

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

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February 19, 2020

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Abstract

This project provides a new income inequality series for reunified Germany combining tax data, survey data to national accounts. Estimating distributional national accounts (DINA), we capture 100% of national income and can compute the distribution of pretax and posttax incomes for the entire population. This allows us to answer the following questions: Who has benefited more from economic growth: employees or capital owners? The bottom 50%, the middle class or the top 10%, 1% and 0.1% of earners? Further, our paper is the first to apply the DINA methodology to the analysis of regional disparities. 30 years after the German reunification, substantial income differences remain between those living in East and West Germany. In the 1990s, West German investors bought real estate and factories in East Germany, following favourable tax incentives. We investigate to what extent capital income generated in East Germany flowing to West German capital owners can explain structural differences between the income distributions in East and West Germany.

JEL Classification: E1, H2 H5, J3

Keywords: Income distribution; Capital accumulation; Wage distribution; Gender

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gap; Income composition; Top Income Groups

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. On 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, (3) investigate the role of the German welfare state in mitigating inequality and (4) to apply the DINA methodology to the analysis of regional disparities between East and West Germany. 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 or public pensions play for changing income inequality across the population? Can capital income generated in East Germany flowing to West German capital owners explain structural differences between the income distributions in East and West Germany?

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 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.

For our distributional analysis, we can use the entire universe of individual tax returns from the PIT micro data became available in Germany in 1992. The triennial wage and income tax statistics (1992, 1995, 1998, 2001, 2004, 2007, 2010) includes all tax units subject to income and/or payroll taxes. Individual income tax files, however, cover only approximately 60% of national income and 37 million individuals (tax year 2007). Individuals and household under the exemption limit are not covered. To arrive at the full population of individuals of 20 years and above, we merge non-filers from the German SOEP. This is done in two steps: First, we identify non-filer cases in the SOEP data via a micro simulation model. Second, we add SOEP cases to match the absolute number of households in the population statistics. To represent the composition of the population, we add SOEP cases to fill up the observed number of households in the following categories: single/married x federal state x 5-year-age-groups of the household head from 20 to 70 years. In this way we arrive at a population of 46.5 million couple or single tax unit or 65 million individuals of 20 years and above (tax year 2007).

Add descriptives

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 definitions, 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 according to the DINA methodology laid out in Piketty et al. (2018) and Alvaredo et al. (2016). After constructing a holistic micro dataset representative for the German population above 19 years, fiscal incomes reported in the tax and survey data are reconciled with national income as recorded in the national accounts.

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 and sickness benefits (*Arbeitslosengeld I*, *Krankengeld*) 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 advantage of the DINA methodology is that it fills the gap between fiscal

income - the income concept most prior inequality studies were based on - and national income recorded in the national accounts. The reasons for this gap between fiscal and national income is mainly due to 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: We distribute imputed rents according to the information from SOEP data using mean-value imputation.
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?: We distributed the personal component of the corporate sector proportional to dividend's and shareholder income recorded in the tax data.
3. Corporate, payroll and indirect taxes represent a part of national income, but are excluded from fiscal income: Income tax (including the Solidaritätsbeitrag) is recorded in the tax data. We simulate corporate taxes from net dividends and legislation. Taxes on productions and products are distributed proportionally to pretax income.
4. Tax-exempt employer fringe benefits such as health and pension contributions are included in national income, but excluded from fiscal income: We simulate employee's and employer's social insurance contributions from information about individual's earnings and occupation.
5. Public and private pensions are included in national income, but are only partly present in tax return data as only a share is taxable: We upscale pensions to the full amount based on the taxable share of pensions and deducting the retirement year from the age of a person.
6. 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: We include those based on information of the progression proviso in tax returns.

7. Non-filer income is included in national income, but excluded from fiscal income if incomes are below the tax allowance: We include those by adding SOEP observations.
8. Unreported income due to tax evasion: We cannot control for this.
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.

We add items 1)-7) to our fiscal income distribution and deduct item 9) to reconcile fiscal and national income. The distributional assumptions laid out above follow the internationally standardized DINA approach and thus will ensure a harmonized comparison with other countries.

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).

Having distributed the entire set of income components across the full income distribution, we estimate percentile distributions. Further, we compute percentile distributions by population subgroups such as gender and East- vs. West Germans to investigate structural differences in the distribution of incomes and income types between subgroups of the German population.

4 Results

4.1 The composition of net national income

Figure 1 presents the share of pre-tax labor income in net national income for Germany and United States. For Germany, 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 continuously 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. In comparison to the United States, we see the difference in the social insurance system between the two countries. While the mainly private insurance system in the USA manifests in private pension contributions of approximately 7% of net national income, Germany's mainly public insurance system shouldered by employees and employers appears through employer's social insurance contributions of approximately 10% of net national income. Contrary to the US case, occupational and private pensions play a minor role in Germany. 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.

During the same time in Germany, 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. This is explained by four reasons. First, capital income is calculated as a residual in German national accounts since there are no representative primary statistics on business income in Germany. This introduces a substantial amount of measurement error.¹ Second, tax avoidance might occur at a larger scale with business and property income than with employment income, which understates business and property income in tax statistics. Third, 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

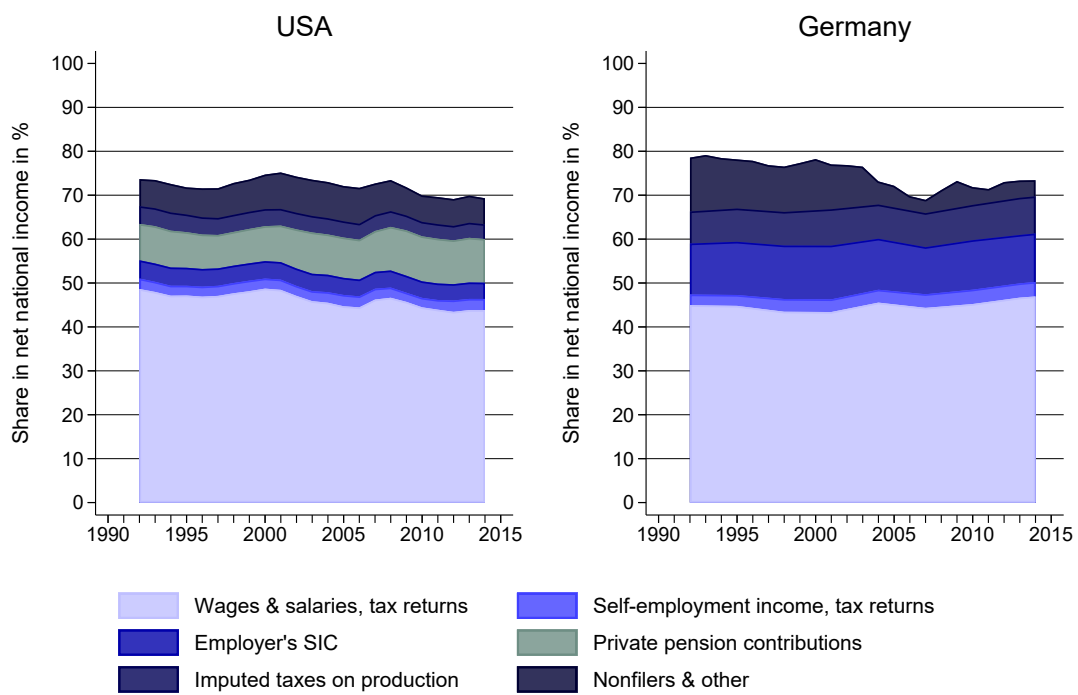
¹The German Federal Statistical Office (Destatis, 2009) acknowledges that "balancing differences" with respect to the production and expenditure approach of GDP calculation amounts to about 1% of GDP. Bach et al. (2013) estimates that the gap between adjusted national accounts' business income and tax-recorded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

anymore. As a consequence, the share of capital income in tax returns is even lower after 2009. 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.

All in all, the labor share 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. ²

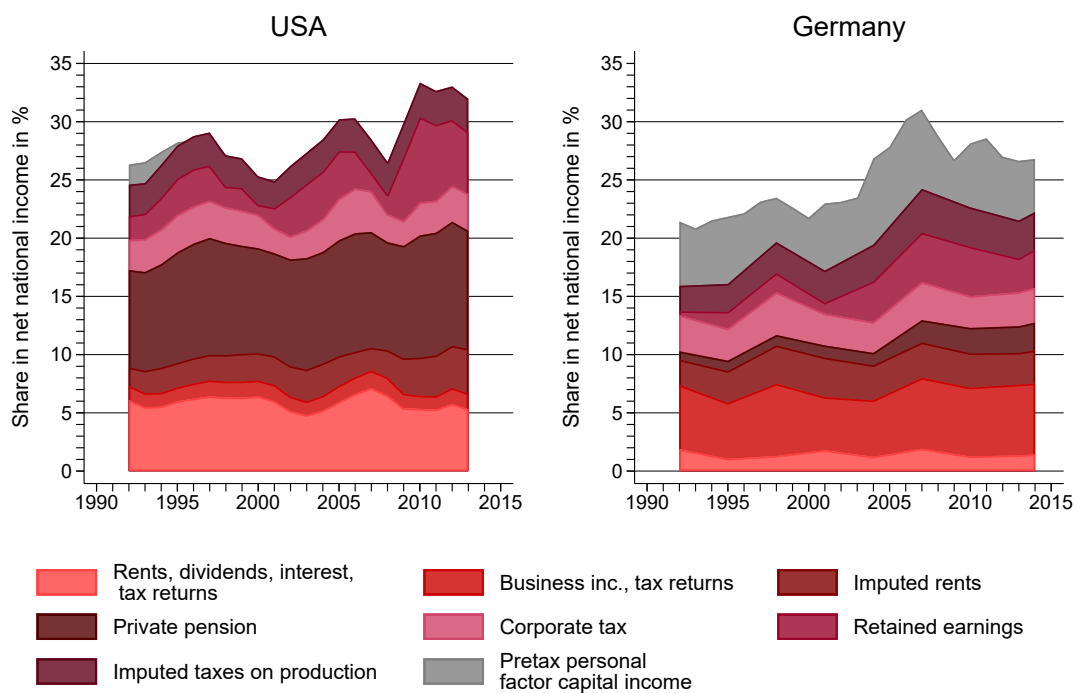
²We deviate from the DINA standard (Alvaredo et al., 2016), which allocates 70% of self-employment and business income to labor income and 30% to capital income. Given that 90% of German firms are family-owned and unincorporated, we fully attribute self-employment income to labor income and fully attribute business and agricultural incomes to capital income. Top incomes in Germany are generated from these unincorporated family firms, while dividends only contribute a minor share (?). 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; for details see on Germany see table A.1

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

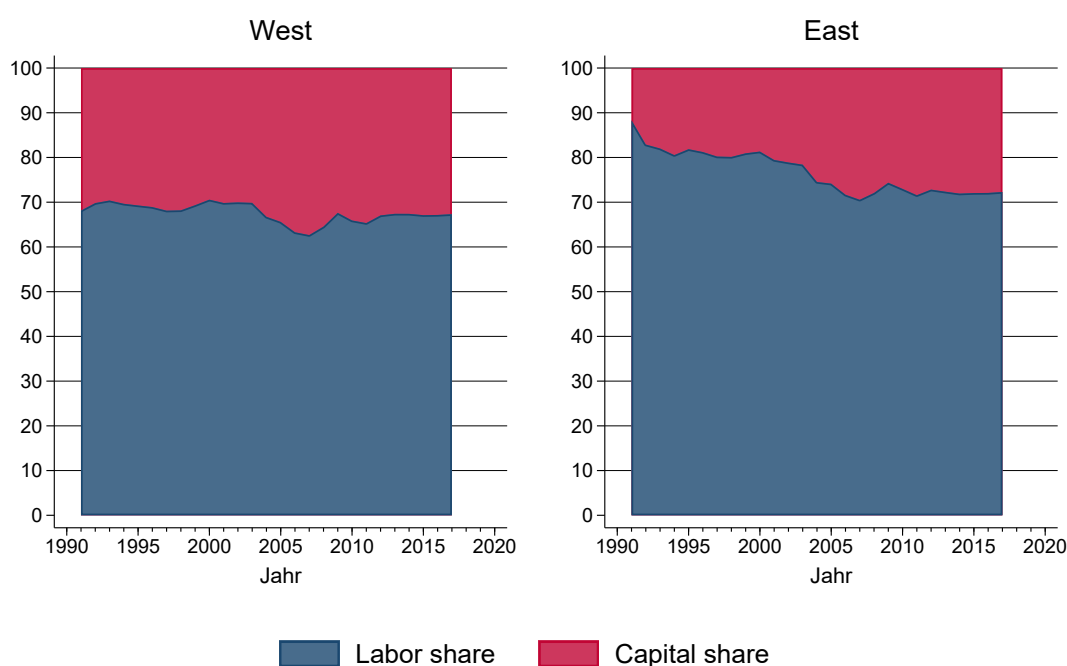


Source: Own calculations based on tax and national accounts data, for details on Germany see table A.2

4.2 The macro view: Regional disparities

30 years after unification of Germany, substantial income differences persist between those living in the Eastern and Western part of the country. Convergence is slow and still far from complete. One possible reason for the income gap lies in the structural difference of the income distribution and its components. Figure 3 shows that the labor share of net national income (excluding taxes on production) in East Germany exceeds the labor share in West Germany. While the West German federal states show a rather constant labor share in national income between 65 and 70%, the East German labor share decreased from 88% in 1991 to 72% in 2017. This means that capital income gained importance in East Germany, particularly during the first two decades after unification.

Figure 3



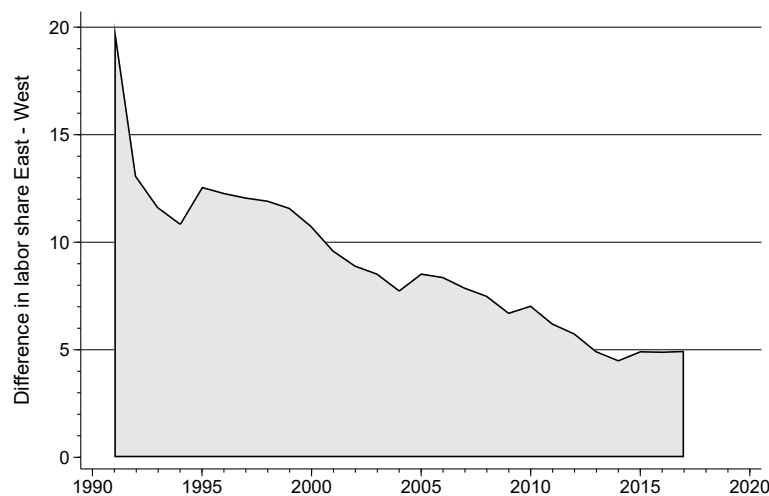
Note: Net national income excluding taxes on production. Capital income is computed as residual of national income.

Source: Own calculations based on tax and national accounts data. Labor income is employees' compensation.

Figure 4 highlights that convergence in the composition of incomes is visible but not complete. In the new federal states the labor share is 5 percentage points higher than in the old states. While until 2013 a clear convergent trend was visible,

the gap was not reduced further in recent years.

Figure 4



Source: Own calculations based on tax and national accounts data.

This compositional difference may stem from diverging patterns in income flows across borders. Figure 5 shows the balance of net foreign income as percentage of net national income. Net foreign income is the difference between net national income and net domestic product and comprises incomes received by residents of (a region of) Germany net of incomes that “foreigner” receive from (a region of) Germany. Net foreign income is positive if residents receive more income from abroad than “foreigner” receive from (a region of) Germany. This might be the case either when a critical mass of persons commutes to work outside the region and thus labor incomes flowing in or due to persons having invested in opportunities outside the region and thus receiving capital incomes from outside their region of residence. A negative net foreign income can be the result of a mass of commuters into the territory (which is often the case for city federal states in Germany) or due to capital incomes flowing out of the territory because “foreigners” have invested in housing or firm shares in the territory and receive capital incomes from their investments.

Figure 5 shows that income flows follow different patterns for the Western and Eastern federal states of Germany. Especially in the Eastern part of the country, the balance between net national income and net national product exhibits turbulences: Net foreign income fell from 10% of net national income (NNI) to -4% of NNI from

1991 to 1995. This sudden drop is followed by a persistent increase until 2017 such that since 2000 the net foreign income is higher in the new federal states than in the old states.

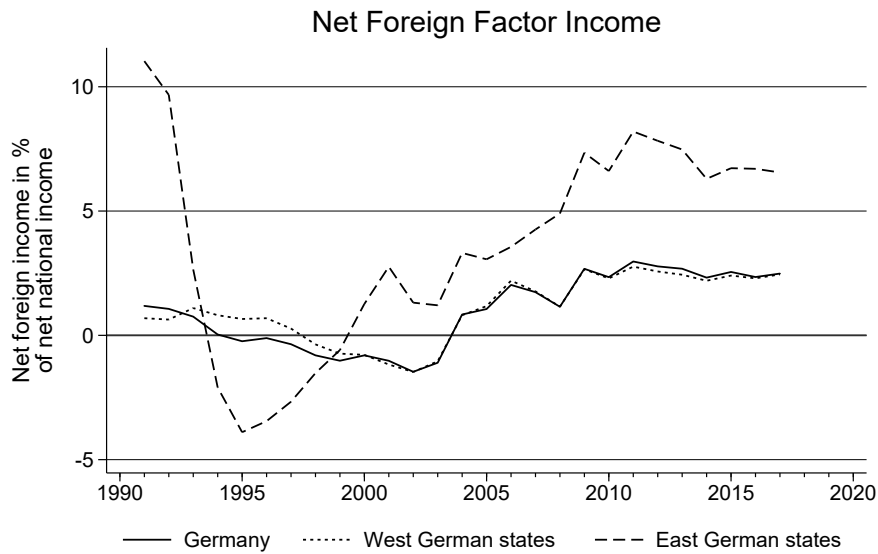
These developments, as mentioned before, can have different causes rooted in the structure and location of labor and capital. Figures 6 and 7 show that the Eastern and Western part of Germany still show very different capital and labor income flow patterns over the last 30 years. While cross-federal-state-border labor income flow almost balance out for the old federal states, the formerly socialist part of the country exhibits stable labor income flows for residents about 5% of NNI. This hints at the fact that even 25 years after Reunification, many persons rooted in Eastern Germany, earn their living in the old federal states and commute. Also for capital income flows, the two parts of Germany diverge. The old federal states show only small imbalances between outgoing and incoming capital flows through this with an increase in net capital flows since 2002 and a plateau at 2.5% of NNI since 2009. The new federal states show more turbulances: An initial sharp decrease in capital flows for residents in 1991 and 1992, negative capital income flows, i.e. capital income flowing from the East German federal states to “foreigners”, prevail until 2008. After 20 years of convergence to the West Germany pattern, since 2001 the new federal states a surplus of capital income flowing to residents of approximately 2.5% of NNI.

All in all, despite some convergence the two German regions still show differences in the composition of their residents income. West Germans still have a higher share of capital income in overall income. A positive capital income balance hints at some capital incomes coming from investments outside West Germany. Vice versa, East Germans still show higher share of labor income. This can be connected to substantial labor income surplus from commuters and a substantial capital income outflow from the new federal states from 1995 until 2008.

What might be possible reasons for these patterns? In the 1990s, we saw a massive investment flow going from West Germany to East Germany. Politicians during this time fostered these investments by incentives such as tax reliefs on real estate and business incomes. Capital income resulting from investment flowing back

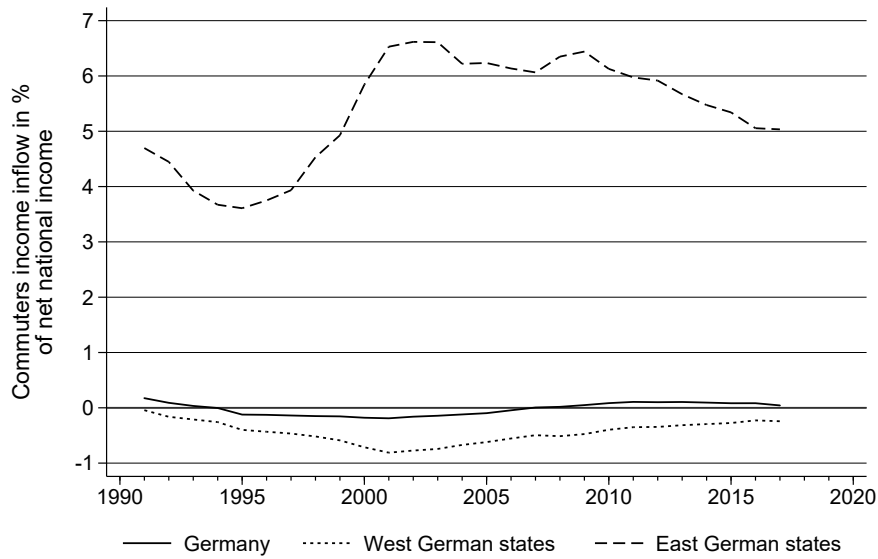
from residents of East Germany to the old federal states might play a part in the long lasting negative capital income balance of the East. Second, the still differing wealth levels between residents of both parts of the countries might causes more capital incomes flowing to residents of the old states. The possible causes have to explored more in-depth.

Figure 5: Net foreign income



Source: Own calculations based on tax and national accounts data. We cannot exclude income flows from other countries, thus, this does not identify directly income flows between the two part of Germany.

Figure 6: Commuter's labor income balance



Source: Own calculations based on tax and national accounts data. We cannot exclude income flows from other countries, thus, this does not identify directly income flows between the two part of Germany.

Figure 7: Resident's capital income flows from other federal states and countries

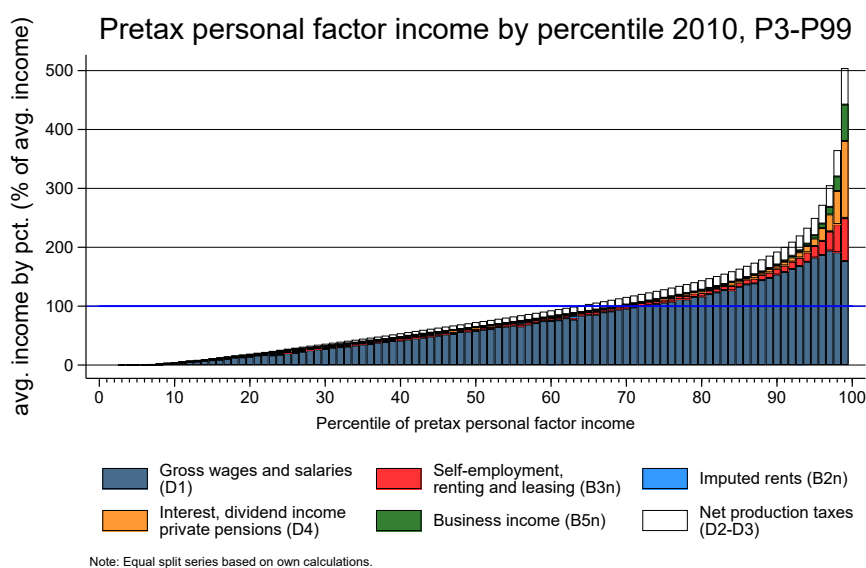


Source: Own calculations based on tax and national accounts data. We cannot exclude income flows from other countries, thus, this does not identify directly income flows between the two part of Germany.

4.3 Distributional results

We now turn to the distribution of pretax factor income. Figure 8 shows the percentile's average income in percent of average income. The 70th percentile's income equals the average income. Further, Figure 8 shows the income composition. Gross wages and salaries dominate incomes up to the 98th percentile. Only the top percentile capital, mostly generates incomes from renting and leasing (red), shareholding and capital assets (orange) and business incomes.

Figure 8: Pretax personal factor income by percentile

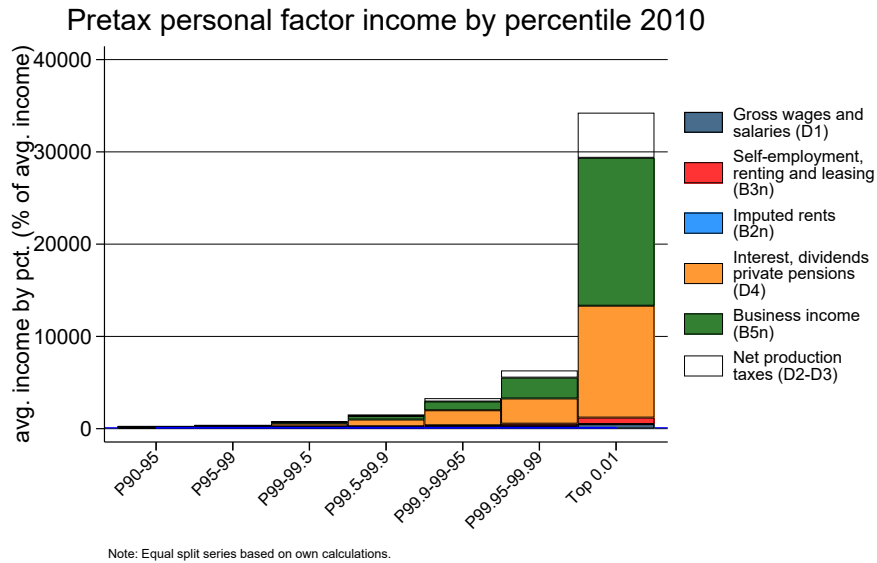


Source: Own calculations based on tax data.

Figure 9 zooms into the top of the distribution. Incomes of the richest 0.1% (appr. 680,000 individuals) amount to 350 times the average income. Labor and self-employment incomes are negligible, while incomes from shareholding and business incomes dominate the highest incomes. A particularity of the German economy is that business incomes prevails in the top 0.01%. This is linked to the high number of unincorporated, often family-owned businesses with high profits and a small number of owners.

Figure 10 displays the distribution of pretax factor labor income by age. We can see a typical development of a lifetime earnings curve with increasing incomes from 20 years to a plateau in 40s and 50s and a subsequent decline. This development

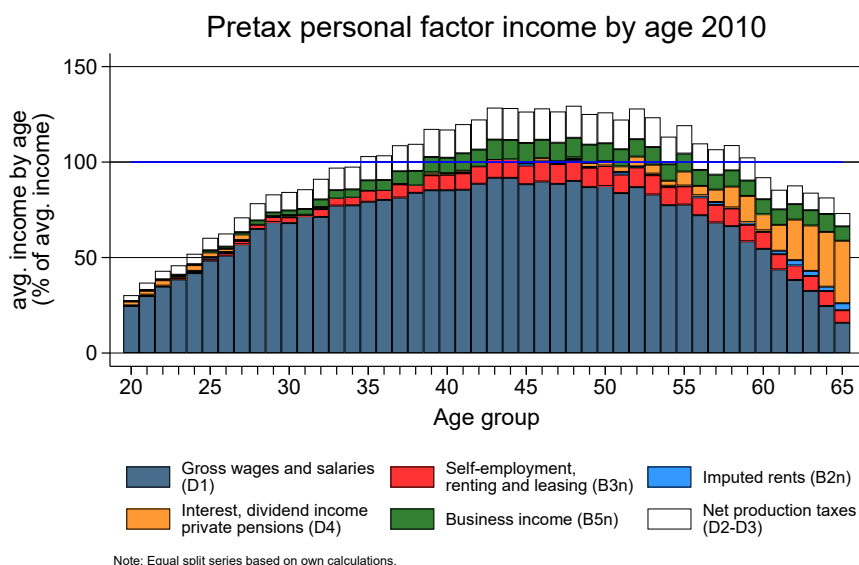
Figure 9



Source: Own calculations based on tax data.

is most prominent for labor incomes which decrease rapidly for persons older than 55 years. One should note however, while wages and salaries decline at higher ages, capital incomes and imputed rents increase. This means that German pensioners are not only relying on public pensions, but also earn substantial incomes from capital investments.

Figure 10: Pretax factor income by age



Source: Own calculations based on tax and national accounts data.

5 Conclusion and Outlook

Our paper provides a new view on German income inequality over the past decades.

We find that the the share of capital income in net national income increased from about 22% in 1992 to about 27% in 2013. 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.

First micro data analysis for the year 2010 show that labor income is the dominating income source for 99 percent of the income distribution. The income of the 70th percentile equals the overall average income. Incomes of the richest 0.1% (appr. 680,000 individuals) amount to 350 times the average income and mostly consist of business income. Incomes follow an inverse u-shape across the lifecycle with increasing incomes until age 45 and declining incomes thereafter. However, while wages and salaries decline at higher ages, capital incomes and imputed rents increase. This means that German pensioners are not only relying on public pensions, but also earn substantial incomes from capital investments.

As a next step, we will add further years to the micro data analysis. Further, we will investigate East-West-German differences in more detail.

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A Tables

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

year	Labor income in tax returns	Self-employment income	Social insurance contributions	Taxes on production	Other income	Pretax capital income
1992	44.78	2.42	11.42	7.27	12.38	78.27
1995	44.94	2.49	11.99	7.64	11.28	78.35
1998	43.56	2.90	12.04	7.70	10.43	76.64
2001	43.53	2.91	12.14	8.39	10.40	77.37
2004	45.81	2.95	11.58	7.96	5.570	73.88
2007	44.65	3.12	10.68	7.92	3.470	69.86
2010	45.58	3.30	11.29	8.26	4.687	73.12
2013	47.03	3.26	11.00	8.71	4.672	74.68
2014	47.11	3.32	10.96	8.63	4.459	74.48

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

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

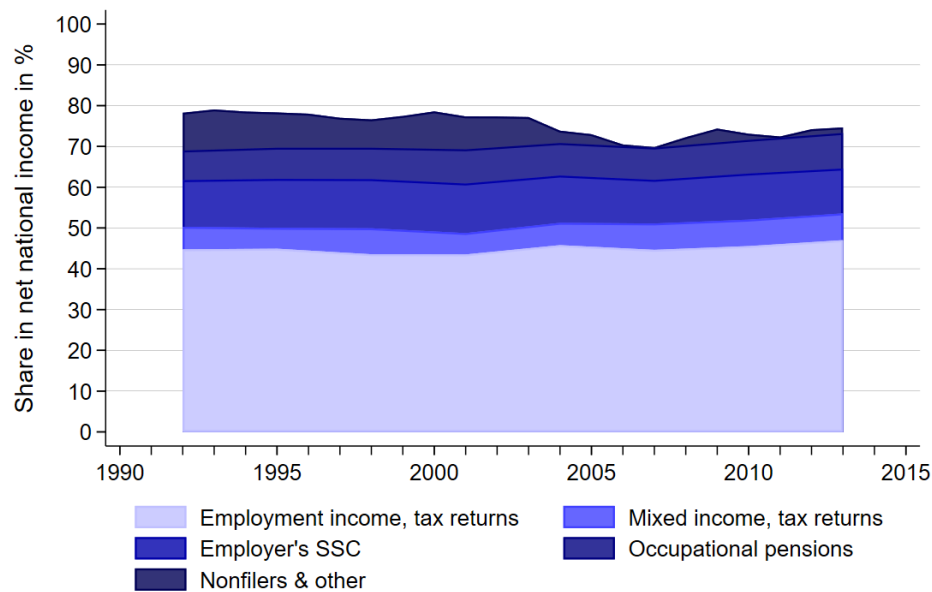
Year	Rent. & Leas.	Dividend, interest	Imputed rent	Business income	Corporate Tax	Retained earnings	Taxes on product.	Other	Pretax capital income
1992	-0.38	1.88	2.17	5.49	3.09	0.55	2.20	5.65	21.73
1995	-0.72	1.06	2.74	4.82	2.77	1.73	2.41	5.25	21.65
1998	-0.63	1.31	3.30	6.21	3.68	2.09	2.66	3.22	23.36
2001	-0.11	1.80	3.40	4.57	2.75	1.29	2.73	5.05	22.63
2004	0.37	0.87	3.03	4.87	2.66	3.64	3.08	6.54	26.12
2007	0.57	1.37	3.07	6.11	3.31	4.69	3.69	5.40	30.14
2010	0.82	0.45	2.98	5.95	2.76	4.40	3.28	4.05	26.88
2013	1.01	0.36	2.76	6.12	2.95	2.68	3.11	4.04	25.3
2014	1.10	0.33	2.91	6.10	3.00	3.45	3.07	3.18	25.52

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

B Alternative strategies

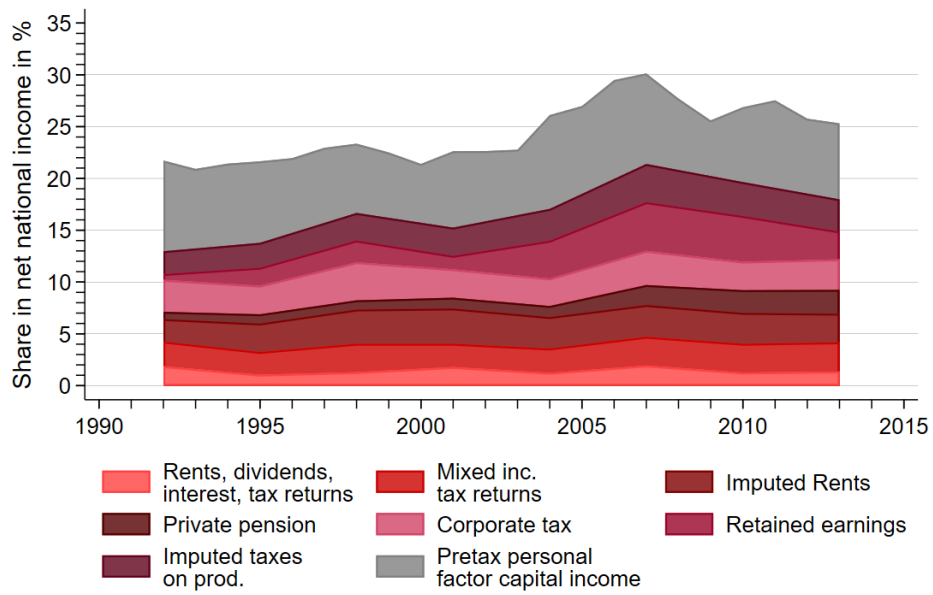
In this section, we include graphs that attribute 70% of self-employment, business and agricultural incomes to pre-tax labor income and 30% to pre-tax capital income. While we think that our assumption of attributing 100% of business and agricultural incomes is more appropriate for the German case, for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

Figure B.3: Income shares

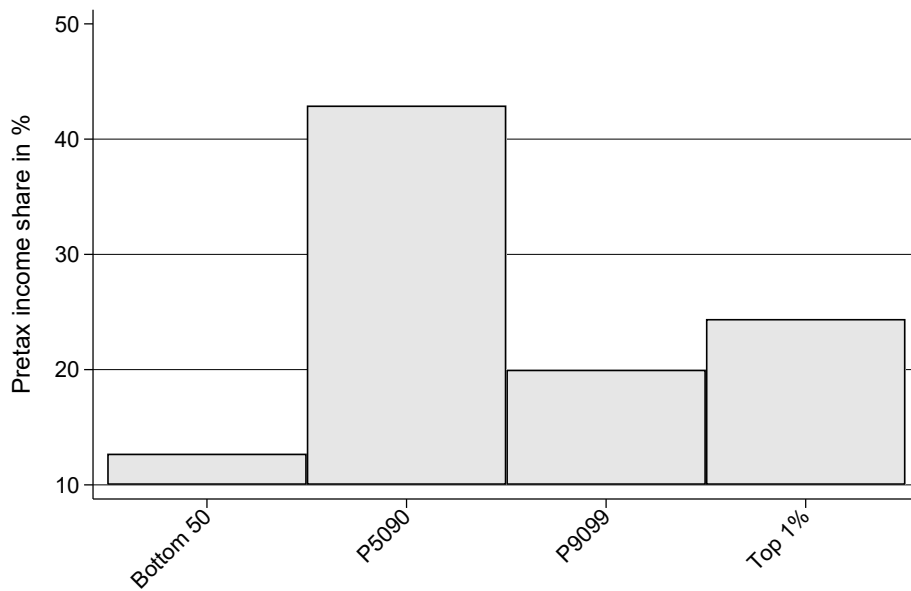


Figure B.4: Share of women

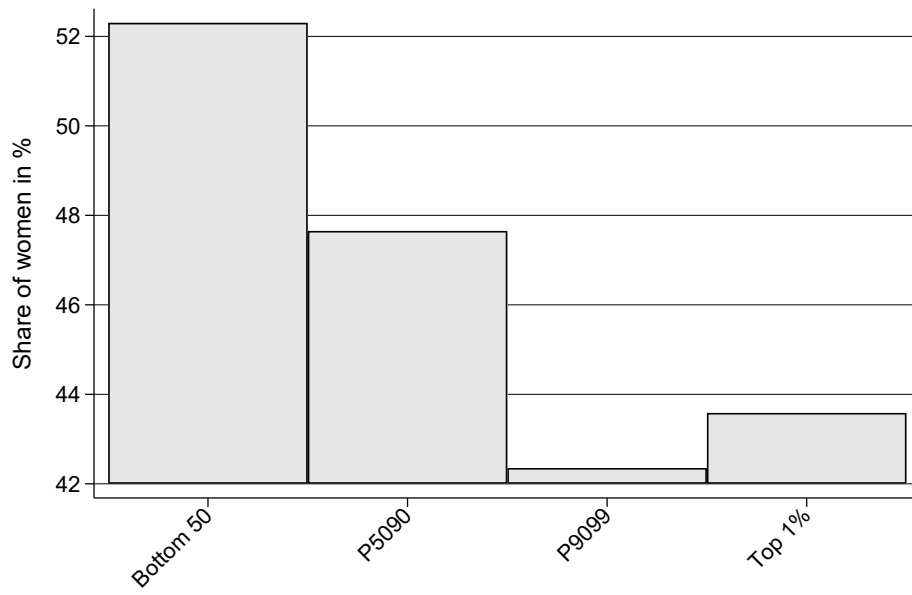


Figure B.5: Share of East Germans

