Wealth Inequality and the Importance of Public Pension Entitlements*

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Abstract:

In recent years, the social policy discussion in Germany—but elsewhere as well—has been heavily dominated by the issue of income inequality and rising poverty risk rates. Yet very little research has been done on the personal wealth distribution to date, not least of all due to the severe lack of appropriate data. Using representative micro-data from the Socio-Economic Panel Study (SOEP), the German contribution to the Luxembourg Wealth Study (LWS), this paper analyzes a standard measure of *net* worth (including property, financial assets, business assets) for 2007. Detailed analyses by SES reveal significant differences in wealth holdings by occupational status as well as across age groups, but are based on a "standard" net worth concept and thus ignore any entitlements to public pension schemes. In the present paper, we use statistical matching to link the SOEP survey data to data from the German Social Security Administration. Using retrospective life history data as well as concurrently collected data from up to 24 annual interviews in the SOEP, our matching is based on education, employment, and income history as well as fertility data, all of which are relevant correlates of pension entitlements. This approach allows us to calculate the present value of an individual's public pension entitlements as of 2007.

Our results for the extended wealth measure indicate a very strong impact of pension entitlements on wealth levels and wealth aggregates (plus 95 percent of non-pension wealth), on the portfolio structure, as well as on wealth inequality (the Gini coefficient is reduced by roughly one quarter), all of which reflect the dominant role of the public pension system in Germany. The effect on "middle-class" households is particularly strong when using either income or net worth measures as the basis for defining the middle class. This augmented wealth measure may be useful to reduce the respective inequality bias *within* a given country (here Germany) resulting from different incentives to invest in old-age provision depending on employment status (self-employed, public servant, dependent employee), but it may be most important for comparative research on wealth inequality across countries and welfare regimes.

JEL-codes: C49, D31, D63, I39

Keywords: Wealth inequality, statistical matching, public pension entitlements, SOEP, LWS

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1 Motivation

Pension entitlements—whether statutory, occupational, or private—represent a considerable source of wealth. But despite the importance of this wealth component—often referred to as public pension wealth[3]—in obtaining unbiased wealth estimates, it has not been adequately investigated in the wealth distribution research.

There are two main reasons why pension wealth is typically disregarded in wealth analyses based on survey data. First, interviewees usually do not know their accumulated pension entitlements, given that in a standard pay-as-you-go old age security system, contributions are compulsory for employers and employees. Pension entitlements are based on earnings but also may cover periods of child-rearing, education, long-term care, or unemployment, with pension entitlements for each of these periods being calculated differently. The insured person generally does not know the precise sum of all of these entitlements.[4]

Second, one may argue that pension wealth represents only a "notional" asset. Simply adding this component to financial and material assets is problematic because such standard assets carry specific functions that pension entitlements largely fail to fulfill. For example, in contrast to interest payments received from savings, no (further) income can be gained from pension entitlements; the latter also lack the usage function of real estate, and the possibility of bequeathing them takes only the severely limited form of provision for dependants (in the form of widow/er pensions). The power, socialization, and prestige functions associated with great monetary and material wealth holdings are also not relevant in the case of old-age pension entitlements. Premature liquidation of entitlements, for example for the purchase of

[3] The terms public pension wealth and social security wealth are defined as the total sum of individual pension rights accrued so far over the life course. These pension rights translate into old-age public pension benefits as the individual retires. Both terms are used interchangeably throughout the paper and refer only to entitlements in the old-age public pension scheme.

[4] In a small pretest of the German Socio-Economic Panel Study (SOEP) in 2002, interviewees were asked for individual social security wealth. The question generated an extraordinarily high percentage of missing data; the reliability of the information given by the remainder of respondents was questionable. Similarly, a 2009 pilot study tested the willingness of SHARE respondents to allow for record linkage with administrative data using their Social Security Number (SSN). While 77 percent gave their consent, only 64 percent of these respondents actually provided their SSN.

real estate, is barred, as is taking an advance. What remains, then, is merely the security function. But even this function is limited to the phase of life that follows retirement, or to cases of occupational disability or provision for dependants. Finally, although pension wealth represents protected private-sector capital stock, the state could change the value of assessment-financed entitlements, making pension entitlements a variable stock of wealth.

Notwithstanding all these arguments, which are similarly valid across countries, conventional analyses using a standard net worth measure also face the problem of major differences between occupational groups *within* a given country in terms of both pension scheme designs and the savings behaviour resulting from different incentive structures. In the case of Germany, some occupational groups are exempted from the statutory pension system and therefore have to put away money for retirement on their own. This is true for most self-employed people, who typically invest in private insurance plans, real estate, or business assets, i.e., types of assets that are usually adequately captured in a standard measure of net worth. A second important group not covered by the statutory pension system is civil servants, who generally do not contribute a significant percentage of their earnings to their pension scheme but still enjoy fairly high tax-financed benefits after retirement.[5] By contrast, wage-earners and salaried employees generally have compulsory pension schemes and in some cases occupational pension schemes as well.[6]

The problem of dissimilarities across occupational groups is considerably larger in the case of international comparisons. Depending on which welfare regime is being examined, the relevance of public pension wealth in an extended measure of net worth may differ widely. For countries like Germany with a mature pay-as-you-go pension (PAYG) system, pension wealth is clearly more important in quantitative terms than in liberal welfare systems that put more emphasis on private pension provision. Convincing evidence is presented by Frick and Head-

[5] The replacement rate for civil servants in Germany retiring after forty years of full-time employment amounts to almost 72 percent of their recent gross earnings. In contrast, the replacement level for the standard public pension system retiree (the so-called "Eckrentner"), who worked for 45 years with average earnings, is as high as approximately 48 percent of previous earnings (Bundesministerium für Arbeit und Soziales 2008).
[6] The consideration of public pension entitlements in wealth analyses might also be helpful for a better understanding of savings behavior across occupational groups, given that there is still not a fully satisfying theoretical model to explain savings behavior (see Börsch-Supan 2001).

ey (2009), who compare the wealth position of retirees (aged 65 and over) in Australia and Germany, that adequately accounting for the present value of pension wealth in an extended wealth measure yields very similar levels of wealth for these groups in both countries—in contrast to the results based on standard net worth, which clearly favor elderly Australians. 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 both countries.

Last but not least, when assessing the impact of public pension wealth, one should also consider inter-temporal changes in benefit levels in the different pension schemes. Demographic changes such as population aging place social security systems under pressure, reducing the generosity of public pensions and the public/private pension mix (Bonin 2009). This may affect middle-income earners most severely, given that a large share of total net worth is contained in pension entitlements.

The aim of this paper is to show the relevance and magnitude of public pension wealth when considered in an extended wealth measure. Given that such information is not readily available in survey data, we describe how, in the German case, pension entitlements can be determined by means of statistical matching and how the present value can be defined.[7] We analyze the impact of pension entitlements on the distribution of net worth, considering variation in wealth across socio-economic groups defined according to age, income, and occupational status. Based on our findings for Germany, we strongly recommend the use of an extended wealth measure like the one proposed here, taking the present value of pension entitlements fully into account in cross-country comparative research on wealth inequality.

[7] We follow the approach by Gruber and Wise (1999) converting future income flows from old age pension schemes into a stock measure.

2 Determining public pension entitlements

Population surveys in Germany typically do not ask for information about social security wealth, because respondents usually do not know their total pension entitlements at any particular point in time. Register data, on the other hand, contain detailed information on pension entitlements, but no information about other wealth components or the individual's socio-economic background or household situation. For the purpose of a comprehensive analysis of the wealth distribution, ideally, survey and administrative data could be directly merged using a unique identifier such as the individual's social security number ("record linkage"). However, at least in Germany, this option is not feasible for data confidentiality reasons, i.e., one has to ask for the social security number and for informed consent (with respect to record linkage), both of which motivate respondents to reject (further) participation. Statistical matching may provide a second-best option to overcome the drawbacks of both data sources and make use of their respective merits. Unlike record linkage, statistical matching does not aim at finding the exact same person, but links observations that are statistically similar, at least in terms of certain characteristics observed in both data sets ("matching variables").

2.1 Statistical matching of survey data and pension account information

The following section describes our double matching approach in determining public pension entitlements. First, we combine standard data on net worth from the representative German Socio-Economic Panel (SOEP) study with data on total pension entitlements accrued over the life course from the German Social Security Administration's sample of active pension accounts (*Versicherungskontenstichprobe*, VSKT). An additional link to data from the "statistics on pension benefits splitting after divorce" (*Versorgungsausgleichsstatistik*), or divorce statistics, provides an effective control of effects of divorce on pension benefits, which would otherwise be ignored but can have important impacts on divorced people's pension entitlements. The most important outcome measure resulting from this double matching procedure is an estimate of the individual's social security wealth as of 2007.

The German SOEP is a multidisciplinary household panel study (Wagner at al. 2007). Start-

ing in 1984, it covers a representative sample of the total population living in private households in Germany. In 2007, about 12,000 households and 22,000 individuals were interviewed. The micro-data provide detailed information on individuals, households, and families, and enable researchers to monitor changes in living conditions over time. The standard components are surveyed annually, whereas certain special topic modules are surveyed at roughly five-year intervals. In 2007, a special wealth module collected detailed data on material and financial wealth at the individual level (Frick et al. 2007), but no information on public pension entitlements. This paper seeks to fill this gap by using data from the sample of active pension accounts (*VSKT*). This is a one percent random sample of pension accounts, containing records for approximately 570,000 individuals, both actively insured and already retired. These records are representative of all those individuals who contribute(d) to the GRV pension scheme. The VSKT collects detailed longitudinal pension-relevant information on monthly earnings, unemployment spells, and periods of child care as well as long-term care over the course of working life. The third data set used in the analysis is the "statistics on pension benefits splitting after divorce" (*Versorgungsausgleichsstatistik*), or divorce statistics. The divorce statistics are designed to aid the administration of the pension system, and contain information on the splitting of pension benefits in all relevant divorce settlements—a total of 5.5 million cases since their introduction in 1977. Further, these statistics contain information about marriages and divorces that goes beyond the information provided in the VSKT.

We slice both data sets, SOEP and VSKT, by sex, region, and immigrant status, taking into account pronounced regional and gender differences in pension entitlements. Pensionable earnings and pension-relevant transfer payments (e.g., unemployment benefits, etc.) are the most important determinants of the individual's social security wealth, and hence, our key matching variables. An income measure summarizes all income that qualifies for the accrual of pension benefits (earnings, unemployment benefits, sickness allowances, etc.).[8] For the

[8] Both data sets contain earnings and income information for the years 1983 to 2007 for West Germany and 1991 to 2007 for East Germany. Thus, we are covering the entire period since German unification in 1990, when the West German social security system was by and large transferred to East Germany, providing GDR workers with pension entitlements for all years of employment during the existence of the GDR without having paid any contributions.

computation of the distance function, income enters the equation as a three-year moving average to smooth individual income histories (average income for the years 1984-1986; 1985-1987, …, 2003-2005): for each individual, this adds up to a maximum of 20 variables.[9] A woman's fertility history is used in the statistical matching as additional information, since it determines the number of childcare credits that translate directly into pension entitlements credited to the woman's pension account. In addition, we take various duration variables into account in the computation of the distance metric reflecting the number of years spent in different activities such as employment, unemployment, education, compulsory military or community service (men only), and long-term care. Finally, the statistical matching includes the age of the respondent as of 2007.

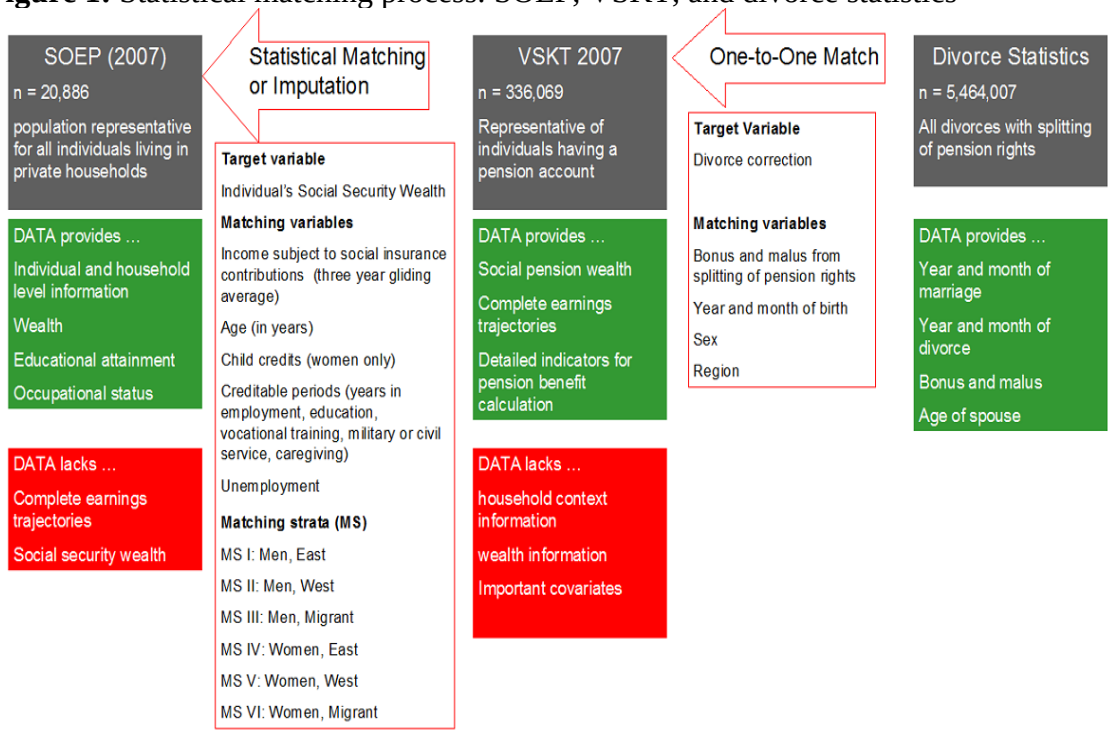
Given the representativeness of the SOEP sample for the German population, we match VSKT information to SOEP data, i.e., the SOEP data provides the *recipient file*. Matching the data in this way enables us to maintain the representative demographic structure of the SOEP population and eliminate potential issues of selectivity inherent to VSKT data.

The statistical matching between the SOEP and the VSKT data makes use of Mahalanobis distance matching (Kantor 2006), which is frequently used in cluster analysis. For each observation x_i in the SOEP, the statistical software measures the Mahalanobis distance d_{ij} from each observation x_j in the VSKT on the basis of the selected matching variables p. The statistical donor chosen is the VSKT observation with the smallest distance from the SOEP case. Unlike the Euclidean distance, the Mahalanobis score incorporates correlations between matching variables and differences in variances. This implies that highly correlated matching variables do not enter the computation of the Mahalanobis distance with the same weight. This property is particularly useful in our application, since the individual's annual income at time t is likely to be highly correlated with the annual income at time t+1.[10]

[9] For all 2007 SOEP respondents with incomplete income profiles, missing information was imputed starting in 2007 and going back to 1984 for West Germany and to 1991 for East Germany. The imputation process made maximum use of all available longitudinal income information since the respondent's initial participation in the SOEP.

[10] In alternative specifications, OLS regression, univariate imputation sampling, and hotdeck imputation were used to combine the two data sets. Using information on actual pension payments received by retired SOEP respondents, we compared imputed results using the different approaches with the observed amounts. The Mahala-

Figure 1: Statistical matching process: SOEP, VSKT, and divorce statistics



Source: Rasner et al. (2010)

Divorce cannot be adequately considered when matching SOEP data with the administrative pension data provided by the VSKT, so an additional match is required to correct for the splitting of statutory pension benefits between former spouses. For every divorce, the pension rights accrued by husband and wife during their marriage are summed up and split in half at the date of divorce.[11] Information provided in the divorce statistics of the statutory pension insurance is the appropriate data source to correct for this potential bias. To estimate the divorce correction, we combine VSKT and divorce statistics using record linkage. The unique identifier used for the linkage is a combination of the exact amount of the split pension, gender, region, and age. Based on the linked data, we estimate group-wise linear regression models that provide us with the divorce correction, which is then applied to SOEP data. Figure 1 illustrates the statistical matching process between the three data sources including matching

nobis distance performed best with respect to absolute differences, distribution, and correlation (see Rasner et al. 2010).

[11] In practice, women are the main beneficiaries of pension splitting because of their weaker labor market attachment. For the majority of divorced couples, the pension is split immediately upon divorce, while bonuses and maluses remain unaffected by the remarriage of either former spouse.

strata and the respective matching variables.[12]

2.2 The principle of capitalization of pension entitlements

For the following analysis of (extended) wealth inequality, we use a measure of net worth from SOEP data in conjunction with the present value of pension wealth entitlements accrued so far from statutory, occupational, and private pension schemes. The latter complement the asset information contained in the SOEP data: owner-occupied and other real estate holdings, financial assets, assets from life insurance policies and private pension schemes, building society savings agreements (*Bausparverträge*), business assets, valuables, and consumer and mortgage loans. Total net worth—the relevant criterion when discussing social welfare and the key indicator when analyzing the personal wealth distribution—is determined by subtracting liabilities from gross assets.

The income section of the SOEP questionnaire asks retired people a number of questions about benefit payments from the different types of pension schemes. As a result, pension entitlements, i.e., the present value of the respective future income streams for those already retired, can be derived directly from their answers, assuming these benefits will be paid as an annuity for the remaining lifetime. However, for the insured but not yet retired people, i.e., people of working age, the information about pension entitlements from the statutory pension insurance is obtained through statistical matching as described above. The SOEP does not contain questions about pension benefits such as occupational pensions or pensions for independent professionals (such as architects or physicians) or tradesmen for the currently insured population (due to the fact that respondents are by and large unable to provide specific answers), nor is there external information comparable to the statutory VSKT data that could be used to generate this missing information through statistical matching. For the cohorts prior to entry into retirement, therefore, the entitlements under these old-age pension systems have been underestimated.[13] A crucial exception is data on pension entitlements for non-retired civ-

[12] For a detailed description of the matching process, the employed matching variables and a simulation to determine the appropriate matching strategy, see Rasner et al. (2010).
[13] Figures in this paper do not include any provisions for dependents (widows or orphans).

il servants. For these active civil servants the amount of the entitlements can be reliably approximated based on the current pay level and the years of service. For each year of service, civil servants are entitled to 1.79375 percent of the level of gross earnings received during the last three years prior to retirement[14]. After 40 years of service, this accumulates to a maximum share of 71.75 percent.

Pension entitlements are assessed through capitalization, that is, by calculating the discounted present value of recurring future payments (see formula 1). For the payout period, the average further life expectancy (according to the 2005/2007 mortality charts of the German Federal Office of Statistics, separated by East and West Germany and by sex) is considered. In addition, a retirement entry age that varies between 65 and 67 (according to the Pension Reform Act 2007) depending on the age cohort is used as a basis. With the additional assumption that future pension increases and inflation will balance each other out, the calculations are simplified in such a way that the real value of the entitlements is preserved.[15] An interest rate of two percent is assumed for discounting purposes.[16] The resulting value is the gross pension entitlement.

Formula 1: Determining the Present Value (PV) of pension entitlements

$$PV = \frac{C}{i} \cdot [1 - \frac{1}{(1+i)^n}]$$

with C = pension benefit, *i* = discount rate, n = further life expectancy in years (payment period)

However, various status groups differ with respect to the tax treatment of retirement income. For example, life annuities and other benefits such as GRV pensions, agricultural pension funds, or trade association pension funds are not fully taxed; rather, a taxable income share,

[14] Using the current pay level most likely leads to an underestimation of the true future pension entitlement of civil servants, given that subsequent earnings increases are not considered.
[15] Because of the pension reform act of 2004 and the sustainability factor introduced with it, future pension entitlements will decline from birth cohort to birth cohort for the same number of payment points. For reasons of simplicity, however, this aspect is ignored here.
[16] In alternative specifications we vary the interest rate between one and three percent; the choice of interest rate influences, by definition, the amount of the present value but changes little in the basic relationships according

which varies depending on when one starts receiving the pension, applies (§22 of the German Income Tax Act [*Einkommensteuergesetz*]). For example, the taxable share of pensions received for the first time in 2007 is as high as 54 percent. With each additional calendar year, the income share for new pensions increases, reaching 80 percent by the year 2020 and 100 percent by 2040.[17] On the other hand, civil servants' annuities are already fully taxable. To determine the net present value of any pension entitlements, the individual tax rate applicable in 2007 is used here and is also differentiated according to the various status groups.[18]

In order to prevent double counting, no present value is determined for entitlements from private pension plans, since the SOEP collects data on these wealth components in the part of the SOEP questionnaire dealing with net financial assets.

3 The impact of pension entitlements on wealth inequality

3.1 Individual net worth without pension entitlements

The aggregated net worth of individuals in private households in Germany amounted to about 5.9 trillion euros in 2007 (Table 1)[19] which is about 83,000 euros per capita. However, such mean values can be highly affected by outliers, which appears to be more of an issue for wealth analysis than for income analysis. Additionally, one should keep in mind that net worth can take on negative values. As such, comparing the mean and median of the distribution is already very informative: indeed, in the year 2007, the latter takes on a value of less than 15,000 euros, thus, the mean exceeds the median by a factor of 5.5, which is very indicative of the overall degree of inequality.

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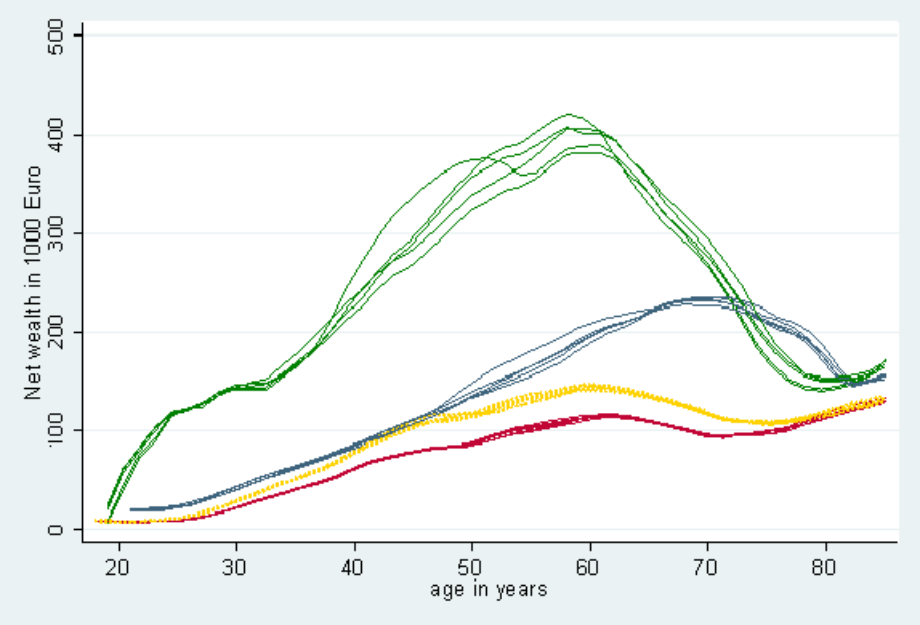
to occupational groups as described here.

[17] Under the German Retirement Income Act (*Alterseinkünftegesetz*), the principle of deferred taxation of pensions has been applied in Germany since 2005. Under this act, all old-age income will be gradually made fully taxable by the year 2040. In return, old-age provision expenses can be deducted from personal income taxes, reducing the progressive effect and the tax burden during the period in which income is earned from employment.

[18] By applying the current individual tax rate, a relatively high tax burden is assumed for insured working persons. The actual tax burden would, however, have to be simulated separately for each age cohort at the time of entry into retirement. Because of the recently introduced deferred taxation, however, such a simulation is combined with major assumptions about the future income situation of the persons in question.

Figure 2: Individual net worth by status group, Germany 2007



— Self-employed, — civil servants, — Members of the statutory public pension scheme (GRV), — Persons with continuous GRV insurance

Note: for each group, the five lines represent the individual net worth derived from the multiple imputation procedures applied to compensate for missing wealth information arising from non-response (see Frick et al. 2007).
Source: SOEP 2007

Following the standard life-cycle hypothesis (Modigliani 1988) there is a strong relationship between net worth and age, assuming that with increased age wealth is typically accumulated until retirement. After leaving the labor force, dissaving occurs to smooth income gaps. However there are pronounced deviations in the levels of wealth accumulation between various status groups over the life cycle (Figure 2). Not surprisingly, self-employed persons in Germany accumulate the highest levels of net worth: around retirement (60 years old), their net worth is around 400,000 euros, twice as high as that of civil servants and 3.5 times higher than individuals insured under the statutory pension scheme (GRV). Even for members of the GRV with a continuous occupational history and few to no periods of unemployment that would lead to a reduced ability to save, net worth adds up to only 140,000 euros around retirement.

[19] See also Frick and Grabka (2009, 2010).

3.2 Individual net worth considering public pension entitlements

The general shape of the age profile of the present value of pension entitlements is as expected: it increases with age up to the time of retirement with a somewhat steeper slope in the second half of working life (Figure 3). Apparently, this results mainly from the fact that earnings typically increase with age, as does the absolute value of the contributions, given that these are calculated as a fixed percentage of earnings (up to a certain income threshold). With retirement, contributions are no longer paid into the system; rather, pensions are paid out, reducing the present value of future pension income flows until the statistical death occurs.

Obviously, the choice of discount rate matters: using a discount rate of two percent, the net present value of all pension entitlements in Germany amounts to about 5.6 trillion euros (Table 1) in 2007, which nearly doubles the figure of net worth. Across all adults in Germany, this equals a mean value of 78,500 euros or a median of roughly 47,000 euros.

Table 1: Net worth and public pension wealth in Germany[1], 2007

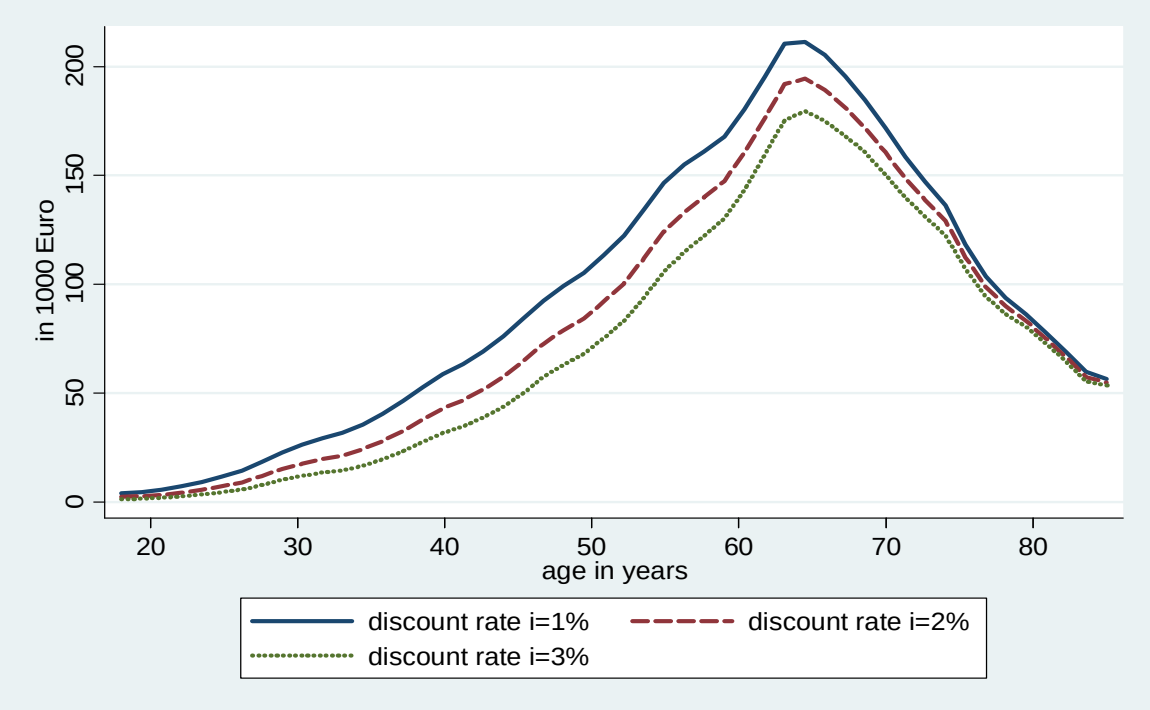
Basic Statistics	**Net Worth (€)** **(1)**	**Public Pension Wealth[2] (€)** **(2)**	**Extended Wealth (€)** **(3)**	**Change (%)** **[(1) / (3)]**
- Mean (s.e.)	83,077 (2,851)	78,479 (871)	161,556 (2979)	94,5
- Median (s.e.)	14,751 (656)	46,680 (849)	94,675 (1795)	541,8
- Sum in billion euros	5.908	5.581	11.489	94,5
Inequality				
- Gini (s.e.)	0,8004 (0,0071)	0,5661 (0,0031)	0,6039 (0,0065)	-24,6
- HSCV (s.e.)	6,5146 (2,6251)	0,7300 (0,0264)	2,0259 (0,7538)	-68,9
- P90:P50 (s.e.)[3]	14,1517 (0,6641)	4,1161 (0,0758)	3,8287 (0,0753)	-72,9
Wealth shares (%)				
- lowest quintile	-1,5	0,9	0,4	-126,7
- 2nd q.	0,4	5,2	4,5	1025,0
- 3rd q.	3,9	12	11,8	202,6
- 4th q.	17,3	24,1	22,4	29,5
- highest quintile	79,9	57,7	60,9	-23,8
Population with zero or negative wealth (%)	28,1	4,5	3,3	-88,3

[1] Population: persons in private households aged 17 or older (*N=69.321.834*).
[2] With a discount rate of two percent, without provision for dependants.
[3] Lowest value for the top ten percent in the wealth distribution in relation to the median (50 percent).
Source: SOEP 2007.

The application of a discount rate of about 2 percent is a rather normative decision, which is oriented toward the long-term real interest rate of federal bonds in Germany. In alternative specifications, we apply an interest rate of 1 percent and 3 percent, yielding an aggregated net

value of pension wealth of about 6.5 trillion euros and 4.9 trillion euros, respectively. The respective mean values vary between about 91,000 euros and about 68,000 euros for a discount rate of 1 percent and 3 percent. Comparing the present value of pension entitlements for three different discount rates, there are clear differences with respect to overall levels but not for the distribution over the life course. For all three graphs in Figure 3, the highest present values can be observed at retirement age, with about 210,000 euros when using a discount rate of 1 percent, more than 190,000 euros applying a discount rate of 2 percent, and finally, 170,000 euros based on a discount rate of 3 percent.

Figure 3: Present value of pension wealth entitlements by age using different discount rates, Germany 2007

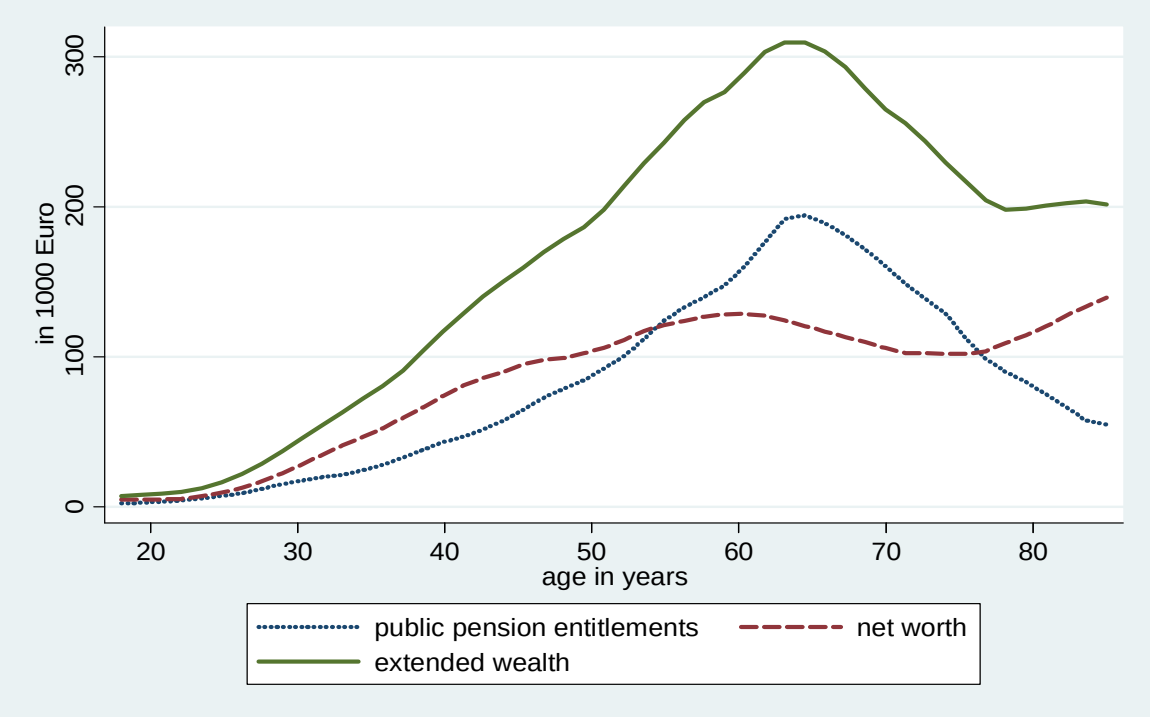


Source: SOEP 2007

Comparing the age profile of net worth, pension entitlements, and the resulting extended wealth measure over the life course (Figure 4), the highest values for pension entitlements can be observed for those around retirement age (about 65 years old) with almost 200,000 euros, while for net worth, the highest values of about 140,000 euros can be observed somewhat earlier in life around age 60. Thereafter net worth decreases slightly, probably due to early inhe-

ritances and gifts to younger generations. However, for the elderly, i.e., those older than 80, net worth increases again, which might reflect a concentration of wealth holdings due to inheritances by widower(s) as well as demographic processes including selective mortality, which tends to favor the wealthy ("survival of the wealthiest").

Figure 4: Net worth, present value of pension wealth entitlements and extended wealth by age, Germany 2007



Source: SOEP 2007; Public pension wealth using a discount rate of 2 percent.

3.3 Wealth inequality and pension entitlements

Net worth is typically far more concentrated than (equivalent) post-government income. This is certainly also true in the German case. In 2007, the Gini coefficient for net worth takes a value of 0.80 (Table 1). The richest fifth of the adult population holds a share of nearly 80 percent of total net worth, while the poorest 60 percent own less than 3 percent of total net worth. In contrast to net worth—where about one-twelfth of the adult population had liabilities exceeding gross wealth, yielding a negative value for net worth—in our application,

pension entitlements can take only positive values.[20] Thus even the poorest fifth of the adult population had a positive value for present values of pension entitlements.

As expected, pension entitlements are less concentrated, given that nearly everyone is insured in at least one old-age pension scheme. More than 28 percent of the population has zero or negative net worth, while less than 5 percent of the population—mostly very young people—have not yet accrued any public pension entitlements at all. Hence, the Gini coefficient of 0.566 for public pension wealth is much lower than for net worth. Adding pension entitlements to net worth yields a Gini coefficient for extended wealth of around 0.6, which is a significant decrease in inequality of about one-quarter.

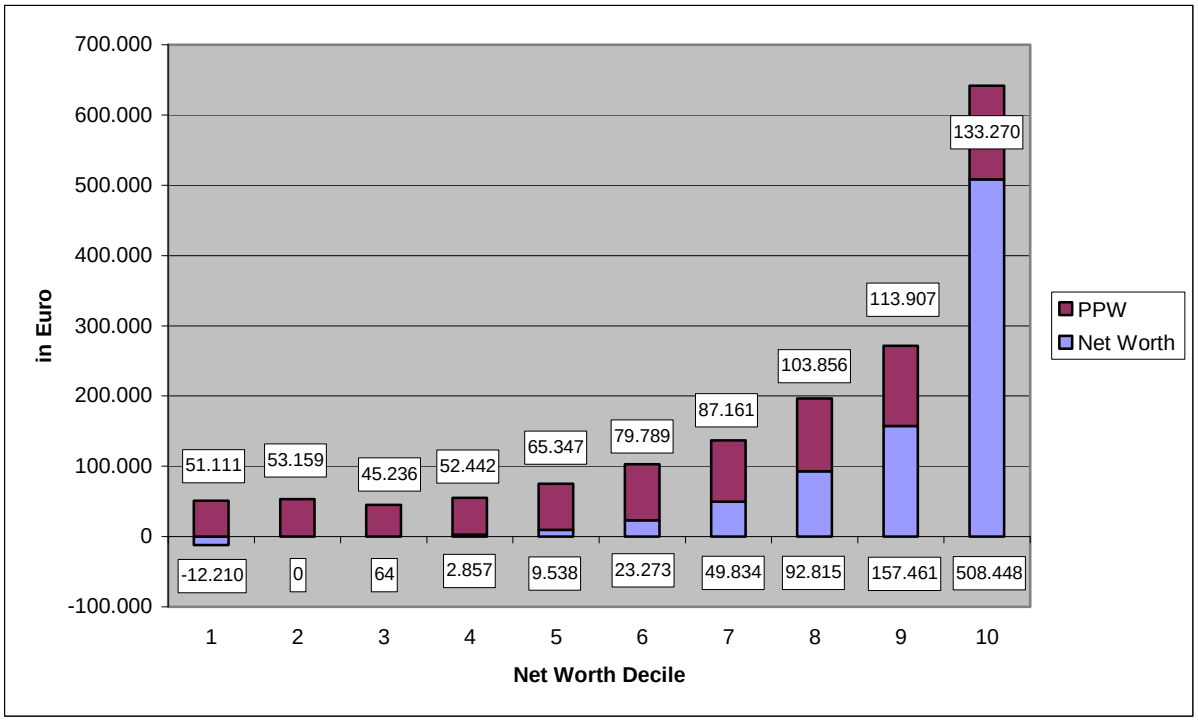
The lower concentration of pension entitlements can also be observed when looking at the top-sensitive half-squared coefficient of variation (HSCV). While this measure takes an extraordinary high value of 6.5 for net worth, the respective outcome for public pension entitlements is only 0.7. For the resulting extended wealth measure, the HSCV comes to just 2.0—a decrease in inequality of more than two-thirds. The reason for the stronger reduction effect for the HSCV than for the Gini coefficient is the extreme top-sensitivity of the wealth data. This result is mirrored for the P90:P50 percentile ratio as well. While the top ten percent of the net worth distribution owns a minimum of 14 times more wealth than the median, this relationship is "only" 3.8 for extended wealth (again, a significant decrease of 73 percent).

The very widespread existence as well as the more even distribution of old-age pension entitlements and the equalizing effect on extended wealth become apparent when comparing the respective present value by decile of net worth (Figure 5).The lower part of each bar depicts the average net worth ranging from a negative 12,000 euros in the lowest decile to more than 500,000 euros in the top decile. Keeping those deciles fixed and adding the average present value of public pension entitlements yields the average extended wealth per decile of net worth. Apparently, for the lower half of the distribution, the mean values for the pension en-

[20] A precise quantification of liabilities to PAYG pension schemes is complex. It requires, among other things, simulating cohorts as yet unborn, all of whom would already have negative wealth by the time they are born.

titlements vary only slightly between 45,000 and 65,000 euros. However, for the lower half of the wealth distribution, this wealth component is far more relevant than net worth. Higher in the wealth hierarchy, pension entitlements do also increase—which is in line with the principle of equivalence applied in the German pension schemes—but not as much as net worth. For the top net worth decile, pension entitlements amount to more than 130,000 euros, but compared with the net worth of more than 500,000 euros in the very same decile, this equals only 20 percent of an extended wealth measure. This process is also dampened by the top-coding effect in the GRV resulting from an upper income threshold (social security contribution ceiling).

Figure 5: Mean net worth and mean present value of pension entitlements by net worth deciles, Germany 2007



PPW: Present value of public pension wealth using a discount rate of 2 percent.
Source: SOEP 2007

Here we refrain from calculating any liabilities, i.e., future contributions to pension schemes; thus, the lowest possible value is zero.

With respect to wealth composition or portfolio structure, public pension wealth accounts for basically almost all of "extended wealth" in the lower half the net worth distribution (Figure 5). In the sixth decile, public pension entitlements account for some 80 percent, in the eighth decile for about half of extended wealth, and among the wealthiest 10 percent only one-fifth comes from public pension wealth.

3.4 Net worth and public pension entitlements by occupational status

In addition to inheritances and gifts, current or earlier employment represents an important source for the accumulation of wealth. Savings are determined largely by professional position and, accordingly, by the income level achieved.[21] While unskilled or semi-skilled workers and salaried employees (without an apprenticeship) in Germany held roughly 34,000 euros in financial and material assets in 2007, the figure for qualified skilled personnel (such as foremen and masters) was close to 70,000 euros (Table 2). Net worth for employees with management responsibilities amounted to more than 120,000 euros. Civil servants in Germany typically have above-average net worth. This can be seen alone in the executive or administrative class of civil servants, who have an average individual net worth of more than 140,000 euros. For civil servants in the sub-clerical or clerical service class, net worth is only 67,000 euros but still considerably higher than for skilled workers and salaried employees in lower-level positions.

The self-employed have the highest level of financial and material wealth. This is the result of business assets but is also due to the fact that the self-employed have to make their own provisions for old age, usually by buying private life insurance plans and property. The larger a business is—as measured in this instance by the number of employees—the higher the value of net worth. For self-employed people without employees, net worth was approximately 170,000 euros in 2007; the figure for the self-employed with up to nine employees was about twice that, and for the self-employed with ten or more employees amounted to more than 1.1 million euros.

[21] Here we differentiate individuals by the occupational positions stated in the 2007 SOEP survey. Nevertheless, a person may have held another occupational position previously, which may affect both the amount of financial and material wealth and old-age pension entitlements.

Table 2: Net worth and public pension wealth by occupational status in Germany[1], 2007

	Individual Net Worth	Present Value of Pension Entitlements[3]	Extended individual Net Worth	Relative Change	Age in years	Share Female
	in Euro			in %	Median	in %
Trainees, apprentices, those in military / community service	11.142	5.645	16.788	51	21	49
Unskilled and semi-skilled workers, salaried employees without an apprenticeship	33.618	53.965	87.582	161	43	55
Trained and skilled workers, salaried employees in low qualification positions	46.964	56.043	103.007	119	42	41
Foremen, master craftsmen, supervisors, salaried employees in qualified positions	69.256	60.128	129.384	87	42	58
Salaried employees with extensive management responsibilities	122.778	74.955	197.734	61	42	33
Civil servants in the sub-clerical or clerical service class	67.019	92.135	159.154	137	40	36
Civil servants in the executive or administrative class	145.775	149.484	295.259	103	47	41
Self-employed persons						
… without employees[2]	169.683	56.296	225.980	33	47	39
… with 1 to 9 employees	351.185	38.064	389.249	11	46	25
… with 10 or more employees	1.138.372	35.909	1.174.281	3	45	26
Persons of working age not gainfully employed	74.553	39.620	114.173	53	44	89
Unemployed	15.406	52.070	67.476	338	42	53
Pensioners in the statutory pension scheme	98.956	129.763	228.719	131	71	56
Retired civil servants	187.510	313.436	500.946	167	69	20
NB: No information as to occupational position	47.583	72.464	120.047	152	17	48
Total	**83.077**	**78.479**	**161.556**	**94**	**48**	**50**

[1] Population: persons in private households aged 17 or older.
[2] Including family members helping out
[3] With a discount rate of two percent, without provision for dependants.
Source: SOEP 2007

Trainees and apprentices are very early in their occupational careers, and at a median age of only 21, they have only accrued pension entitlements worth around 5,000 euros. Unemployed people also have a far below-average net worth of about 15,000 euros in 2007. Following the standard life cycle model of saving, the elderly hold above-average net worth. This is especially true for retired civil servants, with a net worth measure of nearly 190,000 euros, while pensioners in the GRV have a net worth of only about 100,000 euros. The higher net wealth of civil servants not only reflects the somewhat better educational level of this group; more

importantly, they make only an implicit contribution to their tax-financed old-age provisions, which *ceteris paribus* allows them to accumulate more wealth than comparable dependent employees who have to make higher contributions to the GRV[22].

As described above, old-age pension schemes differ widely by occupational position in terms of their structure and the level of benefits they provide. Accordingly, large differences are seen in the present value of pension benefits accrued to date. The group of currently working people that gains most from considering pension entitlements is that of civil servants. Their pension entitlements amount to 92,000 euros for low and medium-level civil servants and almost 150,000 euros for high-level civil servants. In fact, this implies more than a doubling of their respective standard net worth. For all other dependent employees, the present value of pension entitlements is between 54,000 and 75,000 euros. Even the unemployed have accrued 52,000 euros on average. This indicates the importance of old-age provisions in stabilizing the individual economic position, even in the case of (short-term) unemployment. With the most recent German labor market reform of 2005, however, pension entitlements for long-term unemployment were drastically reduced. Thus, old-age poverty will become more prevalent in future cohorts of retirees, especially for individuals who suffered from long-term unemployment during their working career, since they generally do not have any relevant net worth. For the self-employed, the respective figures vary on a somewhat lower level between 35,000 euros and 56,000 euros, given that they typically make their own provisions for retirement. Thus, when using the extended wealth measure, the self-employed still hold the highest average wealth position, but civil servants significantly improve their position relative to the self-employed.

These findings are supported by the age profiles of net worth and extended wealth shown in Figure 6 separately for self-employed, civil servants, and those with a mandatory GRV insurance. While the self-employed top the net worth hierarchy throughout their entire working lives (20 to 65 years), the extraordinarily generous pension provisions for civil servants gives them the lead in the extended wealth distribution even before the age of 60. Looking at the

[22] As of January 1, 2007, the contribution to the GRV is 19.9 percent of the relevant labor earnings up to a ceiling of 63,000 (54,600) euros in West (East) Germany, split equally between employee and employer.

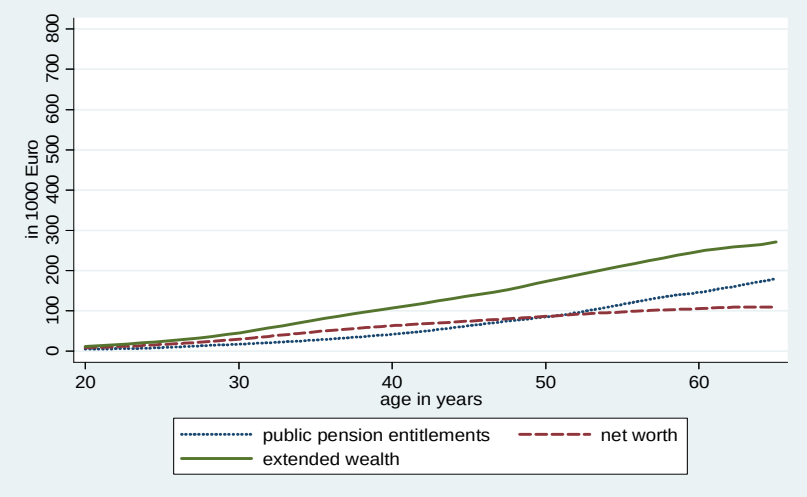
majority of the working-age population insured under the statutory pension scheme (GRV), it is clear that this group is far behind in both respects. First, members in the GRV have below-average net worth throughout working life, and second, the benefit levels of the statutory pension scheme and thus the pension entitlements are far below those received by civil servants.

Given the long period over which pension contributions are made, the elderly profit substantially from taking pension entitlements into account in the wealth measure. At the same time, one must consider that due to the mode of calculation, each additional year reduces the present value of the remaining pension entitlements. Bearing this in mind, pensioners in the GRV, who are 71 years old on average, are entitled to pension payments amounting to almost 130,000 euros (Table 2). Yet the favorable position of retired civil servants, who are somewhat younger on average, is even better. Their pension entitlements are worth more than 310,000 euros. Summing up net worth and pension entitlements for this group yields more than 500,000 euros. Thus, retired civil servants have more extended wealth than self-employed people with up to nine employees, who hold roughly 390,000 euros after adding pension entitlements to the measure of net worth.

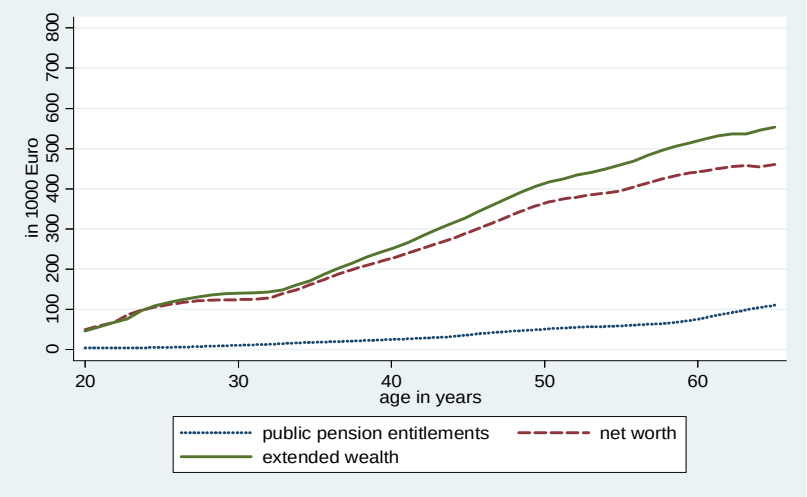
The pronounced difference between pensioners in the GRV and retired civil servants is due to three main effects: first, civil servants tend to have a continuous employment history, without any periods of unemployment that would have reduced the level of contributions to and benefits from the public pension insurance. Second, civil servants tend to be better educated, thus receiving *ceteris paribus* higher earnings. Third, and presumably most important, civil servants receive much higher benefits than people insured under the GRV scheme, given that a civil servant's pension is based on pensionable earnings received during the last years of employment and not, as in the case of those insured under the GRV rules, on social insurance contributions made throughout working life.[23]

[23] In addition, any company pensions that might accrue to employees subject to social insurance generally represent a voluntary benefit provided by the employer.

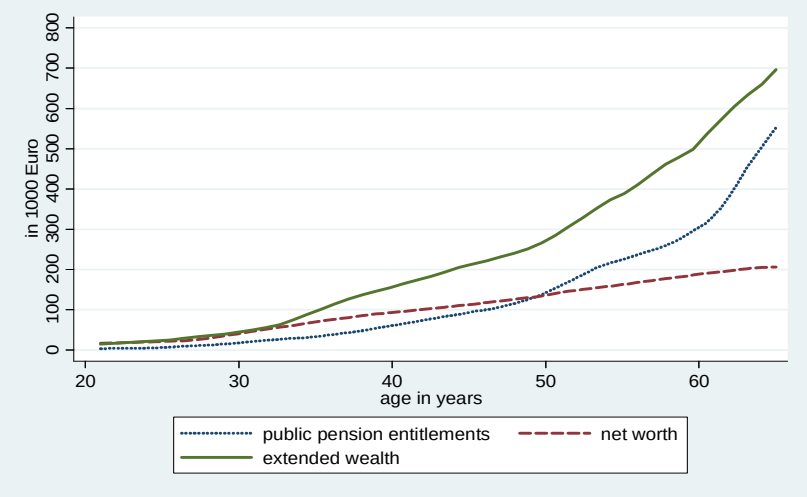
Figure 6: Net worth, present value of pension wealth entitlements and extended wealth by age and occupational group, Germany 2007 – working age individuals (20-65 years old)



A) Members of the statutory pension scheme (GRV)



B) Self-employed



C) Civil servants

Source: SOEP 2007, with a discount rate of two percent, without provision for dependants.

3.5 Inequality decomposition by occupational status

Focusing only on the population of employable age (20 to 65 years) and using occupational status as the independent variable, Table 3 gives average wealth levels before (column B) and after (column C) inclusion of public pension entitlements and the relative change (column D). It is obvious that those who had already retired by the age of 65 (this includes former GRV employees as well as former civil servants) “profit” considerably from widening the wealth definition. Above and beyond owning a net worth of almost 90.000 euros, this group is entitled to more than 210,000 euros from public pensions, yielding an extended wealth measure of 304,000 euros (an increase of about 240 percent).

Among those currently working, civil servants hold an above-average net worth of 113,000 euros. Their very generous public pension entitlements boost them to 240,000 euros in the extended wealth measure, an increase of more than 110 percent. While GRVemployees also gain substantially, moving from 63,000 up to 123,000 euros (an increase of 50,000 euros or 94 percent of their net worth), their relative wealth position does not change significantly, staying at just 84 percent of the overall average. Here, the self-employed have clearly lost ground in relative terms: although they have 43,000 euros in public pension entitlements, their relative wealth position has declined from 370 percent to “only” 220 percent of the overall average. While unemployed persons—as expected—have very limited net worth (16,000 euros), they also have significant public pension entitlements, making them clearly much better off in the analyses of extended wealth: in fact, this group shows an increase of about 340 percent when considering pension entitlements.

Wealth shares are also influenced substantially by the extension of the wealth definition: retirees double their wealth holdings (up from 8.8 percent to 15.6 percent in columns H through J), while the wealth share contributed by the self-employed drops from more than 25 percent down to roughly 15 Percent.

Table 3: Inequality decomposition[1] by subgroup – individuals of working age (20-65 years old)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Occupational status	Pop. Share	Mean		% chg.	Gini		% chg. in inequality	Wealth Share (%)		% chg. in wealth share	% contribution to aggregate inequality		Population normalized Wealth Share (%)		Population normalized contribution to aggr. inequality (%)	
	in %	Net Worth	Ext. Wealth	incl. PPW	Net Worth	Ext. Wealth	incl. PPW	Net Worth	Ext. Wealth	incl. PPW	Net Worth	Ext. Wealth	Net Worth	Ext. Wealth	Net Worth	Ext. Wealth
Not employed	9.5	78,080	135,000	73	0.785	0.620	-21	9.7	8.7	-9	9.4	8.9	101.6	92.0	98.8	93.2
In education	6.0	7,712	14,100	83	0.931	0.740	-21	0.6	0.6	-4	0.6	0.6	10.0	9.6	9.9	10.2
Unemployed	8.5	15,680	69,300	342	1.138	0.636	-44	1.7	4.0	132	2.7	4.1	20.4	47.3	31.4	47.5
GRV employee	56.9	63,340	123,000	94	0.771	0.554	-28	46.9	47.9	2	42.2	39.9	82.4	84.1	74.1	70.1
Self-employed	6.9	285,400	332,000	16	0.782	0.709	-9	25.5	15.5	-39	19.3	16.4	371.4	226.2	281.0	238.8
Civil servant	4.6	113,000	240,000	112	0.623	0.504	-19	6.8	7.6	11	4.0	5.1	146.9	163.4	85.1	110.7
Early Retirees	7.5	89,460	304,000	240	0.754	0.365	-52	8.8	15.6	78	7.8	4.4	116.4	207.3	103.8	57.8
Total	**100.0**	**76,855**	**146,351**	**90**	**0.816**	**0.616**	**-24**	**100.0**	**100.0**	**0**	**85.9**	**79.3**	**100.0**	**100.0**	**85.9**	**79.3**
Between-Group Inequality (%)											**14.1**	**20.7**				

[1] decomposition based on the Gini-coefficient using ANOGI.

PPW: present value of public pension entitlements.

Source: SOEP 2007, with a discount rate of two percent, without provision for dependants.

All of this has the expected significant dampening impact on inequality: starting from a value of 0.816 for net worth, the Gini coefficient for the population aged 20 to 65 years decreases by about one quarter to "only" 0.616 when including public pension entitlements. Given the group-specific variations described above, this goes hand in hand with massive changes in the inequality decomposition by subgroup.[24] In all groups, we see a pronounced reduction in inequality as shown in columns E thru G on the basis of the group-specific Gini coefficients. Not surprisingly, this reduction is smallest among the self-employed (-9 percent) and very strong among those already retired (-52 percent). In fact, between-group inequality goes up from 14 percent to 21 percent (columns K and L). The group-specific contribution to overall inequality has reached an above-average level for civil servants (columns O and P) while being considerably reduced for the self-employed and retirees.

3.6 The relevance of public pension entitlements for the middle class

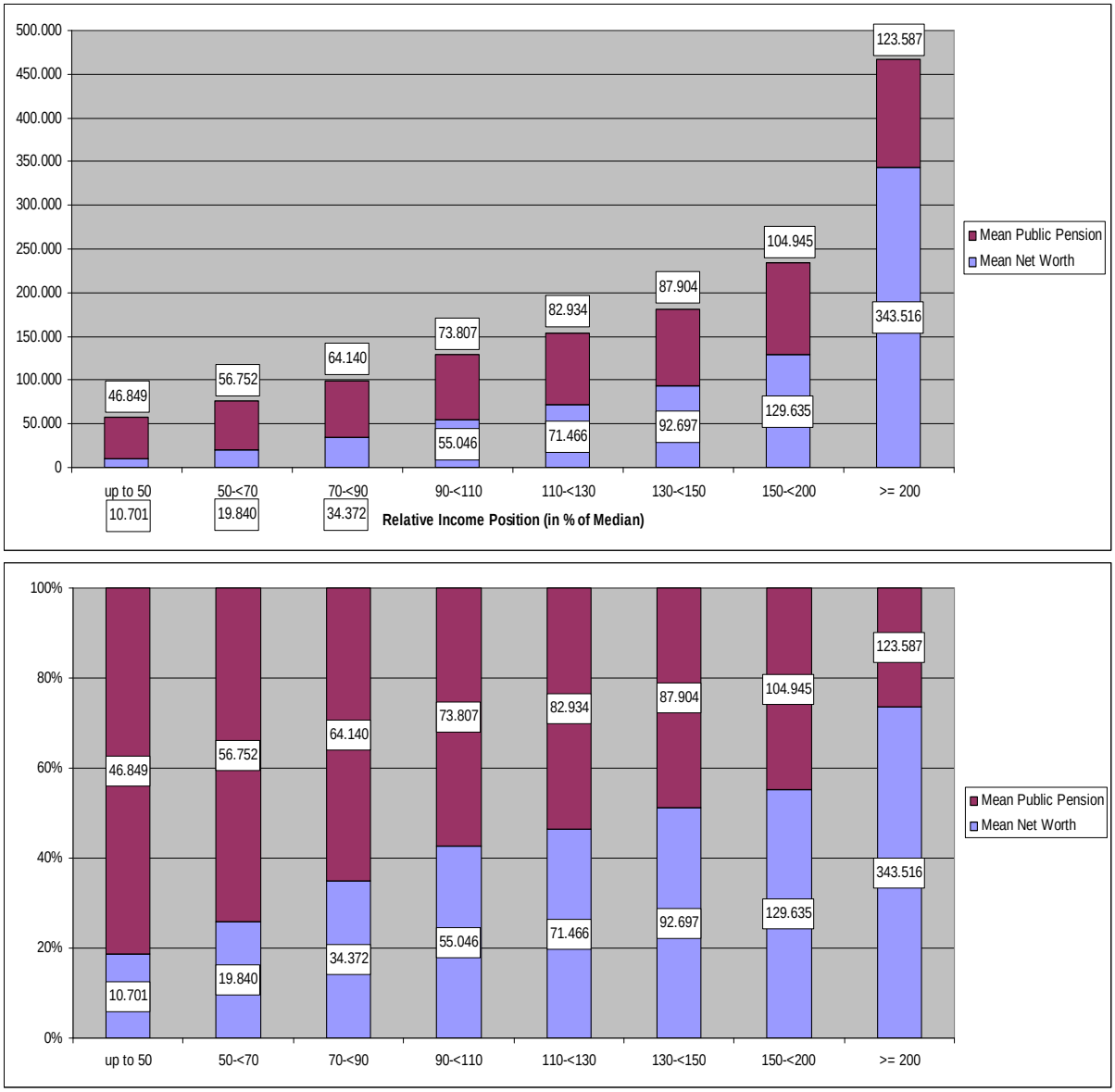
The concept of a middle class has a long tradition in Germany, not only since the seminal work of Schelsky (1965), who argued that after World War II, modern societies would tend to be more mobile with more and more people from the lower (higher) income class moving up (down) the social ladder. As a result, he predicted that the middle class would gain in importance (*nivellierte Mittelstandsgesellschaft*) and form the most important pillar of the social security system. Although this theory has been widely criticized, today's middle income classes bear a large portion of the financial burden of the welfare systems in many countries worldwide. Due to the statutory nature of the pension scheme, a significant share of wealth is tied to pension entitlements, in particular for the middle class.

Yet there is still no commonly agreed definition of the middle class distinguishing it from lower and upper classes. In the socio-political discussions surrounding the emergence of "new poverty" in the 1980s, concerns were expressed that Germany was becoming a "two-thirds society," with one-third of the population locked into poverty or near the poverty line (see e.g. Headey et al. 1994) and the upper two-thirds living in (relative) affluence. Furthermore, there is not even consensus on how to define "high" incomes. In the following, we

[24] We run Gini decomposition as suggested by Lerman and Yitzhaki (1985) using the Stata routine ANOGI, provided by Jann (2006). Typically such decomposition analyses are based on Generalized Entropy Measures such as the Mean Log Deviation (MLD). This was not possible for the analysis at hand, as net worth can take on negative values.

simply define a person's income position relative to the national median. The middle class consists of individuals with a needs-adjusted or equivalized annual post-government income between 70 percent and 150 percent of the median.[25] In 2007, this middle class makes up about 60 percent.

Figure 7: Absolute and relative impact of public pension wealth by income group



Source: SOEP 2007, with a discount rate of two percent, without provision for dependants.

[25] This equals to about 1,100 and 2,300 euros per month for a one-person household in Germany in 2008. For a detailed development of the middle income class in Germany, see Grabka and Frick (2008). The modified OECD equivalence scale has been applied.

Mean net worth of the middle class varies between 34,000 and 93,000 euros (Figure 7 and Table A1 in the Appendix). However, when considering the present value of public pension entitlements, one can observe more than a doubling of net worth for this group. For those in the lower middle class (70-90 percent of the median) net worth is almost tripled, for the upper middle class (130-150 percent of the median) we observe roughly a doubling of net worth. Moving up the income distribution we find a consistent picture of the absolute value of pension entitlements increasing in absolute terms; at the same time, however, the relative contribution of these entitlements to the extended wealth measure is reduced markedly. Among those in the poorest income group (with income below 50 percent of the median), pension entitlements add more than 80 percent to extended wealth, whereas the top income group (with more than twice the median income) enjoys three times as much public pension wealth in absolute terms (124,000 euros vs. 47,000 euros), however, this adds only about 25 percent to extended wealth.

4 Conclusion

Entitlements from old-age pension schemes—statutory, occupational, and private—represent a considerable source of wealth. For data-related reasons, however, empirical analyses of wealth inequality in Germany have failed to take this important component adequately into account. This paper takes on this challenge by making use of statistical matching strategies to combine representative individual net worth information from a major household panel study —the German Socio-Economic Panel (SOEP)—with detailed administrative data about pension entitlements from the statutory pension scheme in Germany. According to our calculations based on 2007 data, the present value of total pension entitlements (not including entitlements to provisions for dependants) amounted to roughly 5.6 trillion euros using a discount rate of 2 percent. This corresponds to an average of 78,500 euros per adult. When this is combined with net worth held in financial and material assets, which amount to an average of 83,000 euros, the result is a more comprehensive measure of extended wealth, amounting to more than 160,000 euros.

This extended measure of wealth shows considerably (about 25 percent) less inequality than traditional analyses that refer only to financial and material assets (net worth). This is mainly the result of the substantial and widespread pension entitlements under the various pension schemes for the vast majority of adults in Germany.

There are marked differences in levels of pension entitlements across occupational groups. While civil servants have the highest entitlements, self-employed people, who typically make their own provisions for old age, have below-average public pension entitlements. Such differences are not specific to Germany but are likely to exist in other countries as well. The strong variation in relevance and magnitude of publicly provided pension insurance across welfare regimes should be carefully considered when conducting comparative wealth analyses, such as those based on the Luxembourg Wealth Study (LWS, see Sierminska et al. 2006). In other words, every effort should be made to take the present value of any pension entitlements into account in comparative analysis of wealth data.

Future research in this area should address appropriate means of determining the present value of pension entitlements. Based on the findings presented here, it appears necessary to invest more effort in defining the discount rate, in determining future pension adjustments, and in addressing the problem of selectivity in mortality rates, since high income earners typically live longer than low income earners (see Himmelreicher et al. 2008). This should be accompanied by a discussion about the necessity to consider liabilities to pension schemes. In a pay-as-you-go pension system, there is already an implicit liability with birth, which levels off until middle age, when the entitlements accrued so far are higher than the present value of the future contributions. Adequately dealing with this phenomenon would also mean taking liabilities outside the private household sector into consideration, since employers and the state both have make considerable contributions to overall pension expenditures.

Summing up, this paper gives clear evidence that neglecting public pension entitlements in wealth analyses yields massive biases with respect to the level and the degree of inequality in the distribution of wealth, as well as with respect to differences across socio-economic groups. While data on net worth can be collected successfully in population surveys, respondents' information on pension entitlements appears incomplete at best. This shortcoming can be overcome best by employing the social security number (or similar information), with the individual's informed consent, to link the microdata at hand with the relevant administrative data. But since this may significantly reduce the respondents' willingness to participate (further) in (panel) surveys—most likely in a selective way—, the statistical matching approach presented here may be seen as a successful second-best solution.

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Appendix:

Table A1: Net worth and extended wealth by income groups.

	Mean			Median					
Relative Income Position (in % median*)	Net Worth	PPW	Ext. Wealth	Net Worth	PPW	Ext. Wealth	Population Share (%)	Women's share (%)	Age (Median)
up to 50	10,701	46,849	57,550	0	23,842	28,715	7.8	55	44
50-<70	19,840	56,752	76,592	0	29,684	39,310	12.3	57	46
70-<90	34,372	64,140	98,512	4,954	37,767	63,403	18.4	55	47
90-<110	55,046	73,807	128,853	15,000	49,338	95,274	17.7	53	47
110-<130	71,466	82,934	154,399	27,761	54,830	117,637	13.1	48	48
130-<150	92,697	87,904	180,601	37,360	55,186	124,995	9.9	48	48
150-<200	129,635	104,945	234,580	75,913	59,865	176,081	12.2	48	50
>= 200	343,516	123,587	467,103	156,175	68,144	278,811	8.5	46	52

Shaded cells indicate the middle income class in Germany

* Median Equivalent Post-Government Income (based on the total population) using modified OECD-Scale.

Source: SOEP 2007