurance. Please state the exact amount written there.*

☞ *If you are unable to check, please try to remember and give the approximate amount.*

**exactly** **approximately**

Amount in euros: ... ☐ ..... ☐ .....

Did not receive pension information ..... ☐

*Muster: Ausschnitt aus der Renteninformation*


**Aside from your statutory pension, do you also have a supplementary company pension plan or a supplementary pension plan for public employees (such as bAV, VBL)?**

☞ *Company pension provisions include company retirement accounts, pension funds, relief funds, deferred compensation, as well as what are known as direct commitments and direct insurance from employers (betrieblichen Direktzusagen, Direktversicherungen).*

Yes ☐ ⇩ No ☐ → *Question **110!***

Does not apply, I am already receiving supplementary pensions ☐

**What type of supplementary company pension plan or supplementary pension plan for public employees do you have?**

paid for entirely by my employer ..... ☐

paid for entirely by me ..... ☐ ⇨ Are you using deferred compensation?

A mixture of types ..... ☐ Yes ..... ☐ No ..... ☐

**How high are the claims you have accrued so far to company pensions?**

☞ *Please state the pension payment amount from your last insurance statement.*

☞ *If you are unable to check the statement, please try to remember and give the approximate amount.*

**exactly** **approximately**

Amount in euros: ... ☐ ..... ☐ .....

Did not receive an insurance statement ..... ☐

**Figure A1.** Questionnaire – pension claims survey year 2013

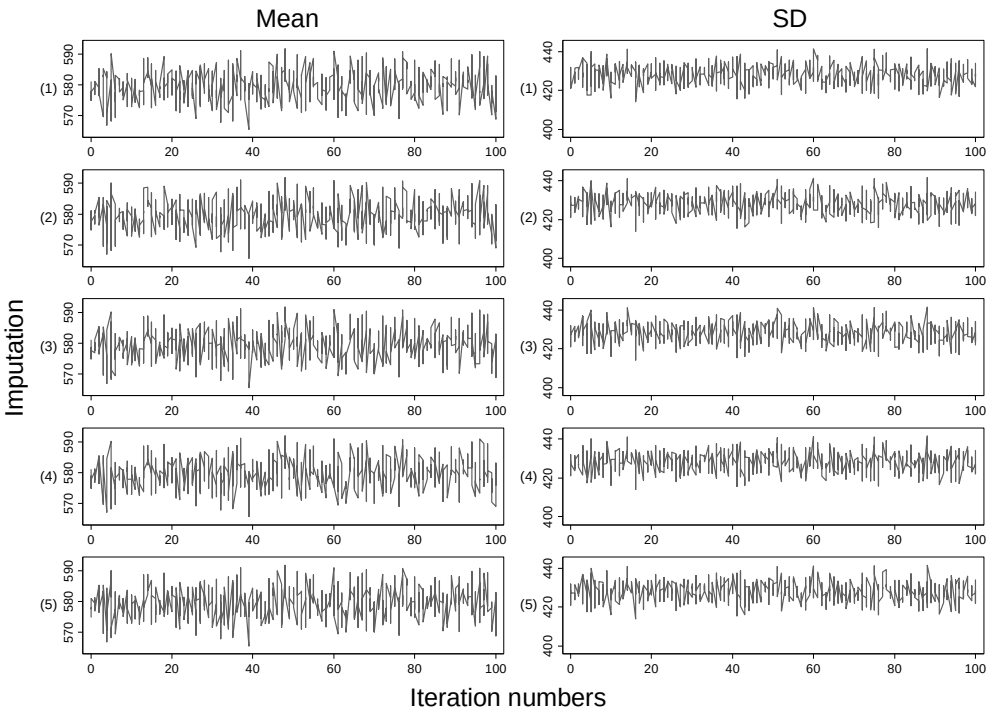


**Figure A2.** Trace plots for predictive mean matching imputation, statutory pension entitlements

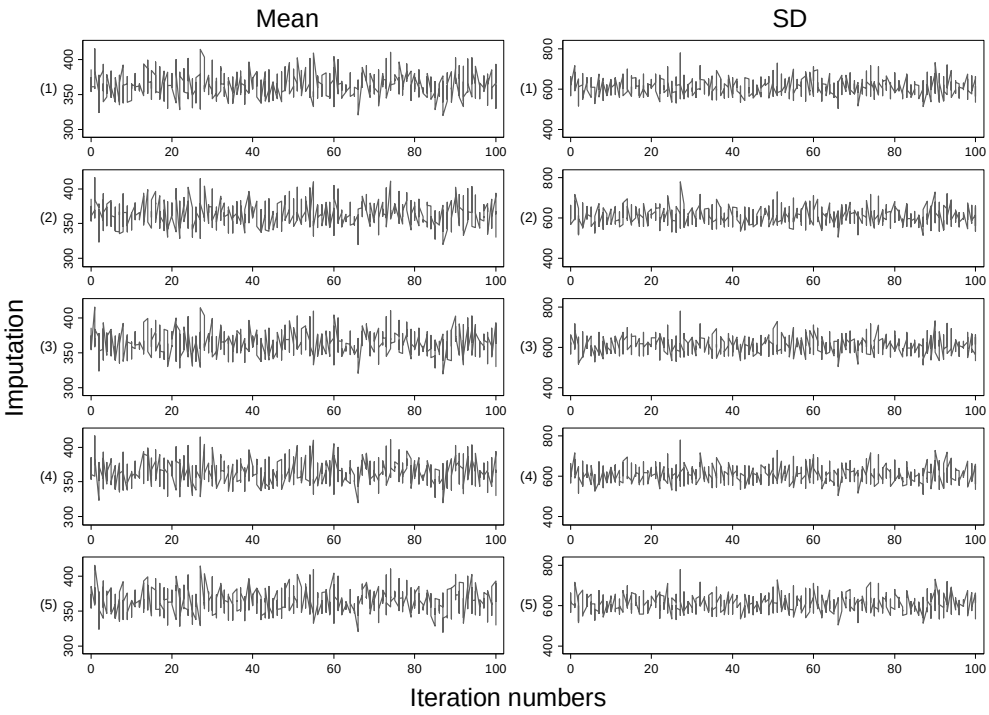


**Figure A3.** Trace plots for predictive mean matching imputation, company pension entitlements

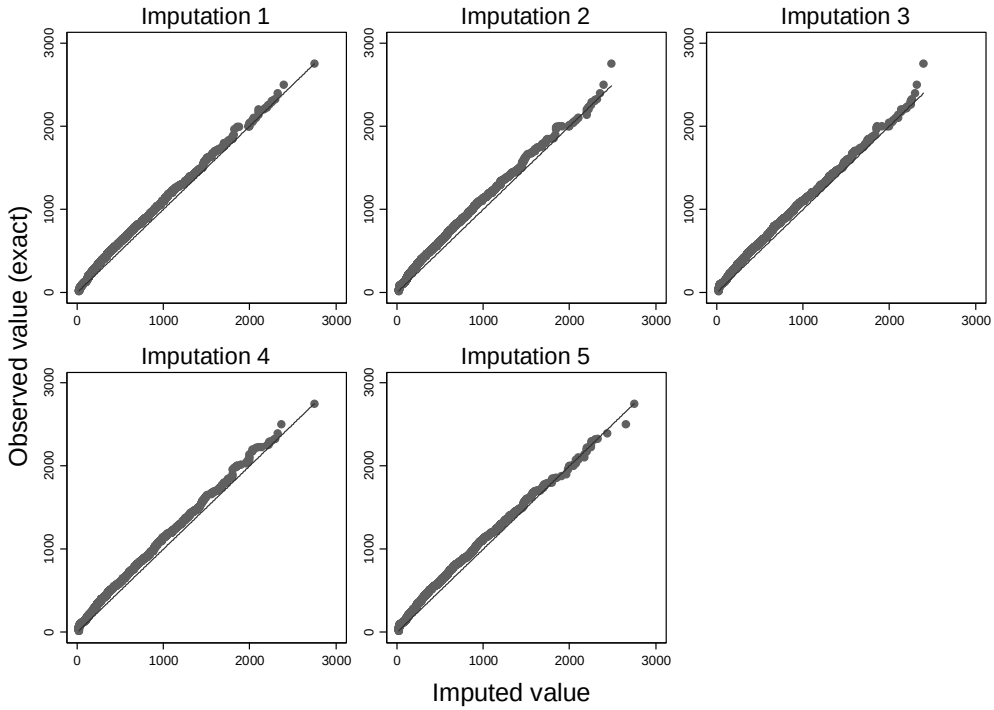


**Figure A4.** QQ-plots for exact vs. imputed values for statutory pension entitlements

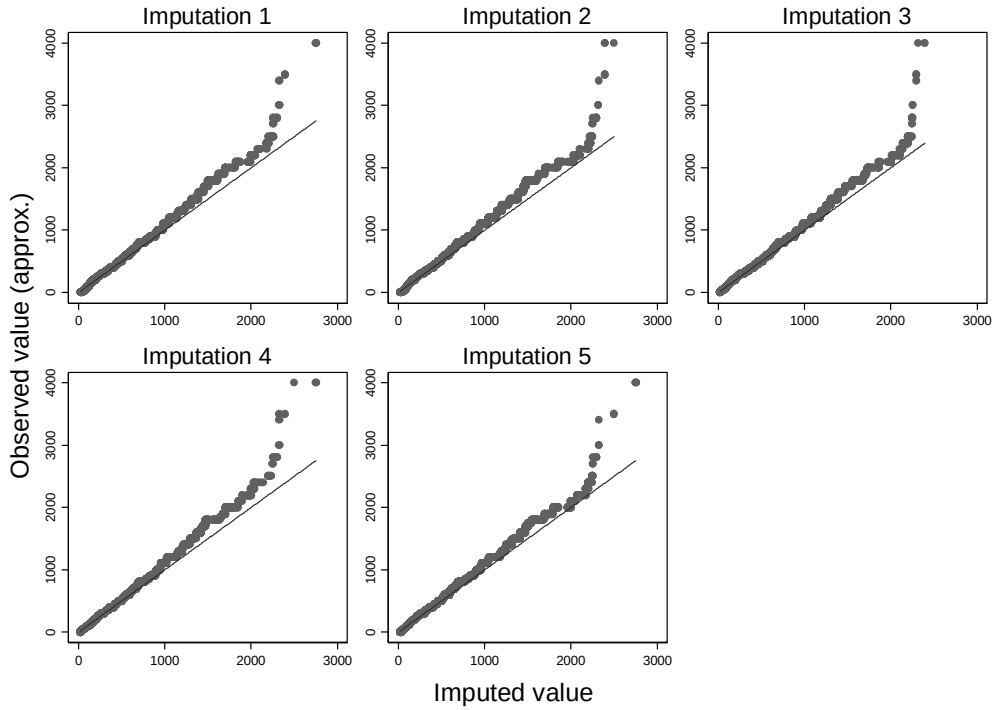


**Figure A5.** QQ-plots for approximated vs. imputed values for statutory pension entitlements

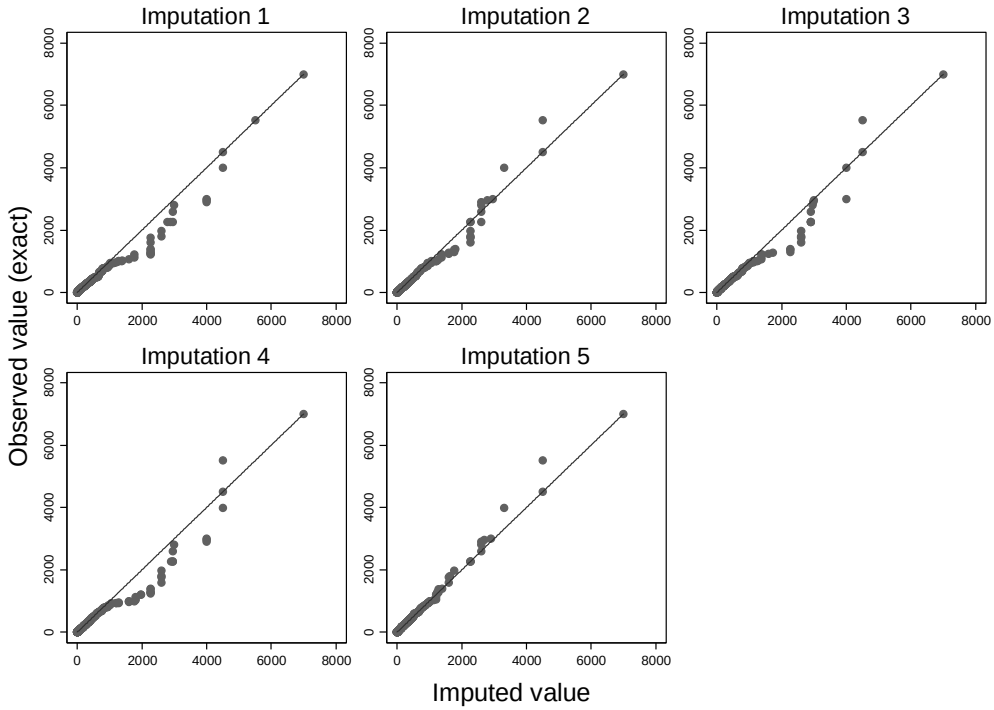


**Figure A6.** QQ-plots for exact vs. imputed values for company pensions

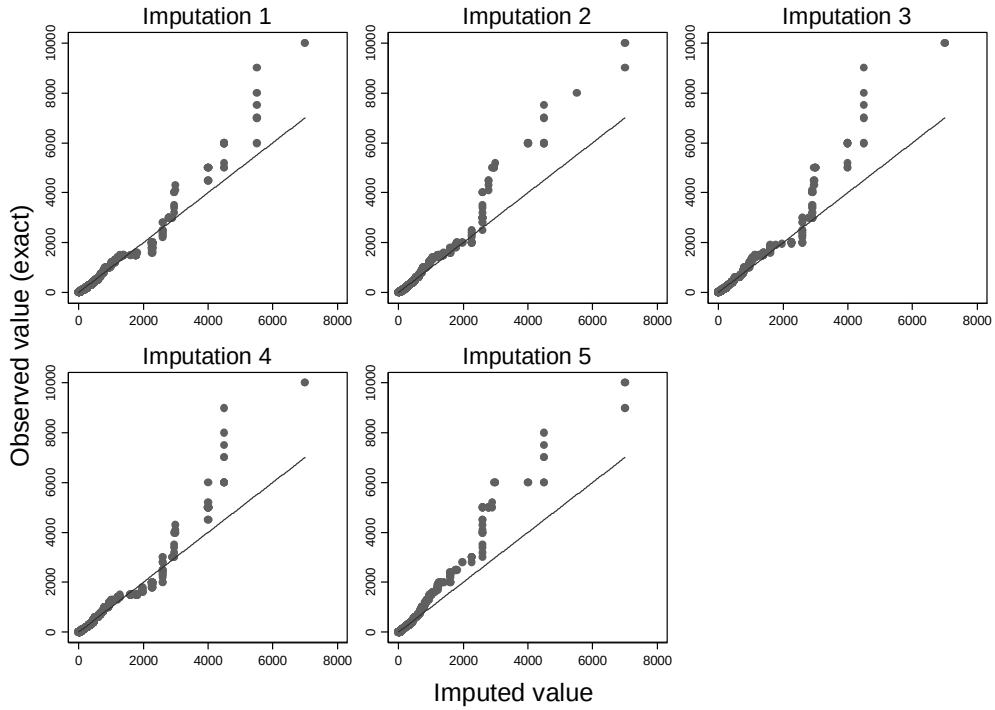


**Figure A7.** QQ-plots for approximated vs. imputed values for company pensions

**Table A1.** Wealth levels and inequality using alternative interest rates (total population)

| Wealth aggregate | Median (in Euro) | Mean (in Euro) | | Gini | | CV | |
|---|---|---|---|---|---|---|---|
| | | Interest rate of 0% | | | | | |
| Net worth | 18,000 | 85,348 | (2,082) | 0.785 | (0.007) | 3.378 | (0.454) |
| Pension wealth | | | | | | | |
| - Total | 119,237 | 156,196 | (2,008) | 0.502 | (0.005) | 1.030 | (0.017) |
| - Statutory | 94,069 | 115,148 | (1,273) | 0.494 | (0.004) | 0.922 | (0.012) |
| - Civil servant | 0 | 22,055 | (0,874) | 0.962 | (0.001) | 4.832 | (0.089) |
| - Company | 0 | 18,994 | (1,016) | 0.894 | (0.004) | 3.597 | (0.145) |
| Augmented wealth | 173,106 | 241,545 | (2,803) | 0.527 | (0.006) | 1.451 | (0.141) |
| | | Interest rate of 2% | | | | | |
| Net worth | 18,000 | 85,348 | (2,082) | 0.785 | (0.007) | 3.378 | (0.454) |
| Pension wealth | | | | | | | |
| - Total | 73,741 | 107,257 | (1,324) | 0.544 | (0.004) | 1.130 | (0.015) |
| - Statutory | 56,022 | 79,145 | (0,861) | 0.537 | (0.004) | 1.022 | (0.011) |
| - Civil servant | 0 | 15,829 | (0,650) | 0.966 | (0.001) | 5.073 | (0.094) |
| - Company | 0 | 12,283 | (0,619) | 0.900 | (0.004) | 3.788 | (0.134) |
| Augmented wealth | 124,061 | 192,605 | (2,446) | 0.574 | (0.006) | 1.714 | (0.185) |
| | | Interest rate of 3% | | | | | |
| Net worth | 18,000 | 85,348 | (2,082) | 0.785 | (0.007) | 3.378 | (0.454) |
| Pension wealth | | | | | | | |
| - Total | 58,990 | 91,440 | (1,133) | 0.566 | (0.004) | 1.186 | (0.014) |
| - Statutory | 43,617 | 67,500 | (0,745) | 0.560 | (0.004) | 1.077 | (0.011) |
| - Civil servant | 0 | 13,740 | (0,576) | 0.967 | (0.001) | 5.195 | (0.098) |
| - Company | 0 | 10,200 | (0,506) | 0.905 | (0.004) | 3.920 | (0.133) |
| Augmented wealth | 107,391 | 176,789 | (2,370) | 0.594 | (0.006) | 1.832 | (0.205) |
| | | Interest rate of 4% | | | | | |
| Net worth | 18,000 | 85,348 | (2,082) | 0.785 | (0.007) | 3.378 | (0.454) |
| Pension wealth | | | | | | | |
| - Total | 46,723 | 79,216 | (0,993) | 0.587 | (0.004) | 1.242 | (0.014) |
| - Statutory | 34,185 | 58,498 | (0,660) | 0.582 | (0.004) | 1.132 | (0.011) |
| - Civil servant | 0 | 12,090 | (0,517) | 0.969 | (0.001) | 5.314 | (0.102) |
| - Company | 0 | 8,629 | (0,424) | 0.909 | (0.003) | 4.065 | (0.136) |
| Augmented wealth | 96,242 | 164,564 | (2,320) | 0.611 | (0.006) | 1.940 | (0.222) |

Note: Medians based on first imputation. For all other statistics, results based on multiple imputed data and 200 bootstrap replicate weights; standard deviation in parentheses. Source: SOEPv30, persons living in private households age 18 and above in 2013 and respondents of the 2012 and 2013 waves.

**Table A2.** Robustness of median over imputations

| Wealth aggregate | Median (in Euro) | | | | |
|---|---|---|---|---|---|
| | Imputation 1 | Imputation 2 | Imputation 3 | Imputation 4 | Imputation 5 |
| Net worth | 18,000 | 17,100 | 17,300 | 17,300 | 17,000 |
| Pension wealth | | | | | |
| - Total | 58,990 | 57,968 | 57,719 | 58,159 | 57,124 |
| - Statutory | 43,617 | 43,497 | 44,310 | 44,399 | 43,565 |
| - Civil servant | 0 | 0 | 0 | 0 | 0 |
| - Company | 0 | 0 | 0 | 0 | 0 |
| Augmented wealth | 107,392 | 107,106 | 106,945 | 106,792 | 108,215 |

Note: Results based on respective imputation. Source: SOEPv30, persons living in private households age 18 and above in 2013 and respondents of the 2012 and 2013 waves.