IARIW 2021
Monday 23 – Friday 27 August
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When Capitalism Takes Over Socialism:

(Missing) Capital and East-West-German Income Inequality

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Paper prepared for the 36th IARIW Virtual General Conference
August 23-27, 2021
Session 20: Inequality I
Time: Thursday, August 26, 2021 [14:00-16:00 CEST]

When capitalism takes over socialism: (missing) capital and East-West-German income inequality

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July 23, 2021

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Abstract

This paper constructs Distributional National Accounts (DINA) for East and West Germany to study the distribution of pre- and post-tax national income since reunification in 1990. We complement the universe of individual income taxpayers with the non-taxpaying population recorded in SOEP survey data and then align incomes with national accounts aggregates. We document substantial income differences between East and West Germans 30 years after the German reunification, which we relate to the lack of capital ownership in the East. We show that 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: D3, E01, H2 H5, J3

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

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1 Introduction

30 years after the German reunification, differences in income, wealth and living standards between East and West German households persist. Median disposable income in East Germany stabilized at 85% of the West German average (Krause, 2019). Average wealth of East German households is still less than 50% of the West German average (Albers et al., 2020).[1] With the economic convergence process slowing down, resentments and extreme voting behavior are on the rise. Only in recent years, a critical debate about the adequacy of policies accompanying the German reunification has evolved.

After reunification in 1990, the overriding majority of firms and real estate in East Germany was sold to West German investors and companies. The privatization, restructuring and closure of former state-owned enterprises in East Germany was managed by the state-owned trust agency (*Treuhandanstalt*), which in turn was headed by West German managers. Substantial tax reliefs on real estate and business investments – mostly directed at West German top income earners – fostered investment flows going to East Germany in the 1990s.[2] As a result, the process of reunification contributed to cementing differences in capital ownership and capital income between East and West Germany. Has this changed over time? How does the (missing) capital income affect the East-West-German income distribution until today? While labor income has been in the focus of most studies on the East-West-German income gap, capital income has received much less attention.[3]

In this paper, we combine individual income tax returns, SOEP household survey data and national accounts to estimate distributional national accounts (DINA) for Germany following the methodology established by Piketty et al. (2018) for the

[1] Other persistent differences between East and West Germany have been documented, for example, for financial literacy (Bucher-Koenen and Lamla-Dietrich, 2018), preferences for redistribution (Alesina and Fuchs-Schündeln, 2007), egalitarian sex-role attitudes (Bauernschuster and Rainer, 2012), solidarity behavior (Brosig-Koch et al., 2011), social trust (Heineck and Süssmuth, 2013), and inflation expectations (Goldfayn-Frank and Wohlfart, 2019).

[2] The economic literature on German reunification has highlighted these large investment flows and fiscal transfers from West to East Germany. See, e.g. Dornbusch et al., 1992; Von Hagen et al., 2002; Burda and Hunt, 2001; Snower and Merkl, 2006

[3] See for example BMWi, 2019; Fuest and Immel, 2019; Krause, 2019; Kluge and Weber, 2016; Kluge and Weber, 2018.

United States.[4] Thereby, our project is part of the global effort coordinated by the World Inequality Lab to improve international inequality analyses by compiling information on inequality using all possible data sources for as many countries as possible in a harmonized and comparable manner. 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 adult population. We build on Bach et al. (2009, 2013) who combined individual tax returns with SOEP household survey data to produce a full income distribution series of gross market and net incomes for Germany 1992-2005 as well as the German top income share series 1871-2014 using income tax data by Bartels (2019).

We develop a new regional DINA approach adding further national accounting concepts to identify capital income flows between East and West Germany. The traditional DINA methodology is based on net national income, i.e. income received by residents of a country. We draw on regional national accounts of German federal states (*VGR der Länder*) and differentiate between domestic income and residential (=national) income in a federal state. More precisely, we quantify the macroeconomic outflow of capital income from East Germany as the difference between capital income generated in East Germany and capital income received by East German residents.

We show that structural differences in capital ownership importantly contribute to the persistent income differences between East and West Germany, particularly at the top of the income distribution. While the richest 1% of West German residents earned, on average, ca. 800,000 euros (current euros) in 2007, their East German peers earned ca. 500,000 euros. While incomes from labor and small businesses showed negligible differences, the main source of these differences emerged from a substantial gap in business incomes from partnerships, quasi-corporations and corporations. Structural differences in capital ownership and, as a result, capital income explain the under-representation of East Germans at the top of the national income distribution. We document substantial outflow of capital income

[4]Up to this date, the DINA framework 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., 2019), India (Chancel and Piketty, 2017), Spain (Martinez Toledano, 2017) and Europe as a whole (Blanchet et al., 2019).

from East Germany and inflow into West Germany, which aggravates the capital income gap between the two parts of the country.

The paper is organized as follows. Section 2 introduces our data sources, income concepts and methodology. Section 3 presents our inequality series for Germany as a whole. Section 4 explores East-West German income differences and their possible drivers. Subsection 4.1 gives an overview on the economic reunification process of Germany. Next, subsection 4.2 tracks patterns of capital income flows between East Germany an the rest of the world. In subsection 4.3, we explore the regional income distributions in East and West Germany. Last, subsection 4.4 tries to shed more light on the factors for persisting income differences between East and West Germany. Section 5 concludes. This paper is supplemented by an Online Data Appendix providing detailed additional information about the harmonization of income concepts across data sources and data imputation procedures.

2 Methodology to distribute German national income

2.1 Data sources

Our analysis is 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 draw on the universe of individual tax returns which became available in Germany in 1992. The triennial wage and income tax statistics (*Lohn- und Einkommensteuerstatistik*) (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 households 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).

2.2 DINA income concepts and methods

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. (2020). After contructing 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 wages and salaries, social insurance contributions, self-employment and business incomes, dividends and interest as well as incomes from renting and leasing including owner-occupied housing rents. The drawback of this concept is, however, that pensioners, a substantial group in the German society, in many cases receive none of these incomes and are thus observed 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 micro-macro 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 Bartels (2019): 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 incomes between couples (equal-split series). Further, we will explore the individualist attribution of incomes by earner (individualistic adults series). Despite the fact that Germany has a joint-taxation scheme for married couples, most incomes (incl. capital incomes until 2007) are reported individually on the tax form. Thus, we attribute most pretax incomes, including pensions, capital incomes and replacement incomes to individuals within a married couple. The income tax is levied on the joint couple and can thus not be attributed individually. This applies also for all means-tested benefits because the welfare state takes into account the income of spouses when assessing the financial needs of a person.

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.

2.3 From taxable to net national income

One crucial step of constructing DINA series is to align individual income data with national accounts income. Figures 1 and 2 show how the labor income and capital income recorded in tax returns as well as other pre-tax income components from other data sources build up to net national income comparing Germany and the United States. We first comment on the share of labor income and capital income in net national income, respectively. Then, we discuss the importance of particular components.

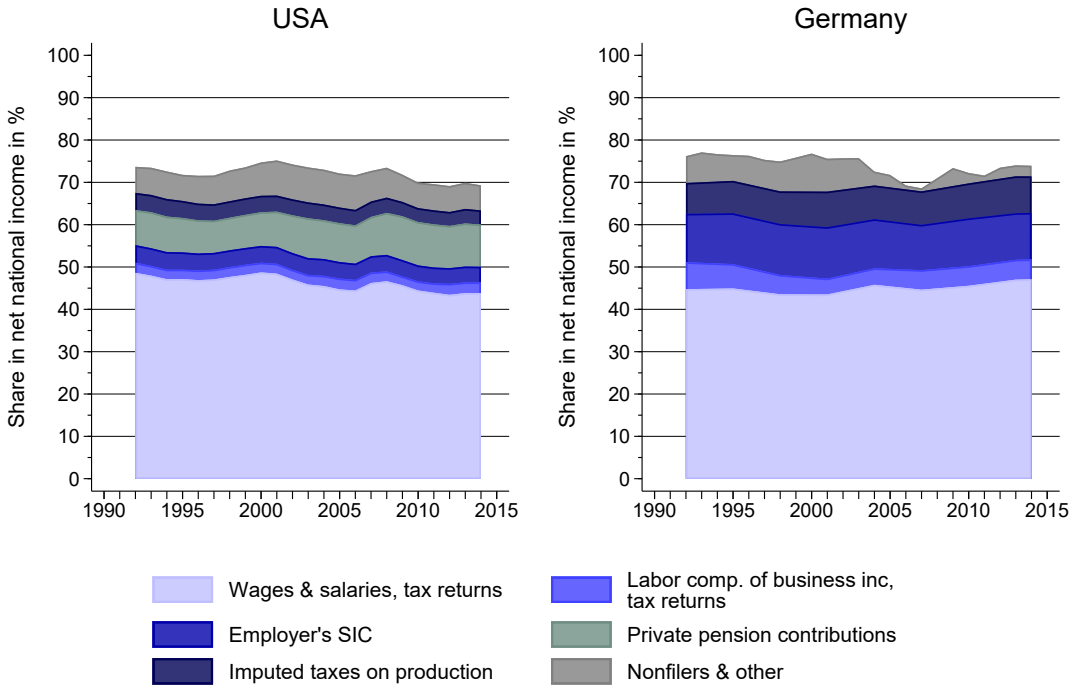
Figure 1 presents the share of pre-tax labor income in net national income for Germany and United States, 1992-2014. For Germany, the share of pre-tax labor income in net national income decreased slightly from about 76% in 1992 to 74% in 2014. It declined in the 2000s and reached its lowest level in 2007 - before the recession hit Germany in 2009. About 67% (1992) to 70% (2014) of pre-tax labor income is recorded in income tax returns. Employee incomes make up about 59% to 64% of pre-tax labor income while the labor share of business incomes plays a minor role in Germany compared to the United States summing up to no more than 5% of net national income since the 2000s.[5]

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. Employee's contributions are included in wages & salaries.

Figure 2 presents the share of pre-tax capital income in net national income for Germany and United States. The share of capital income in net national income

[5]90% of German firms are family-owned and unincorporated. Hence, we deviate from the DINA standard methodology (Alvaredo et al., 2020), which allocates 70% of self-employment and business income to labor income and 30% to capital income. In the German national accounts business incomes are attributed to net mixed income (B3n, S14) and withdrawals from income from quasicorporations (D422) according to their legal form as sole proprietorships or partnerships. From the tax microdata, we can observe that these two legal forms make up approximately equal shares. Thus, we split the sum of business incomes from agriculture, self-employment and businesses observed in aggregate tax data 50/50 between capital and labor income.

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



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

increased from about 24% in 1992 to about 26% in 2014 in Germany. In contrast to the labor share, income tax returns only capture a very small portion of national accounts' capital income.

This has five linked explanations: 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.[6] Second, tax avoidance might occur at a larger scale for business and property income than for employment income, which leads to an understatement of business and property income in income 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. Fourth, dividends and interest income is only taxable if exceeding the savings allowance.

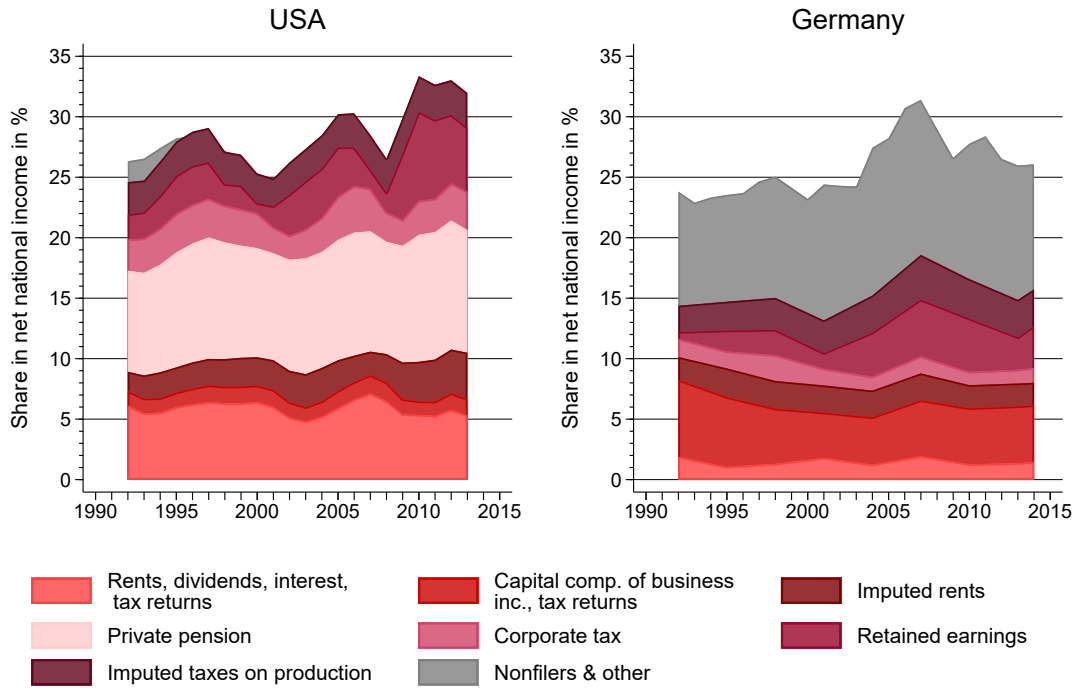
[6]The German Federal Statistical Office (Destatis, 2009) acknowledges that "balancing differences" with respect to the production and expenditure approach of GDP calculation amounts to about 1% of GDP. Bach et al. (2013) estimates that the gap between adjusted national accounts' business income and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

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 comparison to the United States, capital incomes such as rents, dividends, and interest play a minor role in Germany, while the capital component of business incomes is twice as high in Germany. This is due to the particular structure of the German business sector that is dominated by unincorporated, family-owned businesses. Retained earnings are on the rise in both countries. We cannot separate private pensions from other types of income in income tax data so that we refrain from displaying an estimate for Germany in Figure 2.

All in all, the labor share in net national income in Germany has been slightly higher than in the United States in most years. Vice versa, capital income has less importance in Germany relative to the United States.

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



Source: Own calculations based on tax and national accounts data.
Note: Private pensions in Germany are included in "other income sources" in German tax return data and cannot be disentangled from the other incomes such as the social security pensions and are, thus, not shown here.

3 Distribution of German national income

3.1 The distribution of pretax national income[7]

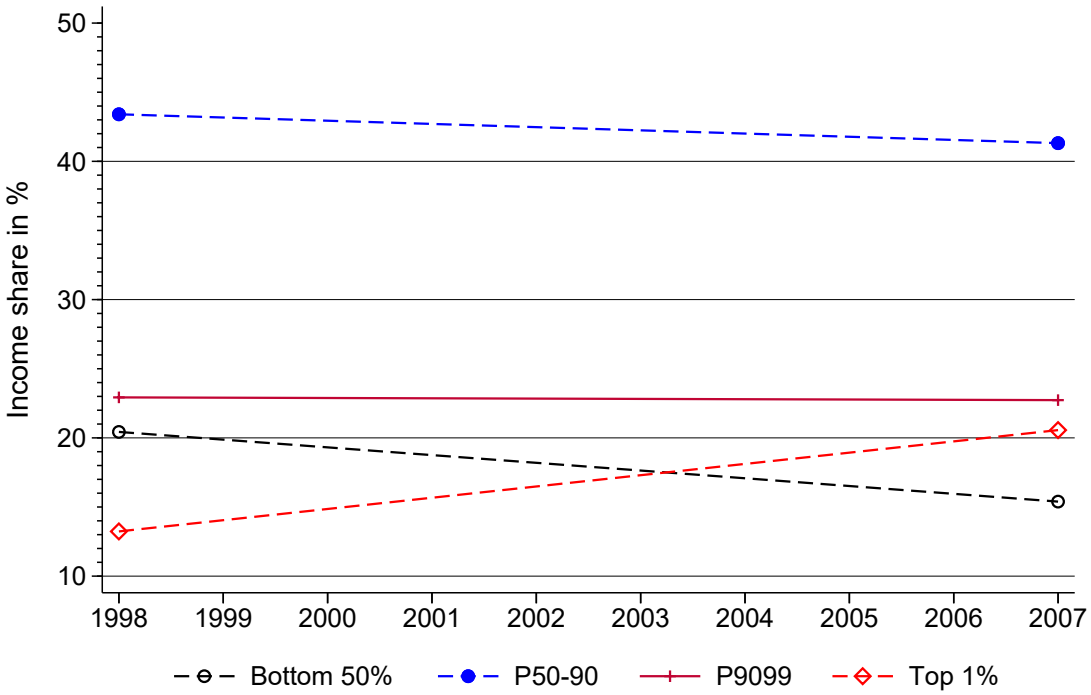
To get an overall sense of the German income distribution, table 1 presents the average income and income shares of five groups in the income distribution and the full adult population. Average income amounted to about 32,500€ (current 2007). While the middle 40%, a group of about 26 million adults, earned approximately the average income, the bottom 50%, a group of 32.5 million adults, earned about 10,000€ in 2007 - less then a third of average income. Accordingly, the bottom 50% received 15,4% of national income. Among the top 10% of income earners, income disparities widen even more: While adults in percentiles 90 to 98 earned on average 82,000€ , the lower part of the top 1% (P99-P99.9) earned on average 346,000€. The top 0.1% of the German income distribution, a group of 65,000 adults earned on average 3.5 million € in 2007. In comparison to the US-American case (Piketty et al., 2018, updated data appendix), the German income distribution is less unequally distributed in the bottom 90%, i.e. the bottom 50% received a higher share of income in Germany than in the US. However, the concentration at the very top, is similar to and even slightly higher than in the US: While the US-American top 0.1% received about 8.5% of national income in 2007 (Piketty et al., 2018, updated data appendix), in Germany the share of the same group amounted to 11% of national income. The strong concentration at the top might be a manifestation of the above-mentioned closely held family firm structure of German businesses. Due to the low degree of incorporation, firms' business incomes are less distributed in the form of dividends but concentrated among the small group of firm owners and their family.

[7]We are awaiting further results to be released by the Federal Statistical Office soon.

Table 1: Pretax national income in current euros, 2007.

Income Group	Number of adults	Income Threshold	Average Income	Income Share
Full population	64.939.276		32.532€	100%
Bottom 50%	32.469.638		10.013€	15,4%
Middle 40%	25.975.711	22.456€	33.602€	41,3%
P90-99	5.844.535	54.316€	82.162€	22,7%
P99-99.9%	584.453	192.001€	346.517€	9,6%
Top 0.1%	64.939	947.435€	3.570.873€	11,0%

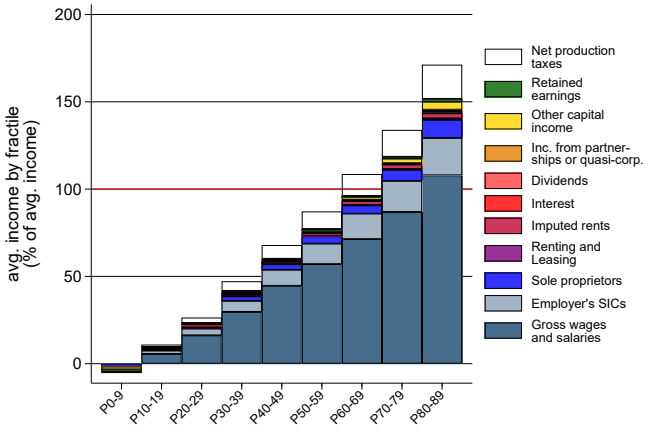
Figure 3: Income share pretax income



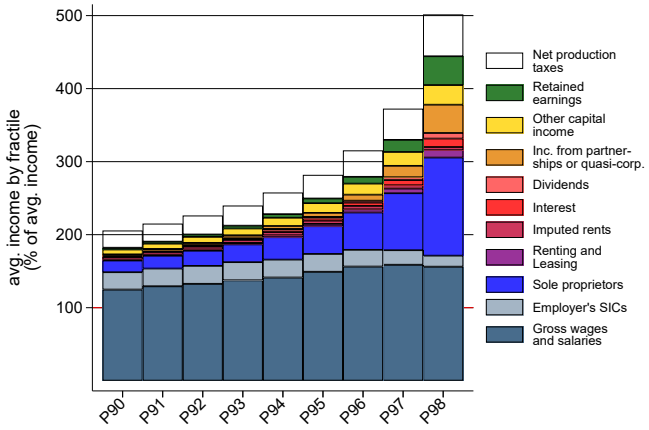
Comparing the income shares of the main groups between 1998 and 2007[8], we see a polarization of income which is driven by an increasing income share of the top 1% and a corresponding decrease of the income share of the bottom 50%. The rest of the distribution (P50-P99) maintain their income shares in national income. While the top 1% received approximately 13% of national income in 1998, income of this group accrued to 20% in 2007. Vice versa, the bottom 50% share declines from 20% in 1998 to 15.4% in 2007.

Figure 4: Composition of pretax personal factor incomes, 2007.

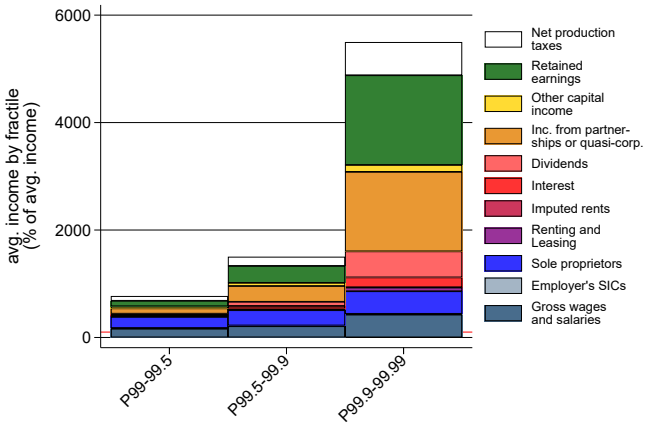
(a) Bottom 90



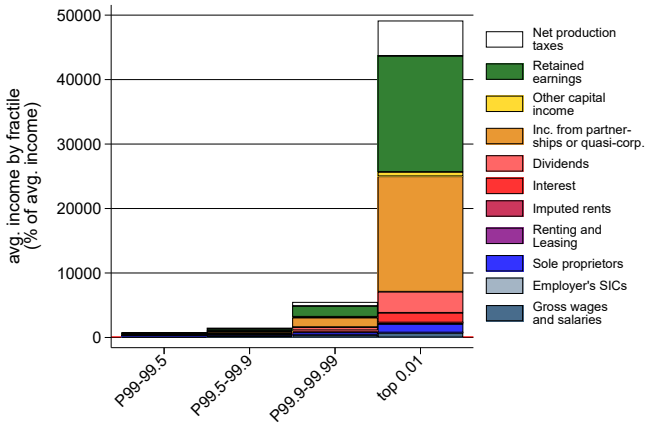
(b) P90-98



(c) P99-P99.99



(d) Top 1%



Source: Own calculations based on PIT and SOEP survey data uprated to national accounts.
Note: Fractile average income relative to overall average income in percent. I.e., average income of 91st percentile is twice the overall average income. Other capital income is investment income disbursements (D441 and D442) and land rents (D45).

[8]We are awaiting our results for further years to be released by the statistical office soon.

To better understand the dynamics of the observed patterns in income concentration, figure 4 details the composition of factor incomes received by different income groups from bottom to the very top. Incomes of the bottom 90% are dominated by gross wages and salaries. Moving up the top decile, especially income from sole proprietorships, i.e. business incomes from mostly smaller firms with few employees and one owner, are gaining a bigger share. At the very top the steep income concentration already visible in table 1 is visible again. Also, the different structure of US-American and German capital incomes observed from the macro perspective in figure 2 becomes apparent again when decomposing German top incomes: While dividend incomes play a minor role, business incomes from partnerships clearly dominate top incomes. This again hints at a strong concentration of unincorporated, closely held firms at the very top of the German income distribution.

4 Persistent East-West income differences

30 years after German reunification, substantial income differences persist between those living in East and West Germany. In 2018, national income per capita exceeded 30.000 Euros in the two southern states (Baden-Wuerttemberg and Bavaria) and in the independent city of Hamburg in the north. In East German states, national income was below 25.000 Euros and in two East German states even below 20.000 Euros (Mecklenburg-Western Pomerania and Saxony-Anhalt) (see Appendix Figure .1). In this section, we investigate the reasons for the persistent income gap, with a particular focus on capital ownership and capital income. We start with a short description of the reunification process.

4.1 The economic reunification of Germany

The treaty of the monetary, economic and social union (MESU) of the Federal Republic of Germany (FRG) and the former German Democratic Republic (GDR) was signed on May 18, 1990. East German fiscal and monetary sovereignty was transferred to West Germany and the economic order of the FRG was transplanted to the GDR (Collier and Siebert, 1991). As Collier and Siebert (1991) note, reunification meant "merging a large open economy, relatively well-endowed with capital and technology, with a smaller, semi-autarkic economy, relatively well-endowed in labor and land."

For the former GDR, reunification kicked-off a "dramatic process of de-indus-

trialization" (Von Hagen et al., 2002, p. 13). Industrial production fell by two-thirds as the capital stock was largely judged obsolete and production techniques outmoded (Burda and Hunt, 2001; Priewe, 1993). One-third of jobs were lost (Burda, 2006, p. 4f). Those who kept their jobs benefited from an unprecedented wage hike achieved through negotiation by West German labor unions that aimed at reaching parity between East and West German wage levels by 1994 (Burda and Hunt, 2001).

The privatization process in the former GDR was unique among transition countries. While most of Eastern Europe has pursued privatization through markets, the federal government of the FRG set up a state-owned trust agency (*Treuhandanstalt*), that was responsible for the privatization, restructuring and closure of former state-owned enterprises. The Christian-Liberal government of the FRG envisioned this trust agency to "bring about a neo-liberal transformation of the hitherto state-owned and state-controlled East German economy" (Webber, 1994). In March 1990 – even before the economic and monetary union of East and West Germany – this trust agency became the owner of 126 former centrally-managed combines and 95 regionally-managed combines, including more than 8,000 firms with about 45,000 plants[9] and of an estate of 62,000 km2 ($\approx$ 57% of the total GDR area). By the end of 1992, 83% of these enterprises were privatized (Priewe, 1993, p. 337).

The overriding majority of the firms was sold to West German investors and companies, often operating in the same or similar industries (Windolf, 1996). Dornbusch et al. (1992, p. 244) highlight "the immediate and strong infusion of market skills and state-of-the-art technology at the level of the firm." At the same time, transfer of ownership and control to Western enterprises further increased the concentration of means of production ownership in Germany. A large variety of general support programs including tax credits for fixed capital investment, preferential depreciation rules and regional programs – co-financed by the European Union, the federal and the respective state governments – were initiated to support fixed capital formation in East Germany (Klodt, 2000). The largest West German investments went to manufacturing, construction and the service sector in East Germany.

The privatization process thus transferred formerly state-owned East German capital to mostly West German owners. Sinn and Sinn (1994) summarize the economic unification process as follows: "Property rights worth mentioning have not been assigned to East Germans, but unrealistically high wages have been promised – a combination well designed to prevent investment and to maximize unemployment."

[9] As a result, about 41% of the total GDR work force (41 million employees), were working in *Treuhandanstalt* firms in mid-1990 (Priewe, 1993, p. 337).

The former Eastern Bloc countries pursued various privatization paths, from voucher privatizations to manager-buyouts to the auctioning of big companies to national and international investors (Ther, 2016; Sutela, 1998). While for example Poland and Hungary pursued a quick and early privatization and reforms with a high share of sales to outsiders, the Czech Republic and Slovenia, the countries with the lowest income inequality in Eastern Europe today, postponed radical reforms, privatized slowly and under strict government control, liberalized foreign trade in several stages so firms could adjust, and regulated the housing market heavily. The East-German privatization process stands in strong contrast to many of those countries. Ther (2016, 85) underlines that âthe economy of the GDR was exposed to the most radical shock therapy in postcommunist Europeâ. However, the East-German example is less discussed due to the integration into the prosperous FRG.

However, the switch to a market economic system induced a start-up boom in East Germany. During the 1990s, the self-employment rate in East Germany grew rapidly and reached the West German level in 2004. The new East-German firms were on average smaller (for details, see IWH, 2010) and less successful when compared to their West German counterparts (Brixy and Grotz, 2004; Fritsch, 2004). A relatively high share of the newly emerging businesses in East Germany was in industries such as retailing, hospitality and catering, which are characterized by low entry barriers in terms of financial resources and required qualifications (Fritsch et al., 2014).

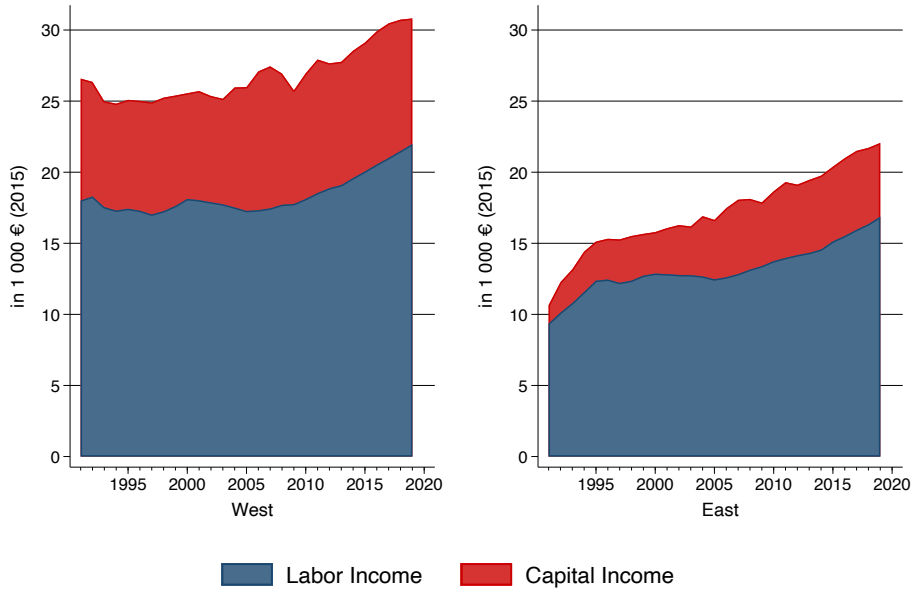
In sum, the economic reunification process in the 1990s generated persistent differences in capital ownership between East and West Germany, which we will investigate in the next section.

4.2 East and West German national income

Net national income per capita in East Germany is 73.1% of the West German per capita level in 2017. The persistent gap between East and West German incomes stems from both lower capital income and lower labor income, as shown by Figure 5. But while the share of East German labor income has reached 70% of West German labor income in 2017, East German capital income is 60% of the West German level. Hence, lower capital income contributes 38.3% to the persistent income gap between East and West Germany. The large literature documents the reasons for labor income differences, highlighting lower skills (**tbc**).

Capital income earned by those living in East Germany (residential capital

Figure 5: Net national income per capita: capital and labor income



Source: Own calculations based on the national accounts of federal states (*VGR der Länder*), Statistische Ämter der Länder, excluding Berlin.

income) may be lower for two reasons. First, a substantial fraction of capital income generated in East Germany is flowing to West German capital owners (and abroad). Second, residential capital income is lower because less capital income is generated in East Germany.

In this section, we investigate the first reason and quantify the capital outflow. We measure capital outflow as the difference between domestic capital income K_d and residential capital income K_r. More precisely, we quantify the macroeconomic outflow of capital income from East Germany as the difference between capital income generated in East Germany and capital income received by East German residents. The prime income concept of the DINA methodology is *net national income*. We rephrase this term to *net residential income* because we are now interested in the incomes of the residents of either East or West Germany.

Net residential income NRI (formerly net national income) of residents in a federal state b is the sum of residential labor income L_r and residential capital income K_r.

$$NRI_b = L_{r,b} + K_{r,b} \tag{1}$$

While we cannot identify the geographic origin of capital incomes in our PIT microdata, we can use national accounts which are available at the federal state level (*VGR der Länder*) in Germany to differentiate between domestic capital income K_d

and residential capital income K_r. Following the SNA definitions, net residential income NRI_b (formerly net national income) in federal state b is the sum of net domestic product NDP_b and net foreign income:

$$NRI_b = NDP_b + \underbrace{Y_{r,a,b} - Y_{nr,d,b}}_{\text{net foreign income}} \tag{2}$$

where $Y_{r,a,b}$ is income of residents r of federal state b from abroad a, which includes other German states. $Y_{nr,d,b}$ is income generated as domestic income d in federal state b flowing to non-residents nr. We then decompose net foreign income into its components, net foreign labor income and net foreign capital income as well as taxes on products paid and subsidies received from the rest of the world:

$$NRI_b = NDP_b + \underbrace{L_{r,a,b} + K_{r,a,b}}_{\text{inflow}} - \underbrace{L_{nr,d,b} - K_{nr,d,b}}_{\text{outflow}} - (T-S)_{r,a,b} \tag{3}$$

Ultimately, we are interested in the balance of $K_{r,a,b} - K_{nr,d,b}$, i.e., the difference between capital income received by residents from abroad and the capital income generated in the federal state flowing to non-residents. German national accounts provide information on net residential income, net domestic income, residential labor income and domestic labor income by federal state so that we can compute net foreign capital income as a residual:

$$K_{r,b} = K_{r,d,b} + K_{r,a,b} = NRI_b - \underbrace{L_{r,d,b} + L_{r,a,b}}_{\text{Residential labor income}} - (T-S)_{r,a,b} \tag{4}$$

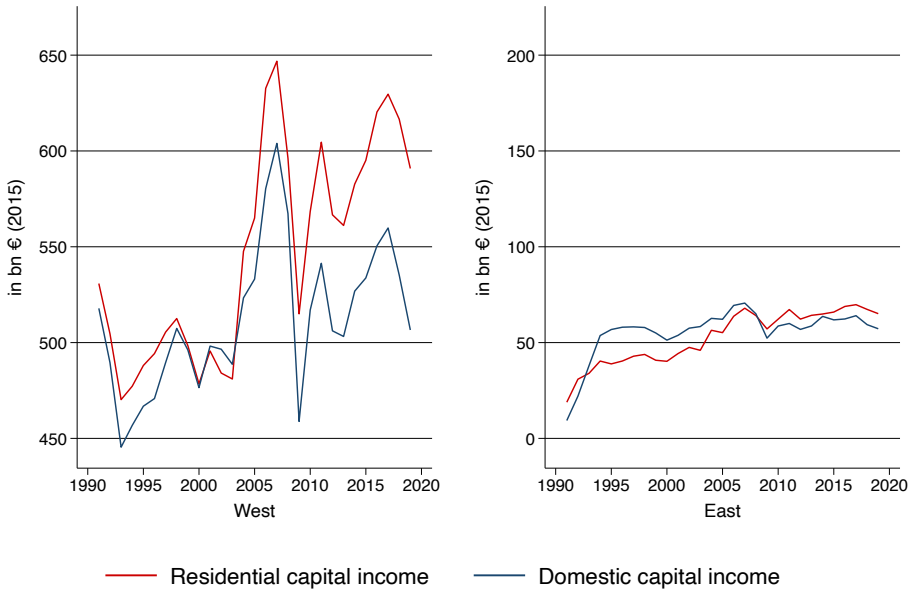
$$K_{d,b} = K_{r,d,b} + K_{nr,d,b} = NDP_b - \underbrace{L_{r,d,b} + L_{nr,d,b}}_{\text{Domestic labor income}} - (T-S)_{d,a,b} \tag{5}$$

Subtracting Equation 5 from Equation 4, assuming that differences between net taxes on production, $(T-S)$, in the domestic and residential concept are negligible, we arrive at net foreign capital income: $K_{r,a,b} - K_{nr,d,b}$.

Given that East German firms are predominantly owned by foreigners, mostly West Germans, we expect net foreign capital income to be negative such that $K_{r,a,b} - K_{nr,d,b} < 0$

The evolution of domestic and residential capital income in East and West Germany ($K_{d,b}$ and $K_{r,b}$) is presented in Figure 6. Domestic capital income exceeds residential capital income in East Germany throughout the 1990s until 2008, while the contrary applies to West Germany. For example, in 1995, the gap between domestic capital income and residential capital income is 21.4 bn Euro (real, 2015 Euros) in East Germany. Since the turn-of-the-millennium, continuous residential capital income growth – only interrupted by the recession in 2009 – has closed the gap between domestic and residential capital income.

Figure 6: Residential vs. domestic capital income

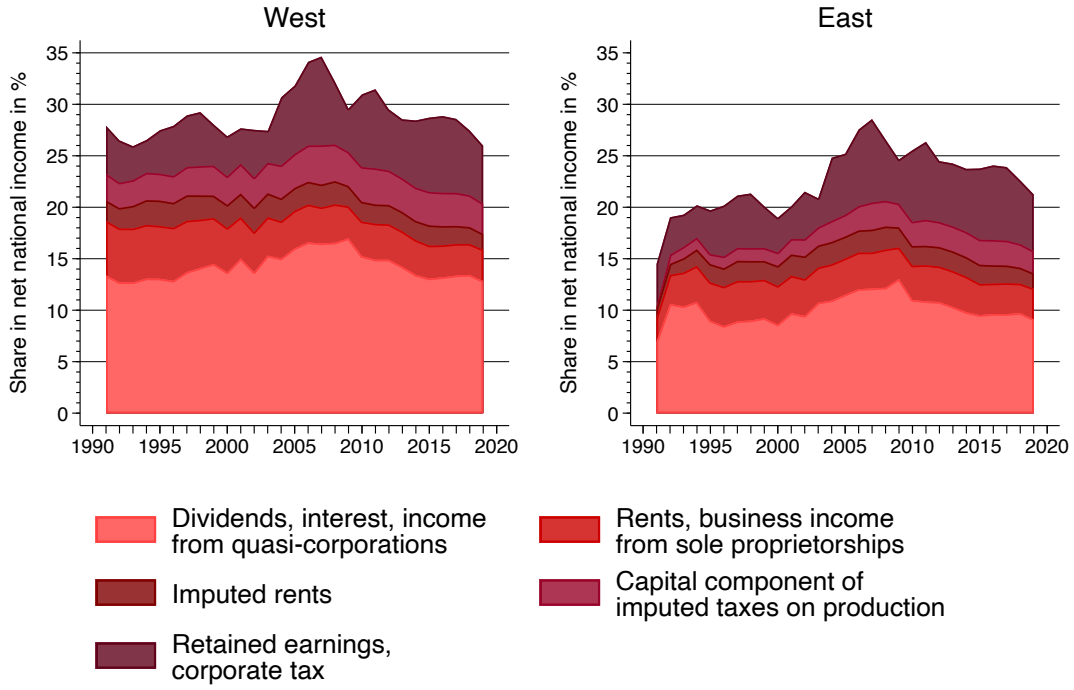


Source: Own calculations based on the national accounts of federal states (*VGR der Länder*), Statistische Ämter der Länder, excluding Berlin. The Figure depicts the results for $K_{d,b}$ and $K_{r,b}$ resulting from Equations 5 and 4 aggregated over federal states in West and East Germany.

Capital income growth may occur at the extensive and at the intensive margin, i.e., an increased number of firms or existing firms becoming more profitable. The number of firms has expanded steadily peaking in the first half of the 1990s and the 2000s, respectively. For example, in 2004, 91.700 new firms were established in East Germany (BMWi, 2019, p.108). The composition of capital income as a fraction of residential income in West and East Germany is presented in Figure 7. The capital share increased in both parts of Germany between 1991 and 2017 from 25% to 30% in West Germany and from 10% to 25% in East Germany. In both parts of Germany, the growth of retained earnings in the corporate sector explains

most of the capital share increase. Dividends, interest and income from quasi-corporations remained rather stable in both regions. This component explains most of the persistent capital income gap between East and West Germany.

Figure 7: Composition of capital income

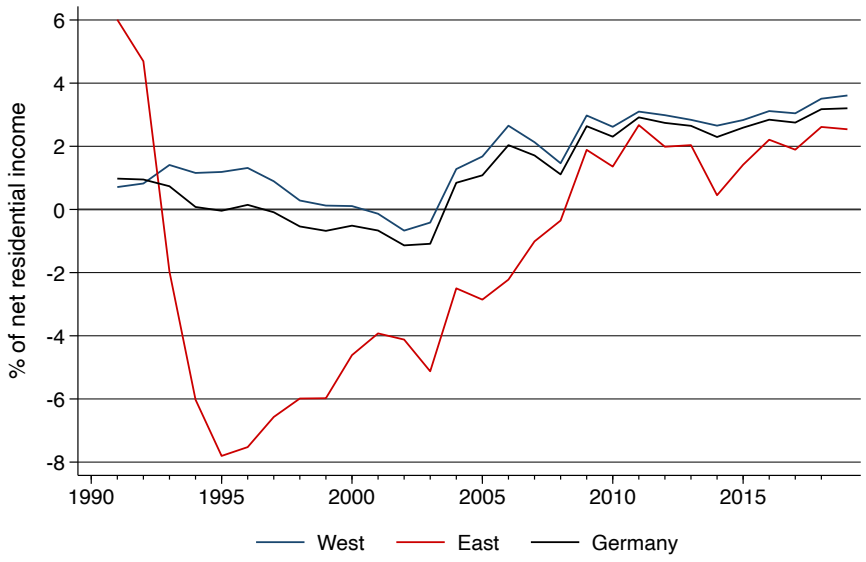


Source: Own calculations based on the national accounts of federal states (*VGR der Länder*), Statistische Ämter der Länder, excluding Berlin.

Note: We cannot disentangle corporate and public earnings on the state level. Hence, we estimate retained earnings and corporate tax by splitting the national aggregate of the primary income of the corporate sector according to the regions' share in gross value added.

The balance between domestic capital income K_d and residential capital income K_r – net foreign capital income – as a fraction of net residential income is shown in Figure 8. More precisely, Figure 8 depicts the share of net foreign capital income in net residential income (net national income for Germany as a whole). As suggested by Figure 6 above, the balance was negative for East Germany since the mid-1990s until 2008. Given that the overriding majority of the firms was sold to West German investors and companies, often operating in the same or similar industries (Windolf, 1996), the outflow of capital income from East Germany was most likely directed towards West Germany. Over time, the outflow of capital income has diminished. Since 2011, the share of net foreign capital income is around +2% of net residential income in both East and West Germany.

Figure 8: Net capital outflow/inflow

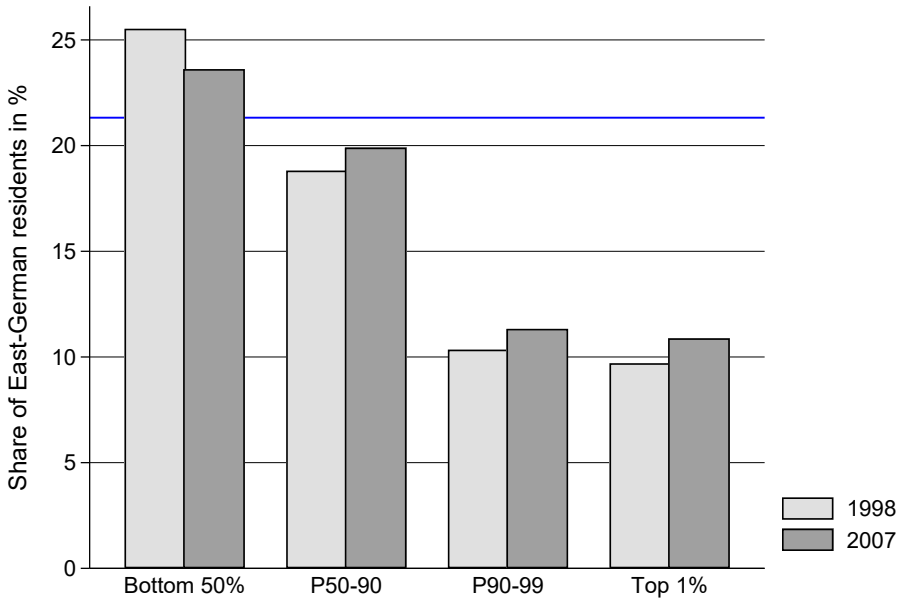


Source: Own calculations based on the national accounts of federal states (*VGR der Länder*), Statistische Ämter der Länder, excluding Berlin.

4.3 The distribution of East and West German national income

Figure 9 shows how East Germans sort into the overall German income distribution. While East Germans represent ca. 20% of the population (highlighted by the blue horizontal line), they are slightly over-represented with 23% within the bottom 50% of the pretax income distribution. Moving further to the top of the distribution, East Germans are increasingly under-represented.

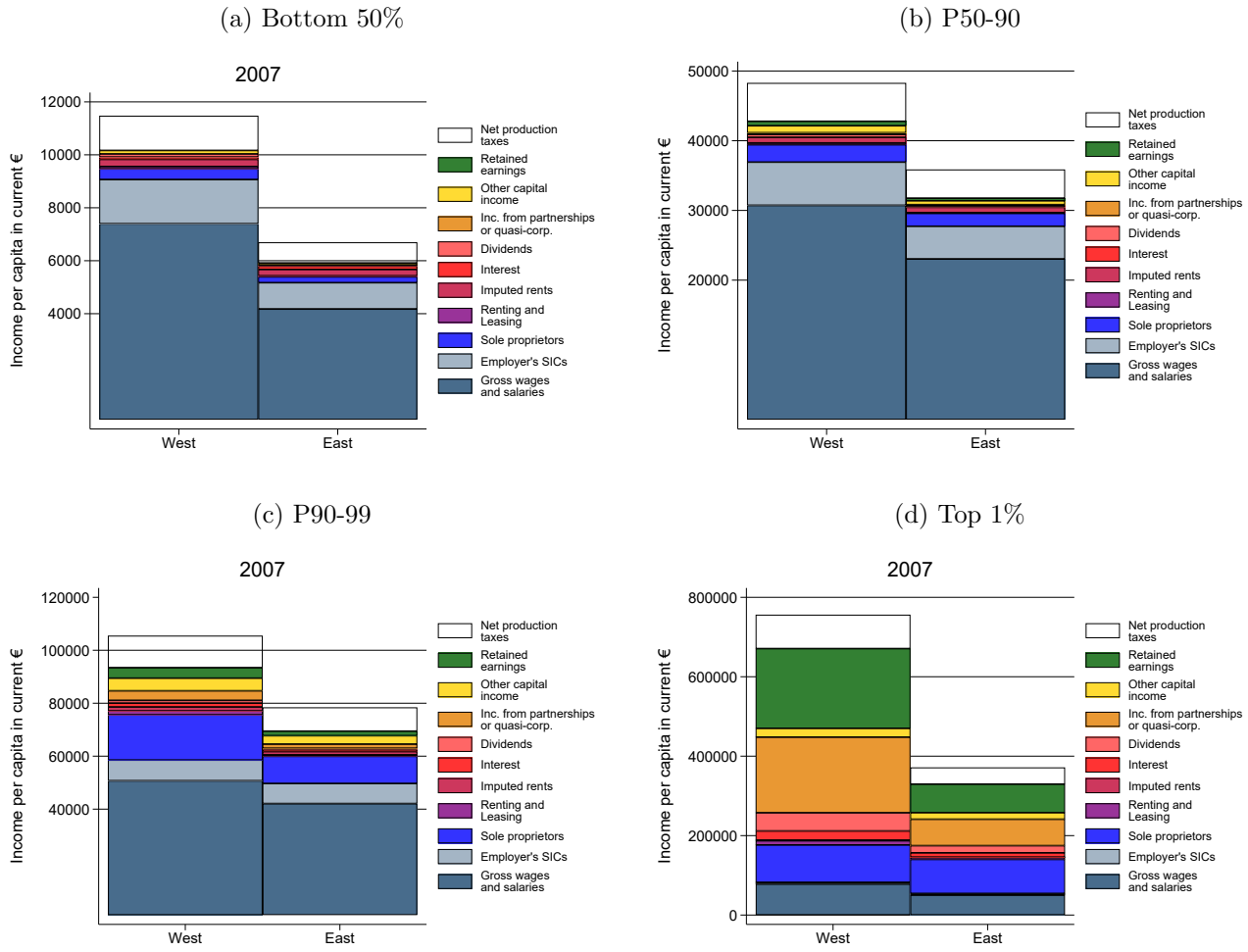
Figure 9: East Germans in the German pretax national income distribution, 1998 & 2007



Source: Own calculations based on our integrated database of PIT and survey data uprated to national accounts.

Figure 10 shows the average income and factor income composition in East and West Germany by income group for the year 2007. The upper panel shows the income composition of the bottom 50% (left upper panel) and the middle 40% (P50-90) (right upper panel). Income differences between East and West Germans in the bottom 90% are largely explained by labor income differences. Moving further to the top of the income distribution, labor income differences diminish and capital income differences expand. The lower panel shows the income composition of the top decile broken down into the bottom 9% of the top decile (left lower panel) and the top 1% (right lower panel). Average income of the top 1% was 800,000 Euros in West Germany and 500,000 Euros in East Germany (current Euros). While the top percentile's average income from wages and self-employment is of similar magnitude in East and West Germany, capital income from corporate, quasi-corporate and non-corporate firms as well as interest income in West Germany greatly exceeds East German levels. Thus, capital income explains the difference in top incomes between East and West Germany.

Figure 10: Income composition in West and East Germany by income group



Source: Own calculations based on our integrated database of PIT and survey data uprated to national accounts.

4.4 Explaining persistent capital income differences

Reasons for the persistent income differences between East and West German households include fewer headquarters, smaller firms, fewer industrial clusters generating network effects (Krugman, 1991) and a smaller share of high-skilled workers in East Germany compared to West Germany. Can these factors explain the persistent income gap between East and West Germany? To answer this question, we use firm data of the IAB's Establishment Panel and employ the reweighting approach developed by DiNardo et al. (1996) (DFL). The IAB Establishment Panel provides information on sales turnover,[10] ownership (East German, West German or other majority ownership), legal form (sole proprietorship, partnership/(quasi-)corporation), number of employees, industry (manufacturing/service) at the establishment level. We restrict the sample to firms in either East or West German majority ownership

[10]Unfortunately, there is no information on profits net of expenses.

which leaves us with about 1.35m West-German-owned establishments (unweighted about 7,200) and about 260,000 East-German-owned establishments (unweighted about 3,000) per year from 2000 to 2019.

The goal is to assess the extent to which income differences between East and West German households can be explained by differences in the distribution of firm-types. In the following, we explain how we adapt the DFL method to our purposes.

Let each firm be characterized by a vector (y, z, c) comprising a continuous variable y (turnover), a vector of attributes z (i.e., headquarter, legal form, profitable industry), and a regional ownership identifier c. The joint distribution of turnover and attributes of firms owned by the population of c is $F(y, z, c)$, while $F(y, z|c)$ denotes the distribution of y conditional on the distribution of z in c. Following DiNardo et al. (1996), the density of sales turnover of firms owned by the population of c, $f_c(y)$, can be written as

$$f_c(y) \equiv f(y; c_y = c, c_z = c). \tag{6}$$

The notation allows us to express the density of turnover y of firms owned by one population subgroup conditional on the distribution of attributes z of firms owned by the other population subgroup. For example, while $f(y; c_y = \mathrm{W}, c_z = \mathrm{W})$ denotes the actual density of turnover of West-German owned firms (W), $f(y; c_y = \mathrm{W}, c_z = \mathrm{E})$ is the counterfactual density of turnover of West-German owned firms, applying the distribution of attributes of East-German owned firms (E). The aim of the DFL reweighting method is to estimate the counterfactual density, which (taking the example for E and W) is defined as

$$f(y; c_y = \mathrm{W}, c_z = \mathrm{E}) = \int f(y|z, c_y = \mathrm{W}) dF(z|c_z = \mathrm{E}) \tag{7}$$

$$= \int f(y|z, c_y = \mathrm{W}) \phi_z(z) dF(z|c_z = \mathrm{W}), \tag{8}$$

$$\tag{9}$$

where $\phi_z(z)$ denotes the reweighting function

$$\phi_z(z) = \frac{dF(z|c_z = \mathrm{E})}{dF(z|c_z = \mathrm{W})} = \frac{Pr(c = \mathrm{E}|z)}{Pr(c = \mathrm{W}|z)} \cdot \frac{Pr(c = \mathrm{W})}{Pr(c = \mathrm{E})}. \tag{10}$$

The probability of observing a firm owned by subpopulation c, given firm attributes z, can be estimated with a probit model:

$$Pr(c_z = c|z) = Pr(\epsilon > -\beta' H(z)) = 1 - \phi(-\beta' H(z)). \tag{11}$$

where $\phi(\cdot)$ is the cumulative normal distribution and $H(z)$ is a vector of covariates. East-German firms are smaller, less likely to be a headquarter or a corporation and more likely to operate in the service sector than in manufacturing (see Table or Figure with sample descriptives).

We split establishments into 64 subcategories with two legal forms groups (sole proprietors and small partnerships vs. corporations), fours establishment size groups based on the number of employees, two groups indicating if the establishment is a headquarter or subsidiary as well as two groups distinguishing between establishments localized in East or West Germany and last two groups indicating if the industry the establishment operates has a above or below median return on sales. In our counterfactual, West-German owned firms are reweighted according to the distribution of attributes of East-German-owned firms for each available year.

Figure xxx presents the results of our DFL reweighting exercise.

5 Conclusion and Outlook

In this paper, we combine individual income tax returns, SOEP household survey data and national accounts to estimate distributional national accounts (DINA) for Germany following the methodology established by Piketty et al. (2018) for the United States. Developing a new regional DINA approach, we use regional national accounts of German federal states (*VGR der Länder*) and differentiate between domestic income and residential (=national) income in a federal state. More precisely, we quantify the macroeconomic outflow of capital income from East Germany as the difference between capital income generated in East Germany and capital income received by East German residents.

We find that structural differences in capital ownership importantly contribute to the persistent income differences between East and West Germany, particularly at the top of the income distribution. While the richest 1% of West German residents earned, on average, ca. 800,000 Euros (current euros) in 2007, their East German peers earned ca. 500,000 Euros. While incomes from labor and small businesses showed negligible differences, the main source of these differences emerged from a substantial gap in business incomes from partnerships, quasi-corporations and corporations. Structural differences in capital ownership and, as a result, capital income explain the under-representation of East Germans at the top of the national income distribution. We document substantial outflow of capital income from East Germany and inflow into West Germany, which aggravates the capital income gap between the two parts of the country.

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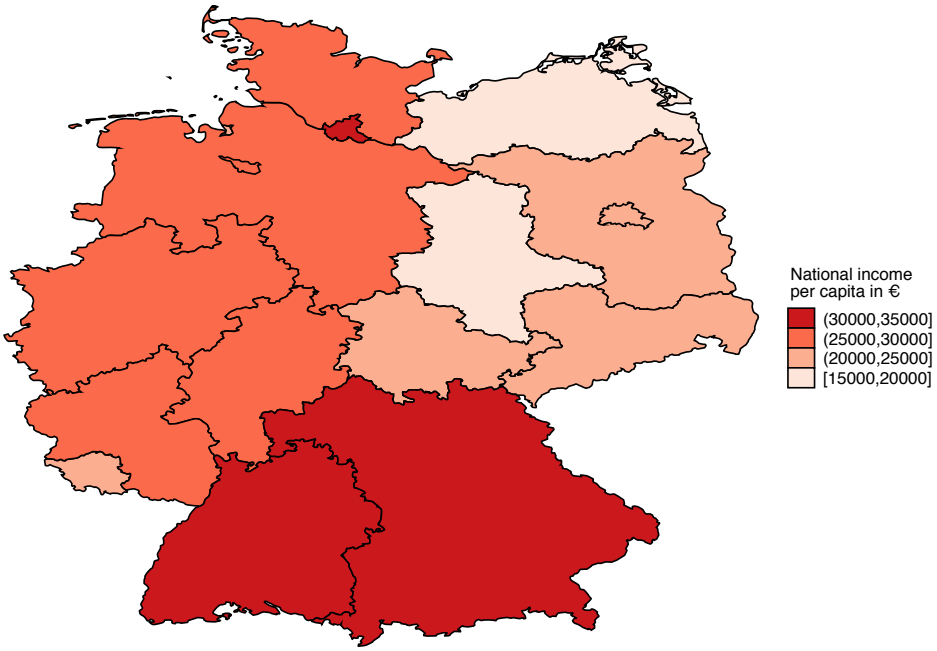
Figure .1: Net national income per capita, 2018



Source: Own calculations based on the national accounts of federal states (*VGR der Länder*), Statistische Ämter der Länder.