Distributional National Accounts: A Macro-Micro Approach to Inequality in Germany

Stefan Bach, Charlotte Bartels, Theresa Neef

The recent rise in income inequality in rich countries across the world has increasingly been the subject of academic and public debate. However, long-run inequality series, that put these developments into a wider perspective, are still scarce, and observed inequality trends are far from conclusive even for recent years. A recent contribution by Piketty et al. (2018) for the United States establishes a methodology to estimate distributional national accounts (DINA) capturing these components, which allows to overcome these shortcomings and compute inequality measures for both pre- and post-tax income for the entire population.

This paper provides new long-run income inequality series for Germany combining all potential income data sources from tax data, household survey data to national accounts. Estimating distributional national accounts (DINA), we capture 100% of national income and can compute inequality measures for both pre- and post-tax income for the entire population. Thereby, we can investigate how government redistribution influences inequality over time, which is probably the most important contribution to both the public debate and our understanding of long-run trends. Moreover, we can compute growth rates for each quantile of the pre- and post-tax income distributions that are consistent with macroeconomic growth. Last, we can decompose the development of pre- and post-tax incomes by age and gender groups.

One the one hand, we will build on the DINA methodology established by Piketty et al. (2018) for the United States as closely as possible in order to construct DINA series in an internationally harmonized way. On the other hand, we will employ different strategies where the German economy and its data landscape diverges from the US.

The aim of this paper is to (1) produce a harmonized long-run inequality series of unique length for Germany before and after taxes covering the entire population applying both internationally standardized and innovative methods using every available income data source, (2) compare this new German series with the existing series for France and the United States and others to come to understand long-run trends and (3) investigate the role of the German welfare state in mitigating inequality across the 20th century until today. This project is part of the global effort coordinated by the WID-project to improve inequality analyses by compiling information on inequality for as many countries as possible in a harmonized and comparable manner.

The paper will deliver answers to the following questions: Who benefits more from economic growth over time: workers or capital owners? Are we on a path towards a rentier society? Which role do welfare state institutions such as progressive taxation, public pensions or collective bargaining play for changing income inequality across the population? What can we learn from structural changes such as globalization and technological change during the industrialization period for our current structural changes such as rapid digitalization?

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Abstract

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JEL Classification: E1, H2 H5, J3

Keywords: Income distribution; Capital accumulation; Wage distribution; Gender gap; Income composition; Top Income Groups

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1 Introduction

The recent rise in income inequality in rich countries across the world has increasingly been the subject of academic and public debate. However, long-run inequality series, that put these developments into a wider perspective, are still scarce, and observed inequality trends are far from conclusive even for recent years. A wide literature documents top income share series across countries over the 20th century using income tax data and applying a harmonized methodology. These series are collectively available at the World Inequality Database (WID). However, these top income share series are silent about (1) the substantial non-tax-filing bottom of the income distribution, (2) parts of national income not captured by income tax statistics such as retained earnings and (3) the redistributive role of the welfare state, which greatly changed over the 20th century. A recent contribution by Piketty et al. (2018) for the United States establishes a methodology to estimate distributional national accounts (DINA) capturing these components, which allows to overcome these shortcomings and compute inequality measures for both pre- and post-tax income for the entire population.

This paper provides new long-run income inequality series for Germany combining all potential income data sources from tax data, household survey data to national accounts. Estimating distributional national accounts (DINA), we capture 100% of national income and can compute inequality measures for both pre- and post-tax income for the entire population. Thereby, we can investigate how government redistribution influences inequality over time, which is probably the most important contribution to both the public debate and our understanding of long-run trends. Moreover, we can compute growth rates for each quantile of the pre- and post-tax income distributions that are consistent with macroeconomic growth. Last, we can decompose the development of pre- and post-tax incomes by age and gender groups. One the one hand, we will build on the DINA methodology established by Piketty et al. (2018) for the United States as closely as possible in order to construct DINA series in an internationally harmonized way. On the other hand, we will employ different strategies where the German economy and its data landscape diverges from the US.

The aim of this paper is to (1) produce a harmonized long-run inequality series of unique length for Germany before and after taxes covering the entire population applying both internationally standardized and innovative methods using every available income data source, (2) compare this new German series with the existing series for France and the United States and others to come to understand long-run trends and (3) investigate the role of the German welfare state in mitigating inequality across the 20th century until today. This project is part of the global effort coordinated by the WID-project to improve inequality analyses by compiling information on inequality for as many countries as possible in a harmonized and comparable manner.

The paper will deliver answers to the following questions: Who benefits more from economic growth over time: workers or capital owners? Are we on a path towards a rentier society? Which role do welfare state institutions such as progressive taxation, public pensions or collective bargaining play for changing income inequality across the population? What can we learn from structural changes such as globalization and technological change during the industrialization period for our current structural changes such as rapid digitalization?

Up to this date, the DINA methodology has been applied to the case of the USA (Piketty et al., 2018), France (Garbinti et al. 2018, Bozio et al. 2018), Russia (Novokmet et al., 2018), China (Piketty et al., 2017), India (Chancel and Piketty, 2017) and Spain (Martinez Toledano, 2017).

For the German DINA series, we build on Bach et al. (2009, 2013) who produced a full income distribution series of gross market and net incomes for Germany 1992-2005, i.e. covering the entire population, using individual tax returns supplemented with non-filer observations from the German Socio-Economic Panel (SOEP). We can build on the data and programs used by Bach et al. (2013) to harmonize the existing concepts with the DINA methodology. We will extend this series over the next few months up to the year 2013, which is currently the last year for which individual tax returns are available. The new top income share series for Germany, 1871-2014 (Bartels, 2018) which is based on income tax data and already includes some components of national accounts, will serve as the central building block to

extend the German DINA series backwards from 1992.

The paper is organized as follows. Section 2 introduces our data sources. Section 3 gives the details on our empirical strategy. Section 4 presents very first results. Section 5 summarizes and provides an outlook on the results to come until July 2019.

2 Data

Our inequality estimates are based on a combination of all potential income data sources ranging from personal income tax (PIT) data, household survey data to national accounts (NA). While NA offer macroeconomic income aggregates across economic functions (labor, entrepreneurial and capital income), income redistribution (taxes and transfers), and across economic sectors (households, corporations, government, rest of the world), PIT micro data and household survey data provide information on the distribution of the different income components across the population.

PIT micro data became available in Germany in 1992. The triennial wage and income tax statistics (1992, 1995, 1998, 2001, 2004, 2007, 2010, 2013) includes all tax units subject to income and/or payroll taxes. For the period 2000-2012, we can additionally draw on the annual *Tax-Payer Panel* which includes all income tax units, but excludes the tax units solely subject to payroll taxes. Our long-run analysis will be based on grouped PIT statistics available from 1871 to 2014, which have been digitized and analyzed in Bartels (2018). The tax tabulations report detailed information on the number of tax payers within a large number of tax brackets.

We will use the entire universe of German household survey data ranging from the Socio-Economic Panel (SOEP) (1984-2016), the Income and Expenditure Survey (EVS) (1962-2013) to the Household Finance and Consumption Survey (HFCS) (2010, 2014). Wage, taxes and transfer income is captured quite well by PIT micro data and household survey data. In contrast, entrepreneurial and property income are the Achilles' heel of both NA and DINA. Apart from differing income defini-

tions, insufficient data sources impede an independent bottom-up calculation of the entrepreneurial income in German NA. Available administrative data from financial or tax accounting that allow such a bottom-up calculation are neither sufficiently detailed nor representative for all German firms. Bach et al. (2013) estimates a gap between adjusted NA corporate income and tax files in Germany of 90 billion Euro in 2008 or 3.7 percent of GDP. To close this gap, we add information from corporate financial accounts and household wealth data from household survey data and rich lists in order to complement entrepreneurial and property income observed in PIT data.

3 Empirical Strategy

The goal is to construct the distribution for three income concepts, pre-tax factor income, pre-tax national income and post-tax national income, over time. In a first step, national income as recorded in the national accounts is reconciled with fiscal income reported by individual taxpayers in their tax declarations. Pre-tax factor income consists of the primary gross market incomes from labor and capital including employer's social insurance contributions. The drawback of this concept is, however, that pensioners, a substantial group in the German society, are reported with zero income. Thus, we compute as our benchmark series pre-tax national income. Pre-tax national income adds insurance-based replacement incomes such as old-age pensions and insurance-based unemployment benefits and subtracts paid social security contributions from the primary incomes. Last, post-tax national income results after deducting direct taxes and adding the value of monetary non-insurance benefits and in-kind transfers as well as publicly provided goods. The gap between pre-tax income and fiscal income arises from the following components:

1. Imputed rent, which estimates the economic return of owner-occupied houses or dwellings, is included in national accounts, whereas fiscal income only includes monetary rent from renting out a house.

2. Retained earnings in the corporate sector do not show up as fiscal income, but are included in national income. However, sectoral accounts show that

retained earnings in German firms have become a widespread phenomenon since the early 2000s Bartels (2018).

3. Unreported income due to tax evasion.

4. Corporate, payroll and indirect taxes represent a part of national income, but are excluded from fiscal income.

5. Tax-exempt employer fringe benefits such as health and pension contributions are included in national income, but excluded from fiscal income.

6. Public and private pensions are included in national income, but are only partly present in tax return data as only a share is taxable.

7. Contribution-based replacement income such as unemployment and disability insurance benefits are included in national income, but not necessarily in fiscal income as they are not taxable in Germany, but have to be declared if the spouse's income or other income sources exceed the tax allowance.

8. Non-filer income is included in national income, but excluded from fiscal income if incomes are below the tax allowance.

9. Capital gains caused by pure asset price changes are excluded from national accounts. As a consequence, we deduct capital gains due to price effects from fiscal income as well.

Items 1)-8) should be added to our fiscal income distribution and 9) excluded to reconcile fiscal and national income. Post-tax national income is equal to pre-tax national income reduced by taxes and augmented by all kinds of government spending. As government revenue from taxes does not match government spending in a given year, the primary government surplus or deficit has to be taken into account as well. Government spending includes:

1. Monetary transfers - including unemployment benefits II, general social assistance benefits, (additional) child benefits, education benefits as well as housing benefits - can be imputed using SOEP survey data and legislative rules.

2. In-kind social transfers such as health benefits.

3. The value of publicly provided goods provision, i.e. of infrastructure, public education and internal and external security.

Once the magnitude of each of the components is identified for each year, we have to decide on different rules how to distribute each of the components across the full income distribution as produced in (1) in order to obtain pre-tax or post-tax national income. Generally, we pursue three strategies to do so. First, the component is distributed proportionally to income which keeps inequality constant. This approach is used in all DINA studies and thus will be ensure a harmonized comparison with other countries. Second, the component is distributed according to its distribution observed in survey data. Third, the component is distributed according to legislative rules.

Following the DINA methodology established by Piketty et al. (2018), we construct time series for individuals of age 20 and above. Our benchmark series will assume the equal split of all income between couples (equal-split series). Further, we will explore the individualist attribution of incomes by earner (individualistic adults series) as well as inequality between tax units (tax-unit series).

Having distributed the entire set of income, tax and transfer components across the full income distribution, we will compute a variety of inequality measures such as the Gini coefficient, percentile ratios and top (10%, 1%, 0.01%) and bottom (90%, 50%) income shares. Further, we will decompose inequality changes by population subgroups such as gender and age to understand how increasing female labor market participation and the aging of the German population contribute to the observed inequality trends.

4 Results

4.1 The composition of net national income

Figure 1 presents the share of pre-tax labor income in net national income. The share of pre-tax labor income in net national income decreased from about 78% in

1992 to slightly more than 72.9% in 2013. It declined continously in the 2000s and reached its lowest level in 2007 - before the recession hit Germany in 2009. About 76% (1992) to 87% (2013) of pretax labor income is recorded in income tax returns. Employee incomes make up about 50%, while self-employment income plays a minor role in Germany summing up to no more than 3.2% of net national income. The role of occupational and private pensions has risen, however, it is still minor compared to other countries.

The share of capital income in net national income increased from about 22% in 1992 to about 27% in 2013, as displayed by Figure 2. In contrast to the labor share, tax returns only capture a very small portion of national accounts' capital income. National accounts' capital income is calculated as a residual since there are no representative primary statistics on business income in Germany. This introduces a substantial amount of measurement error.[1] Also, tax avoidance might occur at a larger scale with business and property income than with employment income, understating business and property income in tax statistics. Second, retained earnings by corporations (undistributed profits) and imputed rents are included in national accounts, but do not appear in income tax data. Finally, in 2009 a dual tax system was introduced such that capital income is not systematically included in tax returns anymore. As a consequence, the share of capital income in tax returns is even lower after 2009.

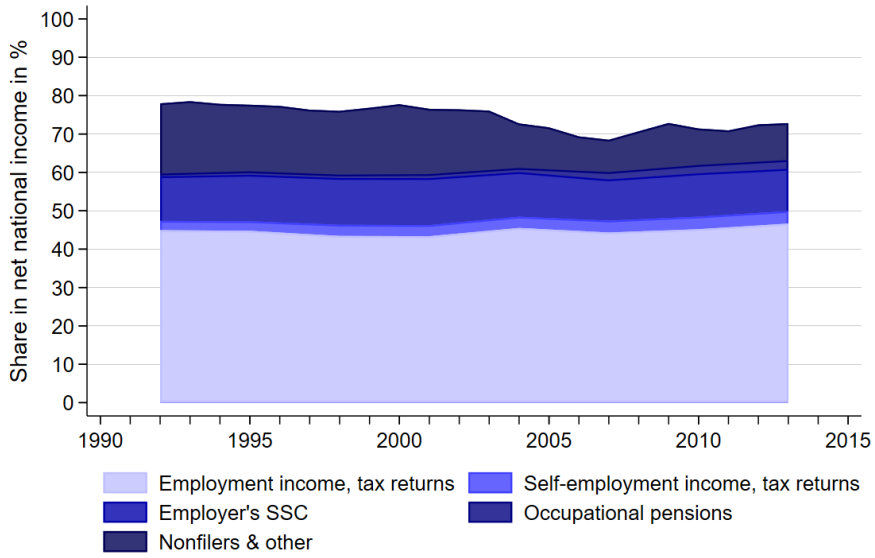
In international comparison, the share of pre-tax labor income in net national income was higher than in the U.S. in the 1990s. Vice versa, capital income has less importance in Germany relative to the United States throughout the 1990s, but has caught up during the 2000s. Contrary to the US case, occupational and private pensions play a minor role in Germany, while employer's social security contributions amount to 10% of net national income. Thus, private pensions - though on the rise in Germany - still play a minor role due to the importance of the public insurance-based welfare scheme.

[1]The German Federal Statistical Office (Destatis, 2009) acknowledges that "balancing differences" with respect to the production and expenditure approach of GDP calculation amounts to about 1% of GDP. Bach et al. (2013) estimates that the gap between adjusted national accounts' business income and tax-recorded business income was about 90 billion euros in 2004, which is more than 4% of GDP in that year.

In comparison to the United States, capital incomes such as dividends, interest and rent play a minor role in Germany. In contrast, business incomes make up twice the share in Germany than in the USA. This can be attributed to the particular structure of the German business sector that is dominated by unincorporated, family-owned businesses.

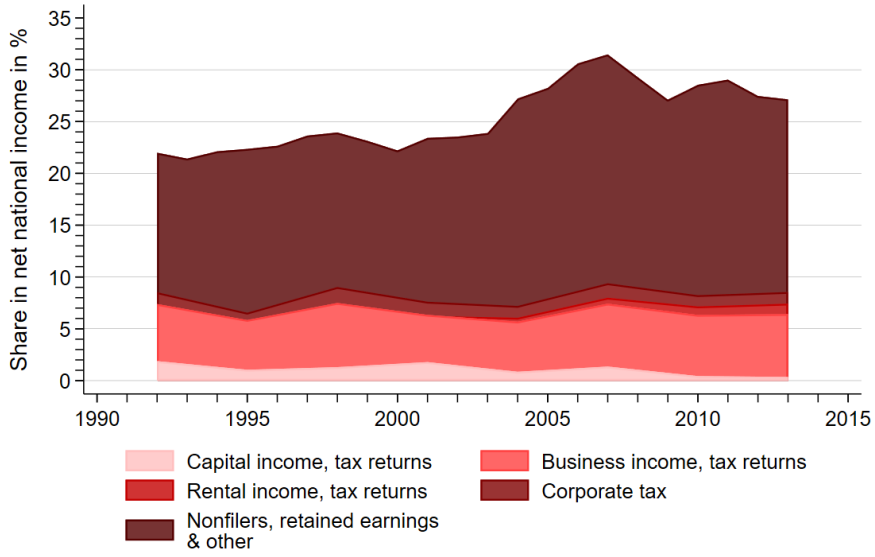
According to Alvaredo et al. (2016), 70% of self-employment and business income is attributed to labor income and 30% is attributed to capital income. We deviate from this procedure: We fully attribute self-employment income to labor income and fully attribute business and agricultural incomes to capital income. The reason for deviating from the basic DINA procedure is that 90% of German firms are family-owned and unincorporated. Top incomes in Germany are generated from these unincorporated family firms, while dividends only contribute a minor share (Bartels, 2018). We argue that business income in Germany mostly represents capital income. Contrary, self-employment incomes in Germany are almost exclusively generated by the independent professions such as lawyers and physicians. For comparability reasons, we include results for the standard procedure (30/70 divide of capital and labor in mixed income) in the Appendix (Figures B.1, B.2).

Figure 1: From taxable to total labor income: Labor share in net national income



Source: Own calculations based on tax and national accounts data, Assumption: Self-employment incomes contribute fully to labor income; business and agricultural incomes contribute 100% to pretax capital income; for details see table A.1

Figure 2: From taxable to total capital income: Capital share in net national income

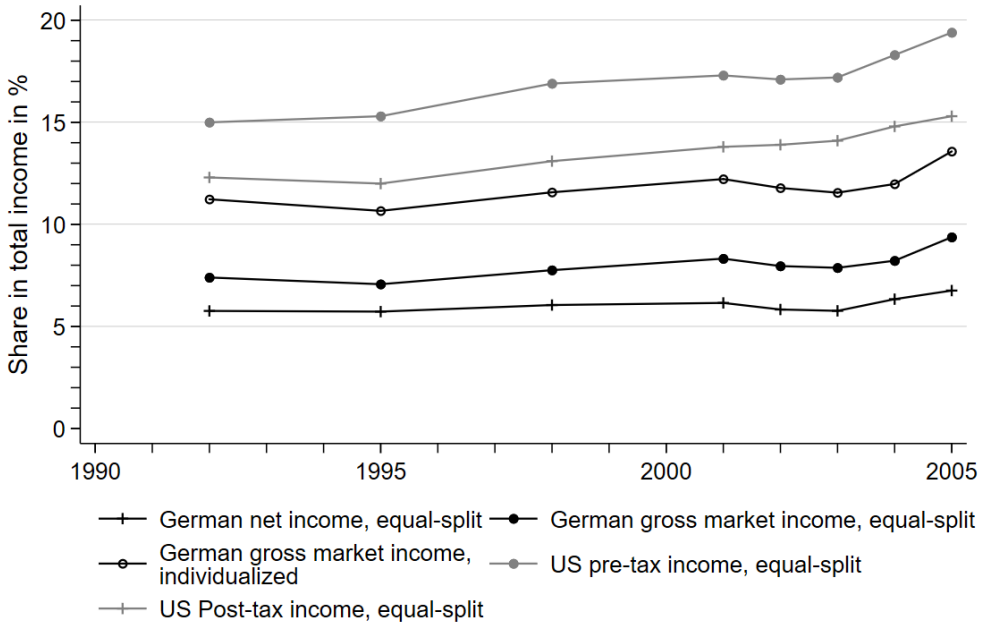


Source: Own calculations based on tax and national accounts data, Assumption: Self-employment incomes contribute fully to labor income; business and agricultural incomes contribute 100% to pretax capital income, for details see table A.2

4.2 Top income shares

Our data allows to revise the top income shares for Germany and compare it to other countries' experiences. The preliminary data analysis shows that the share of the top 1% of incomes in total income has risen from 7.4% during the mid-1990s to 9.4% in 2005. The share is lowered by redistribution through the welfare state to between 1.3 % (1995) and 2.6% (2005). In international comparison, Germany shows a substantially smaller level of income concentration at the top than the US (Piketty et al., 2018), while the redistributive power via the tax-transfer system - measured as discrepancy between gross market and net market income (both equal split) - is higher in the U.S. case. This might be due to the fact that Germany heavily relies on insurance-based welfare schemes concerning pension, unemployment and health care.

Figure 3: Share of the top 1% income share in total gross income

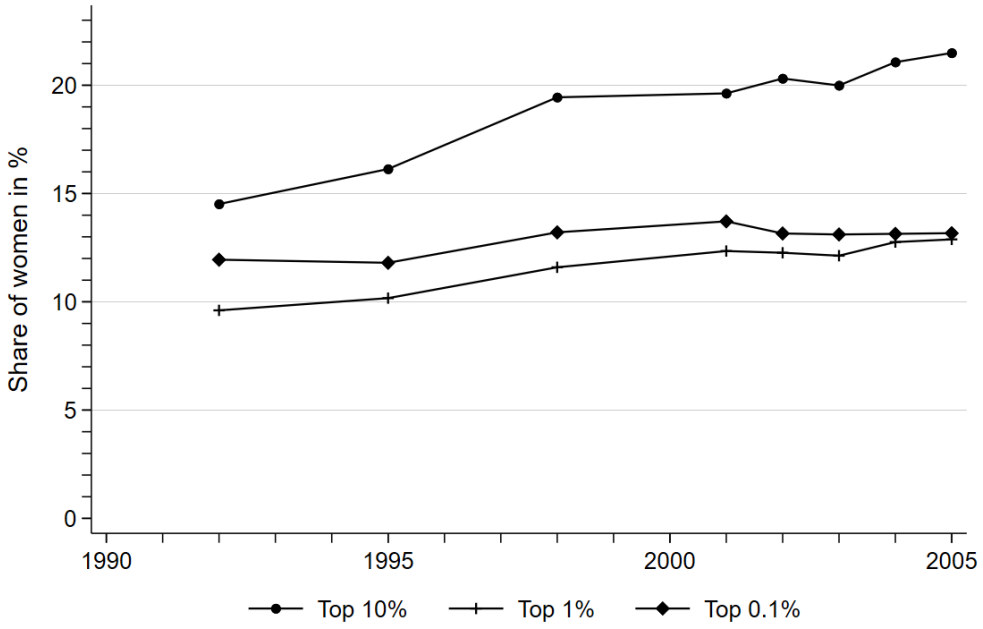


Source: Own calculations based on Bach et al. (2009) (see Table A.3) and Piketty et al. (2018)

4.3 Age and gender groups

Preliminary calculations show that the share of women among the top 10% of income earners in the population has risen substantially from 14.% to 21.5% since the beginning of the 1990s to the mid-2000s. However,the representation of women within the top 1% and top 0.1% of incomes remained fairly stable over this period. This might be due to fact that women entered high-paying jobs, however, did not close the gap in entrepreneurship.

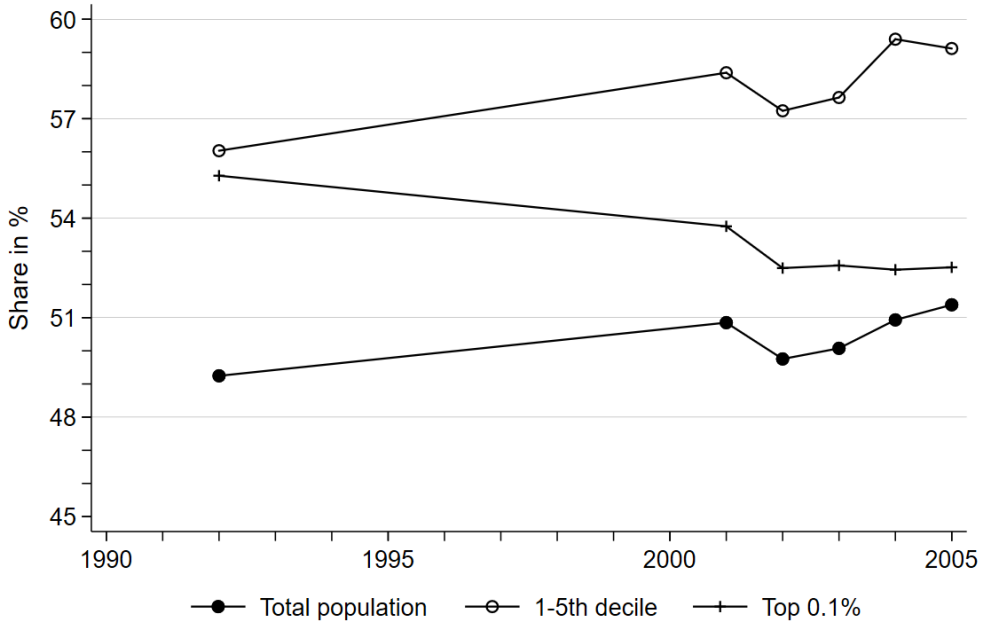
Figure 4: Female top earners



Source: Own calculations based on Bach et al. (2009); based on individualized incomes

Figure 5 suggests that the bottom 50% of income earners are older than the upper part of the pre-tax income distribution. This is not surprising because gross market income is similar to pre-tax factor income which results in zero income for a substantial share of pensioners. Both the bottom 50% and the top 0.1% are older than the population average.

Figure 5: Average age of three gross market income groups



Source: Own calculations based on Bach et al. (2009), Gross market income is similar to pre-tax factor income: it includes gross factor incomes, but exclude private and public pensions

5 Conclusion and Outlook

Our paper provides a new view on German income inequality over the past decades. We find that the labor share in national income declined. Income concentration has increased. Despite government redistribution reducing income concentration at the top, also net incomes became increasingly more concentrated.

The share of women in the top decile has increased, while their share in the very top income groups has been fairly stable. Both the bottom half and the very top of the income distribution are older than the average population.

As of February 1st 2019, we have already analyzed the national accounts data. Further, we have obtained a first round of results from the remote access to individual income tax returns. We are expecting to obtain pre- and post-government inequality estimates in spring and will be able to show and discuss these results in July 2019.

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A Tables

Table A.1: Share of labor income in net national income

year	Wages and salaries	Self-employment income	Employer's SSCs	Occupational pensions	Other income	Pre-tax labor income
1992	44.96	2.430	11.60	0.707	18.31	78.01
1995	44.80	2.481	12.11	0.895	17.36	77.64
1998	43.46	2.897	12.17	0.893	16.63	76.06
2001	43.39	2.898	12.23	1.043	17.02	76.58
2004	45.54	2.930	11.62	1.066	11.63	72.78
2007	44.35	3.100	10.71	1.914	8.443	68.52
2010	45.22	3.273	11.27	2.177	9.515	71.45
2013	46.68	3.240	11.01	2.287	9.636	72.86

Assumption: Self-employment income contributes full to pre-tax labor income; shares are illustrated in Fig. 1

Table A.2: Share of capital income in net national income

Year	Capital income	Business income	Rental income	Corporate tax	Other income	Pre-tax capital income
1992	1.888	5.510	-0.379	1.518	13.46	21.99
1995	1.054	4.799	-0.714	1.415	15.81	22.36
1998	1.306	6.192	-0.625	2.160	14.91	23.94
2001	1.793	4.559	-0.107	1.371	15.81	23.42
2004	0.861	4.837	0.369	1.141	20.01	27.22
2007	1.362	6.070	0.567	1.398	22.08	31.48
2010	0.443	5.902	0.815	1.087	20.30	28.55
2013	0.358	6.070	0.999	1.125	18.59	27.14

Assumption: Business and agricultural incomes contribute fully to pre-tax capital income; shares are illustrated in Fig. 2

Table A.3: Top 1% income share in total income

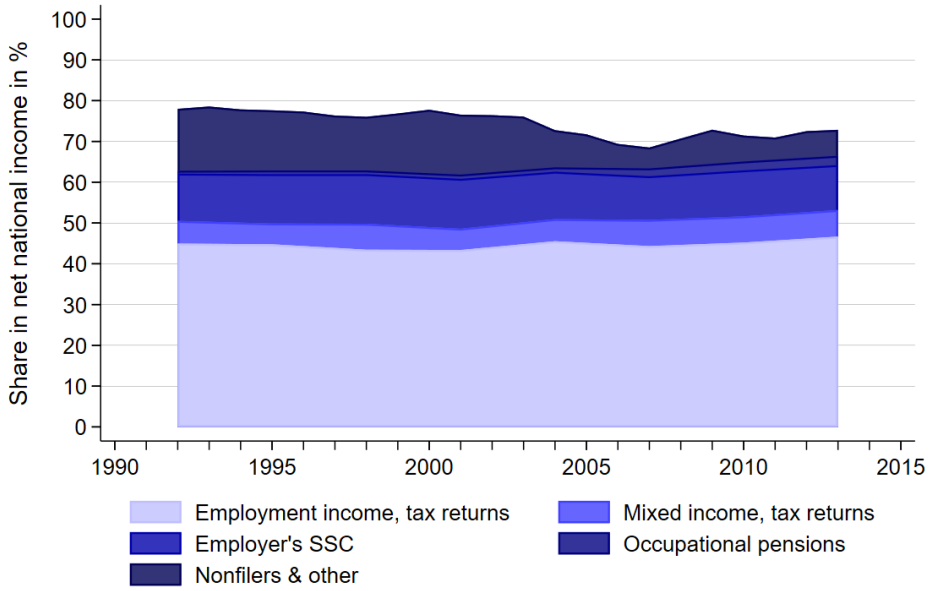
Top 1% share in %			
Year	Gross market income (individualized)	Gross marketincome (equal-split)	Net market income
1992	11.23	7.40	5.76
1995	10.66	7.07	5.73
1998	11.57	7.76	6.05
2001	12.22	8.32	6.15
2002	11.79	7.96	5.83
2003	11.55	7.87	5.77
2004	11.98	8.22	6.34
2005	13.57	9.37	6.76

Source: Based on calculations of Bach et al. (2009), Shares are illustrated in Fig. 3

B Alternative strategies

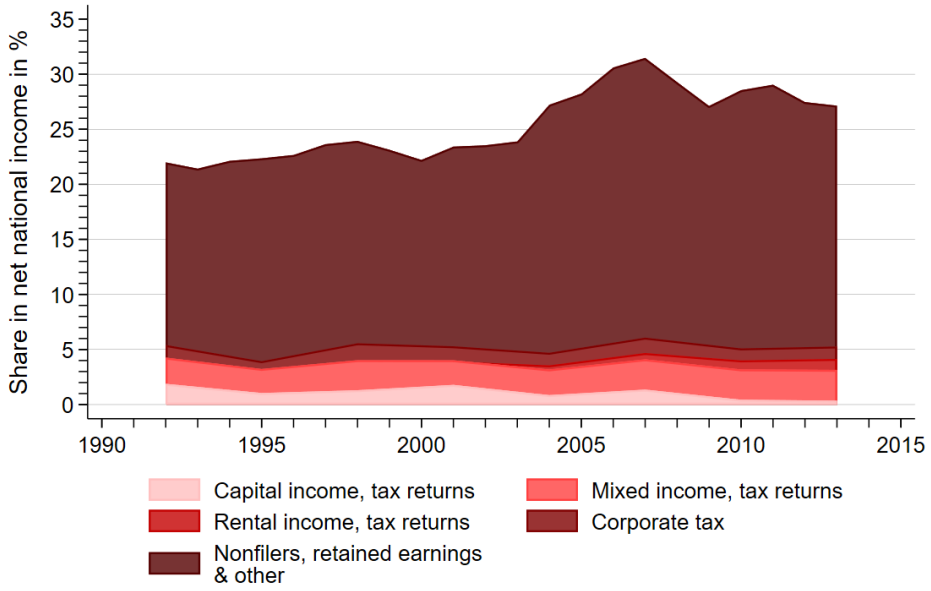
In this section, we include graphs that attribute 70% of self-employment, business and agricultural incomes to pre-tax labor income and 30% to pre-tax capital income. While we think that our assumption of attributing 100% of business and agricultural incomes is more appropriate for the German case, for reasons of international comparability, it is included here.

Figure B.1: Labor share in net national income: tax returns vs. national accounts



Source: Own calculations based on tax and national accounts data, Assumption: Self-employment, business and agricultural profits contribute 70% to pretax labor income

Figure B.2: Capital share in net national income: tax returns vs. national accounts



Source: Own calculations based on tax and national accounts data, Assumption: 30% of self-employment, business and agricultural incomes are attributed to pre-tax capital income

Distributional National Accounts: A Macro-Micro Approach to Inequality in Germany Data Appendix

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April 30, 2019

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Abstract

This Data Appendix supplements our paper "Distributional National Accounts: A Macro-Micro Approach to Inequality in Germany" It provides complete details on the methodology, data, and programs.

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3.1.3 Pretax factor capital income 4

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1 Data sources

1.1 National Accounts

1.2 Tax data

1.3 Survey data

2 Creating DINA concepts with SOEP

We use the SOEP-equivalent file (pequiv). Variable names are in italics.

2.1 Pretax factor income

2.1.1 Pretax factor labor income

For the computation of pretax factor labor income, we first computed a gross wage income concept for each individual (*in code: *p*) each tax unit (*in code: *t*). Yearly wage income includes the following components:

- Compensation of employees received by the household sector
  - Wages or Salary from the Main job of the previous year (*ijob1$$*)
  - Income from secondary employment of previous year (*ijob2$$*)
  - 13th and 14th monthly salary of previous year (*i13ly$$, i14ly$$*)
  - Christmas bonus of previous year (*ixmas$$*)
  - Vacation bonus of previous year (*iholy$$*)
  - Profit-sharing of previous year (*igray$$*)
  - Other bonuses in previous year (*iothy$$*)
  - Indemnity payments of previous year (*idemy$$*)
  - Commuting expenses, travel grants of previous year (*itray$$*)
- Labor share (70%) of net mixed income

  - Income from self-employment (*iself$$*)

Employer's social insurance contributions are not included in the SOEP survey data, but we simulate from yearly information of contribution rates and the contribution assessment ceiling with the microsimulation model STSM. Thereafter, this gross labor income was proportionally upgraded to the aggregate of the national account component "D.1 Employee's compensation" as described in (Alvaredo et al., 2016, 54).

Income from business, agriculture and self-employment are included in the variable *iself$$*. To discern between business and agriculture income on the one hand and self-employment income on the other hand, we....

2.1.2 Pretax factor capital income

- Capital share (30%) of net mixed income
  - Income from self-employment (*iself$$*)
- Net operating surplus
  - Income from rental and leasing (*renty$$*)
  - - Operation, maintainance costs (*opery$$*)
- Property income
  - Interest, dividend income (*divdy$$*)
  - Company pension (*icomp$$*)
  - Private pension (*iprvp$$*)

3 Creating DINA concepts from income tax data

3.1 Pretax factor income

3.1.1 Pretax factor labor income

- Compensation of employees received by the household sector

  - Income from employment minus civil servant pensions (*c65163+c65164-c66206-c66207*)
  - Tax-exempt income according to double-taxation treaties (*c66202+c66203*)

  Employer's social insurance contributions are not included in income tax data, but are simulated from yearly information of contribution rates and the contribution assessment ceiling. We also simulate social insurance contributions for civil servants (does this make sense?), which is assumed to be 2.53 higher than regular employer's social insurance contributions.

- Labor share (70%) of net mixed income
  - Income from forestry and agriculture excl. capital gains (*c65101+c6510-(c65107+c65108-c65112-c65113)*)
  - Income from business incl. dividends excl. capital gains (*c65120 + c65121 + c44024 + c44025 - (c65135 + c65136 - c65127 - c65128)*)
  - Income from self-employment incl. dividends excl. capital gains (*c65141 + c65142 + c22062 + c22063 - (c65155 + c65156 - c65149 - c65150)*)

  Dividends for forestry and agriculture are not included in income tax data.

  @Stefan: why do we substract tax-exempt capital gains? @Stefan: do we have to uprate dividends to full amount? (TeileinkÃ¼nfte), $\text{div}_s am; div_g ew$

3.1.2 Pretax factor capital income

3.1.3 Pretax factor capital income

- Capital share (30%) of net mixed income
  - Income from forestry and agriculture excl. capital gains (*c65101+c6510-(c65107+c65108-c65112-c65113)*)
  - Income from business incl. dividends excl. capital gains (*c65120 + c65121 + c44024 + c44025 - (c65135 + c65136 - c65127 - c65128)*)
  - Income from self-employment incl. dividends excl. capital gains (*c65141 + c65142 + c22062 + c22063 - (c65155 + c65156 - c65149 - c65150)*)

- Net operating surplus
  - Income from rental and leasing (*c65241+c65242*)
  -
- Property income
  - Interest, dividend income (*divdy$$*)
  - Company pension (*icomp$$*)
  - Private pension (*iprvp$$*)

To do: how do we treat losses from renting and leasing over time given extreme losses in 1990s and tax-exemptions

References

Alvaredo, F., A. Atkinson, L. Chancel, T. Piketty, E. Saez, and G. Zucman (2016). Distributional National Accounts (DINA) guidelines : Concepts and methods used in WID.world. WID.world Working Paper Series No. 2016/1.