The Role of Capital Income for Top Incomes Shares in Germany

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November 12, 2014

Abstract

A large literature has documented top income share series based on income tax statistics using the common methodology established by Piketty (2001, 2003). The disappearance of capital income from the income tax base in many countries poses a major challenge to the comparability of these series both over time and between countries. First, we extend the existing German series including capital gains to 2010, and the series excluding capital gains to 2008. Second, we derive three homogeneous series by simulating legislative definitions of capital income prevailing in Germany between 2001 and 2010. For both simulation and the exclusion of capital gains, we employ a rich data set containing the tax files of all income taxpayers. Third, we construct a composite measure of stock dividends and interest income tax flows as a proxy for capital income missing in the data since 2009. We find that the drop in top income shares obtained from income tax statistics in the crisis year 2009 is largely attributable to the exclusion of capital income from the income tax base.

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1 Introduction

Personal income tax data have proven to be an invaluable data source for the long-run development of income concentration. Many countries introduced a modern income tax over a 100 years ago. These series on top income shares can be used to analyze the dynamics and driving forces of income concentration over time and across countries. Over the past decades, income concentration increased in many industrialized countries. The increase began earlier and is higher in English-speaking countries like the UK and the US than in continental European countries like Germany and France.

The World Top Income Database (WTID) contains long-run top income share series for 26 countries using a common methodology and a common data base, i.e., personal income tax statistics (Alvaredo et al., 2014). Many of the results have been published in two collective volumes (Atkinson and Piketty, 2007, 2010). However, income tax data suffer the drawback that the definition of taxable income and, hence, the share of income documented in tax data changes with reforms over time. Much effort has been put into the methodological harmonization of the computation of top income shares (see, e.g., Atkinson, 2007).

In particular, the disappearance of capital income from the income tax base in many countries poses a major challenge to the comparability of top income share series both over time and between countries.[1] Capital income such as interest income, dividends or returns on pension funds is now taxed separately from the PIT by flat rates or is fully tax exempt. Since capital income is largely concentrated among top income taxpayers, top income shares assessed on PIT statistics most likely underestimate income concentration at the top.

In Germany, the introduction of a final withholding tax on capital income and the consequential exclusion of capital income from the income tax base coincides with the highest output drop of the post-war era. German GDP decreased by 5.1 % in 2009. Consequently, it is unclear whether the drop in top income shares is due

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[1]Nordic countries introduced dual income taxation in the 1990s, other European countries such as Austria and the Netherlands followed. In Germany, a final withholding tax on capital income was introduced in 2009.

to the crisis or due to changes in the tax base definition.

Following the great recession, top income shares fell in most countries in 2008–2009, indicating that the first-round effect of the crisis disproportionately hit the top of the income distribution. These drops do not necessarily change the evolution of income concentration in the long run: Piketty and Saez (2013) discuss the recession's impact on top income shares and conclude that economic downturns do not seem to have long-run effects on inequality, but rather regulatory changes such as tax reforms. Long-run analyses of top income shares have come to similar conclusions when analyzing earlier recessions. Theoretical analyses provide strong arguments for the power of institutions such as tax progression as opposed to one-time events (Piketty, 2003, 2007, Piketty and Saez, 2003, 2007).

This paper addresses two challenges. We analyze to which extent top income shares based on tax data underestimate income concentration when capital income is missing in the data. Our second aim is to disentangle the impact of the recession and the tax reform in Germany. We estimate German top income series from 2001 to 2010 using the most recently available income tax data. We thereby extend the existing series with capital gains provided by Dell (2007, 2011) from 2007 to 2010 and the series without capital gains provided by Dell (2007) from 1998 up to 2008. For the exclusion of capital gains we exploit a rich dataset that includes individual tax returns of all taxpayers.

We simulate three top income share series, each applying one of the three taxable income definitions prevailing between 2001 and 2010. Income tax microdata allow us to vary the fraction of capital income included in the overall taxable income. We thereby can check the sensitivity of German top income shares to the gradual disappearance of capital incomes from the income tax base. Furthermore, as the data since 2009 have lacked information about the magnitude of personal capital income and its distribution, we develop an approach how to add missing capital income to the essentially non-capital income share series assessed on the tabulated income tax statistics since 2009. We check several proxies for capital income, such as tax flow aggregates, national accounts, stock dividends and survey data.

Our main findings are as follows. First, excluding taxable capital gains reduces

top income shares only by little. Second, we find that the drop of top income shares in the crisis year 2009 is largely attributable to the disappearance of capital income from the underlying data. The recession seems to have had a minor impact on the top of the German income distribution. Third, a composite measure of stock dividends and interest income tax flows turns out to be a suitable proxy for capital income missing in the tax data since 2009. Fourth, including imputed capital income increases top income shares by between 6 % for the top decile and almost 30 % for the top 0.01 % in 2009 and 2010.

The paper is organized as follows: Section 2 provides an overview over the data used and the methodology employed to arrive at top income share estimates. We briefly describe data sources for potential proxies of capital income. Section 3 starts with the trends in top income shares with and without capital income when using the raw income tax data. In section 4, we then turn to check the sensitivity of the top income series to legislative changes in the definition of capital income by simulating three different series. In section 5, we discuss proxies for missing capital income. Last, we present top income series including capital income up to 2010. Section 6 concludes.

2   Data and Methodology

In the following, we provide a brief description of both data and methodology for the estimation of top income shares. More details on the employed data can be found in Appendix C. For the estimation of top income shares we use both tabulated income tax statistics available annually since 2001 for the years 2001-2010 (PIT statistics) and a very rich data set that includes the tax returns of all income taxpayers available for the years 2001-2008 (PIT microdata). Both data are provided by the German federal statistical office (Destatis). In the search of a proxy for missing capital income, we draw on additional data sources such as national accounts, tax flow statistics and stock market indices.

PIT statistics give the number of tax units and reported income by income bracket and provide the basis for our top income share series including capital gains.

These data were also used by Dell (2011) for the last update of the German series in the WTID.[2] Reported income is taxable income after income source specific deductions, but before personal allowances which we will refer to as gross taxable income (GTI) (*Gesamtbetrag der Einkünfte*).

Using PIT statistics, we apply the Pareto interpolation method commonly used in the top income share literature since the seminal contribution of Piketty (2001, 2003) to obtain thresholds and average incomes of top income groups for each year. Top income shares result from dividing the cumulative income above the income threshold of a fractile by an external total income. As there are tax units who do not file an income tax return, tax statistics neither comprise the whole population, nor do they include total income. In order to derive top income shares we therefore need external totals for both population and income. In the German PIT, tax units are either married couples or bachelors. As population total, we therefore use the sum of married couples and bachelors published in population statistics of Destatis. Following Dell (2007) we define adults as those aged 20 and above. The population total for 1998-2010 is reported in Table A.1. We also follow Dell (2007) for the construction of the income total and use 90 % of total primary household income less employers' social security contributions as published in national accounts. The income total construction is described in Appendix A. The control for total income for 1998-2010 is reported in Table A.2.

PIT statistics suffer two drawbacks of substantial importance for our research question: First, taxable capital gains are not reported separately. Series excluding capital gains can thus not be derived. Second, PIT statistics only report the taxable income after income source specific deductions and are thus sensitive to changes in the definition of taxable income. For the estimation of top income shares, this is of particular importance regarding capital income: the share of capital income reported in German PIT statistics in two stages declined to zero as a result of tax

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[2]Annual tax statistics do not include tax units who only paid payroll tax and did not file an income tax return. This is, however, of limited importance for the estimation of top income shares. As long as a tax unit receives other income than wages above certain thresholds, filing an income tax return is mandatory. In addition, even when wages are the only income source, filing a tax return is favorable for most high-income tax units. E.g., even though 31.9 % of total income taxpayers do not file a return paying only payroll tax in 2007, this share drops to 3.7 % in the top decile.

reforms in 2002 and 2009.

PIT microdata comprise the full sample of all income taxpayers' tax returns. For each taxpayer, we have information on capital income and capital gains. Until 2008, PIT microdata include information on both full dividends and interest income before source-specific deductions. We are thus able to compute shares including and excluding capital gains. Furthermore, we can derive top income series homogeneously over time based on varying definitions of capital income and, thereby, check the sensitivity of top income shares to the gradual erosion of capital income in the PIT tax base. Using PIT microdata, we can directly sort taxpayers by fractiles, so we do not need an interpolation method. Top income shares are derived using the same population and income totals as the interpolated shares from PIT statistics described above.[3]

Since 2009 we completely lack information on the capital income total and its distribution among top income individuals. We therefore have to impute capital income by fractile based on external capital income totals. Any suitable proxy of capital income of private households would have to correlate strongly with capital income in PIT microdata. For the years 2001 to 2008, we can test the correlation of external data sources with capital income in the PIT. Four indicators might provide proxies for capital income on the household level: Household sector capital income from national accounts, tax flow statistics on dividends and interest income, stock market indices, and capital income observed in the German survey data SOEP. We compute correlations between the capital income total in PIT and capital income by fractile with these external sources. Each of these sources bears particular advantages and disadvantages on which we elaborate in the following. Appendix C provides additional information on the employed data sources.

- National accounts of dividends and interest income comprise the most comprehensive concept of capital income in the household sector. National accounts aggregates exceed PIT aggregates because the household sector is based on a broader definition than the number of personal income taxpayers and the defini-

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[3]For top income shares excluding capital gains, we correct the income control total for taxable capital gains by substracting the sum of taxable capital gains observed in PIT microdata.

tion of capital income itself is broader than the definition of capital income subject to PIT. The household sector in national accounts includes unincorporated businesses if they are owned by a single person (as opposed to partnerships) as well as private non-profit organizations. Capital income of the household sector includes interest income and dividends that are not distributed but reinvested by private insurances and pension funds. Moreover, dividends in national accounts comprise distributed profits of unincorporated businesses (partnerships), which are classified as unincorporated business income or agricultural income in the PIT and, thus, not part of taxable capital income in the PIT (Schwarz, 2008). Still, gross dividends and interest income from national accounts might display enough correlation to serve as a proxy for PIT capital income after 2008.

- Tax flow statistics report withheld tax flows on dividends from corporations and interest income. Even though the final withholding tax on capital income was not introduced before 2009, 2008 there already existed a withholding pre-tax on dividends and interest income counting against both PIT and corporation tax liability by the end of the year. Tax flows are reported separately for dividends and interest income. The tax base generating these tax flows can be calculated by dividing the tax flows by the respective tax rates. However, tax flow statistics suffer three drawbacks: First, their aggregate depends on the level of the saver's allowance which varied greatly between 2000 and 2010 (see Appendix Figure E.4). Second, aggregates include interest and dividends received by corporations and unincorporated businesses. Third, the tax base definitions for both dividends and interest income changed by legislative reforms likewise the PIT statistics. Between 2002 and 2008, only half of the dividends received by households formed the tax base to the tax, while the full cash dividend became taxable in 2009. The tax base for interest income includes capital gains from stock shares since 2009. This effect, however, is expected to be small in 2009, as transitional rules are quite generous. In consequence to these changes, it is not clear whether the correlations between the tax flow statistics' tax bases and personal capital income in PIT microdata between 2001 and 2008 are comparable to the years since 2009.

- Aggregated dividends from German stock companies can be derived using the

most comprehensive German stock index (CDAX). Neither do all dividends in this aggregate flow to the household sector, nor are the recipients necessarily German taxpayers. In addition, dividends from closely held corporations are not included in the aggregate. However, its time series reflects the expected dividend development of private stock market portfolios and might therefore display a similar trend as private dividend income.

- The SOEP is a representative panel study containing individual and household data in Germany from 1984 onwards and was expanded to the New German Laender after German reunification in 1990. All household members are interviewed individually once they reach the age of 16. SOEP reports gross household income by component including the sum of dividend and interest income. Like most population surveys, SOEP lacks information on individuals at the top of the income distribution. In general, households up to the top 1 % are well represented. [4] We use capital income from the top 5 % without the top 1 % of households (P95-99), applying the fractile thresholds for the 95th and the 99th percentile obtained from PIT microdata.

3 Top Income Shares, 2001–2010

Over the last two decades income concentration at the top increased substantially in Germany. Figure 1 reports series both excluding and including capital gains since World War II for the top 10 %, 5 %, and 1 %. After a quite stable development since the 1960s, the year 1995 seems to mark a turning point.[5] The share of the richest decile increased from 32 % in 1995 to 38 % 2010 by almost 20 %. The share of the richest percentile increased from 9 % in 1995 to 12 % 2010 by almost 30 %. Despite a short period of modest decrease in the beginning of the 2000s, income concentration at the top never returned to the low post-war levels. Contrasting the series with and without capital gains reveals that realized taxable capital gains are of minor

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[4]Appendix Figure E.5 shows that top income shares based on SOEP using thresholds from PIT statistics reveal quite the same level as shares based on PIT statistics, even though the difference increases moving further to the top.

[5]See Dell (2007) for an extensive discussion of the long-run development of top income shares in Germany from 1891 to 1998.

importance up to the richest percentile. One should keep in mind, however, that realized capital gains were mostly not taxable in Germany during this time and thus not part of the underlying income concept of the series.[6]

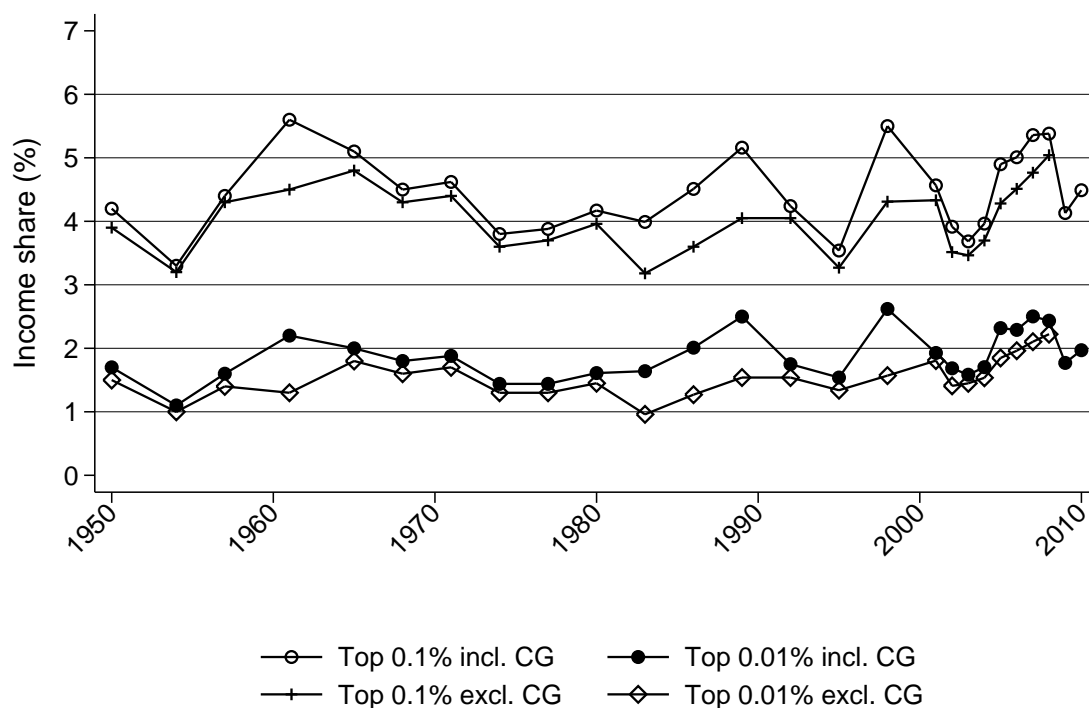Figure 1: Top income shares in Germany (with and without capital gains), 1950-2010
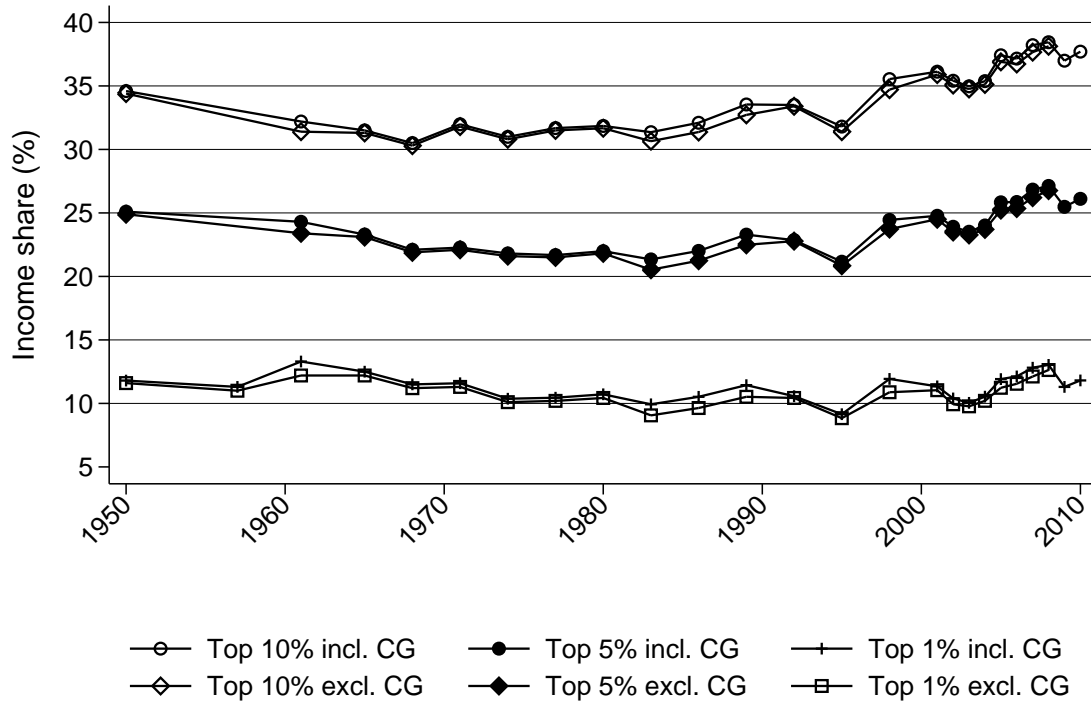
Source: PIT statistics and PIT microdata, WTID for 1950-1998 and own calculations since 2001.
Note: Ranking including and excluding capital gains, respectively.

Figure 2 turns to the development of the very rich, i.e., the top 0.1 % and top 0.01 %. Income shares accruing to these groups did return to levels of 1995 in the early 2000s, but steeply and steadily increased ever since. Between 2003 and 2008, the share of the top 0.1 % increased from 3,7 % to 5,3 % by more than 40 %. Excluding capital gains has a larger effect for the very top in both stabilizing the series over time and reducing their income share. However, excluding capital gains

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[6]E.g., capital gains from stock shares and real estate were tax-exempt to a large part. See Appendix D.2 for details on German capital gains taxation and changes therein over our data period. In general, the German share of capital gains in total taxable income is low compared to other countries such as Sweden or the US (Roine and Waldenström, 2012). The impact of capital gains is somewhat higher if they are defined before income source-specific deductions (Bach et al., 2013). Even though the taxable share of capital gains is low in Germany, their importance for top incomes can be high: Roine and Waldenström (2012) show that in Sweden, capital gains are a substantial and reoccuring addition to top incomes, rather than a transitory component.

does not change the trend of increasing income concentration.

Figure 2: Top income shares in Germany (with and without capital gains), 1950-2010

Source: PIT statistics and PIT microdata, WTID for 1950-1998 and own calculations since 2001.
Note: Ranking including and excluding capital gains, respectively.

There are two developments one should be aware of when interpreting the observed trends in Figures 1 and 2. First, several tax reforms are likely to have induced income timing. Second, changes in the definition of taxable income reduced top income shares mechanically.

Reforms in capital income taxation and changes in the top marginal PIT tax rate may have triggered income timing. Changes in capital income taxation are likely to have impacted on capital income realization in 2001, 2008 and 2009: 2001 was the last year where the corporation tax could be fully credited against the PIT. Hence, 2001 was marked by an all-time high in dividend distribution which boosted capital income in 2001 in comparison to the following years. Dividend income from closely held corporations in 2009 may have been preponed to 2008.[7] In turn, interest

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[7]In 2008, the tax rate on corporate gains distributed in the same year was exceptionally low due to the introduction of the final withholding tax on capital income in 2009. Therefore, dividend distribution of some corporations was preponed. See Appendix D.3 for details on the withholding

income may have been postponed to 2009, as the marginal top tax rate on interest income was reduced from 45 % in the PIT to 25 % in the final withholding tax in 2009.

The marginal top PIT tax rate changed frequently between 2001 and 2008: between 2000 and 2005, the top marginal tax rate was gradually reduced from 51 % in 2000 to 48.5 % in 2001, to 45 % in 2004, and reached its low of 42 % in 2005. As the gradual reduction up to 2005 had been anticipated since the year 2000, we expect some income shifting from the earlier years to 2005 and later years. If top incomes react more elastic to taxation than incomes at lower levels, this shifting may have increased top income shares. Hence, the tax reform might have contributed to the subsequent increase in top income shares between 2004 and 2008. However, top income shares continued to increase in 2007 and 2008, when the top tax rate was raised to 45 % again, suggesting that income timing is not the driving force behind the increase in top income shares.[8]

Both reforms mechanically reduced the income share accruing to the top where capital income is concentrated by changing the definition of capital income. In 2002, the taxable share of dividends in the PIT decreased by 62.5 %. In 2009, dividend and interest income was completely excluded from the PIT tax base due to the introduction of a final withholding tax on capital income.

The reduced share of dividend income in GTI may explain some of the decrease in top income shares after 2001. In 2009, when capital income was entirely excluded from the PIT, all fractiles experienced large losses. However, the mechanical effect of the exclusion of capital income coincides with the largest output drop of the post-war era. In 2009, German GDP decreased by 5.1 %. From 2008 to 2009, the share of the top percentile went down by 13 % and the share of the top 0.1 % even by 25 %. In the wake of economic recovery in 2010, top income shares slightly increased. In

tax reform.

[8]The increase in the top tax rate only applied to incomes above 250,000 €. Income shifting to 2007 and 2008 years is still plausible because of two other legislative changes regarding income from unincorporated businesses and dividend income: For unincorporated business income, the lower top tax rate persisted until 2007. In 2008, dividends may have been preponed, which might have overcompensated reactions to the increased top tax rate. (See Footnote 7 above and Appendix D.3 for details.) However, our harmonized series show that top income shares excluding capital income only slightly decrease in 2008 (see Section 4 and Appendix Table B.5 (scenario 3).

the following sections, we will focus on the second of the two developments discussed above: the mechanical effect of the gradual exclusion of capital income from the PIT tax base. The question of the magnitude of income timing is beyond the scope of this paper. While section 4 will focus on the impact of changes in taxable capital income until 2008, section 5 turns to the impact of the reform of 2009 and the development thereafter to disentangle crisis and tax reform effect.

4 The Role of Capital Income

Between 2001 and 2008 two tax reforms induced the gradual disappearance of capital income from the income tax base. In the following, we first provide a brief overview of the two reforms. Further, we provide details on the income composition of the top fractiles with a particular emphasis on capital income when moving to the top of the distribution. We then turn to check the sensitivity of the top income series to the disappearance of capital income from the underlying data. We derive three harmonized top income series based on varying income tax legislations: Scenario 1 corresponds to German tax legislation until 2001. Scenario 2 applies the legislation in force between 2001 and 2008. Scenario 3 corresponds to the legislation since 2009.

Figure 3 indicates the timing of the two reforms within the picture of the raw data top income shares basically zooming in into the development between 1998 and 2010 already presented in Figures 1 and 2.

Until 2001, capital income as the sum of dividends and interest income was fully taxable in the PIT. Dividends were defined as gross dividends before corporation tax. We refer to this legislation as the 100 %-rule. The first reform in 2002 changed the definition of taxable dividends from full gross dividend (before corporation tax) to half cash dividend (after corporation tax). We refer to this legislation as the 50 %-rule. Even though the effective tax rate on gross dividends only slightly changed, the share of taxable dividend income in gross taxable income was reduced by almost two thirds (62.5 %). The second reform in 2009 introduced a final withholding tax on capital income, which led to the complete exclusion of capital income from taxable income. Consequently, PIT statistics do not have any information on capital income

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Figure 3: Top Income Shares in Germany, 1998-2010

Source: PIT statistics, own calculations. *Note:* Shares are including capital gains.

since 2009. Additionally, the ranking of individuals based on these statistics most probably differs from the years before since the ranking is based on non-capital income since then. We refer to this legislation as the 0%-rule. Further details on the three tax regimes are given in Appendix D.

Both reforms are expected to impact primarily at the top of the income distribution where capital income is concentrated. Figure 4 gives the composition of taxable income within top fractiles. The bottom half of the top decile generates 90% of income through wages. For the next four percent the wage share drops to 80% and then continues to decrease quite sharply. The top 0.01% has a wage share of only 10%. The role of self-employed[9] income increases up to the 99.99th percentile and then decreases towards the very top. Even though the importance of capital income increases towards the top, it fails to generate the largest part of top incomes. The very top accrues the bulk of their income through entrepreneurial income from unincorporated businesses. With the gradual exclusion of capital income from the tax base, the share of capital income of the top 0.01% declines from almost 30% in 2001 to about 10% in 2004 and an 2007. The magnitude of this decline is reinforced by exceptionally high dividend payments in 2001 and the introduction of the 50%

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[9]Self-employed income and unincorporated business income differ by the payment of the local business tax. Some professions are excluded from its liability (mostly physicians and lawyers) and their income is than classified as self-employed instead of business.

Figure 4: Income composition within top fractiles in Germany, 2001, 2004 and 2007
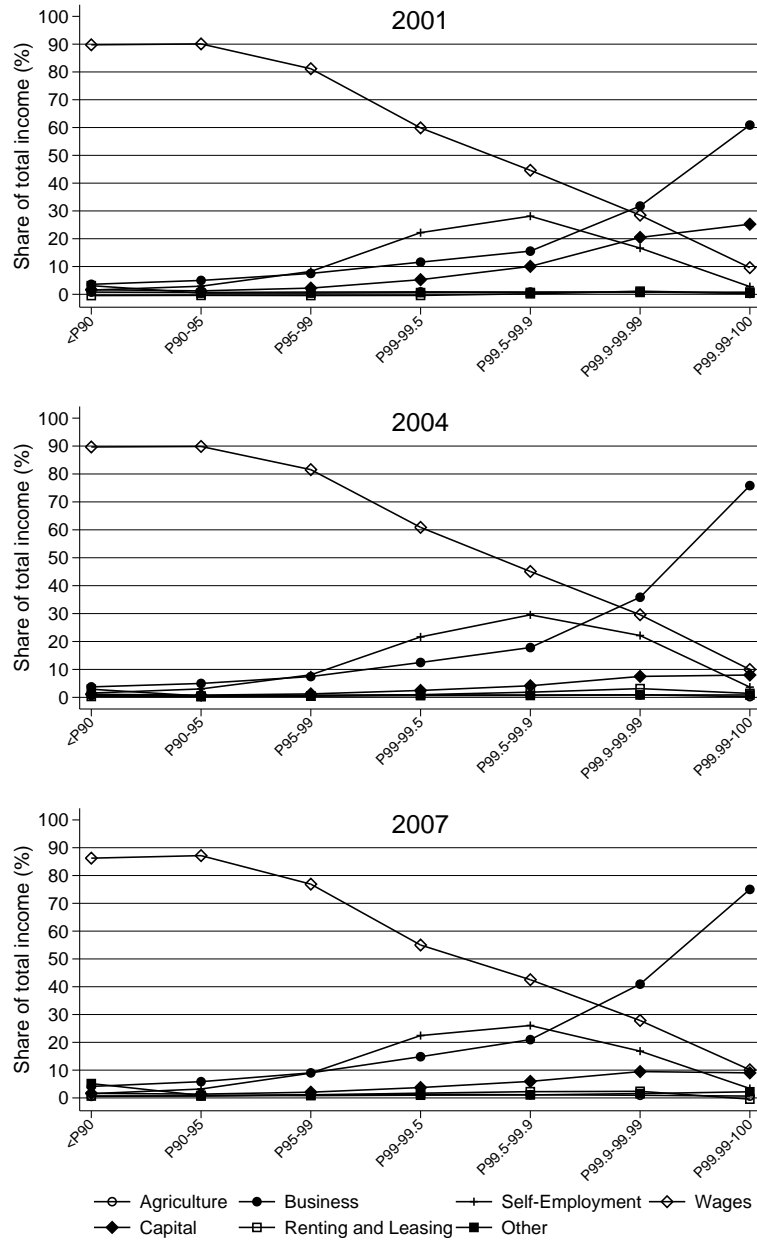
rule in 2002.

Three top income series under simulated tax regimes each based on a homogeneous capital income definition are presented in Figure 5. Scenario 1 shows top income shares if capital income had fully entered taxable income (100 %-rule), as it was the case before 2002. Scenario 2 shows top income shares applying the 50 %-rule. Between 2002 and 2008, this series corresponds almost perfectly with the raw data series.[10] Scenario 3 shows top income shares if capital income had been excluded from the PIT tax base already in the years prior to 2009 (0 %-rule).

Figure 5: Top income shares under simulated tax regimes
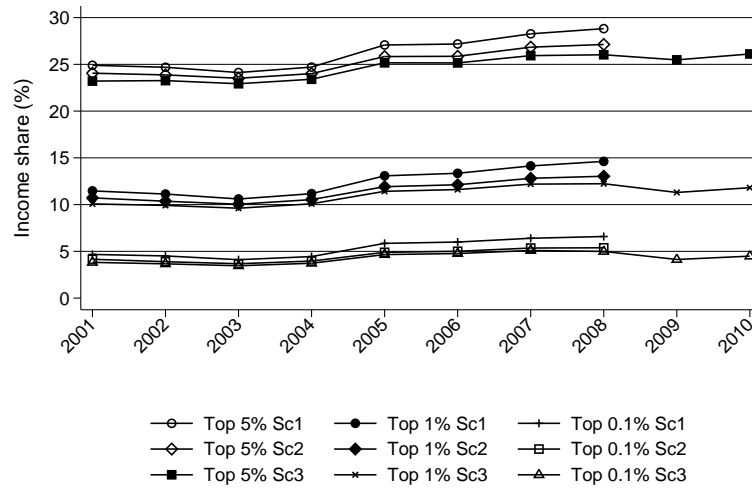
The three scenarios allow us to draw two main conclusions. First, a significant portion of the drop in top income shares in 2009 observed in Figure 3 using the raw PIT statistics can be explained by the tax reform. Second, estimates of top income shares would be both at a higher level and would have increased at a higher rate between 2004 and 2008 if capital income had not vanished from PIT statistics.

The first conclusion is illustrated by scenario 3. If capital income was excluded from the tax base throughout the entire period, top income shares would have decreased only slightly in 2009. Hence, the 2009 drop in raw data top income shares can be explained by the withholding tax reform to some extent, but not entirely.

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[10]Small differences are due to a transitional period that began already in 2001.

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The top 1 % share drops by 1.63 percentage points in raw-data shares, and by 0.83 in scenario 3. I.e., the drop is only half of the size if capital income had been excluded in 2008 already. The top 0.1 % share drops by 1.18 percentage points using raw PIT statistics, and by 0.79 percentage points in scenario 3. Hence, the portion of the 2009 drop that can be explained by the exclusion of capital income from the PIT tax base decreases towards the top and the relative size of the remaining drop in scenario 3 increases towards the top: while the drop is below 2 % for the top 5 %, it exceeds 7 % for the top 1 % and reaches almost 20 % for the top 0.1 %. From this, we can draw the conclusion that the output drop in 2009 did disproportionately hit the very top of the non-capital income distribution, albeit to a smaller degree than raw data shares presented in Section 3 would suggest.

The second conclusion is illustrated by scenario 1 and scenario 2. If capital income would have been subject to the 100 %-rule (scenario 1) instead of the 50 %-rule (scenario 2), then estimated top income shares would be both at a higher level and would increased at a higher rate between 2001 and 2008. Simulating the 100 % rule instead of the 50 % rule raises the top 1 % share by more than 1.5 percentage points, 1.2 of which accrue to the top 0.1 %. This indicates the heavy concentration of dividend income at the very top. The share of the top percentile under the actually prevailing rules of scenario 2 increased by about 24 % between 2004 and 2008, whereas their share increased by 30 % under the 100 %-rule of scenario 1.

In sum, harmonized series show that top income shares increased more than raw data series suggest. Much of the decrease in top income shares between 2001 and 2003 is driven by the introduction of the 50 % rule. Top income shares excluding capital income reveal that much of the 2009 drop in the raw data series can be explained by the introduction of the 0 % rule. However, the series excluding capital income still display a drop in 2009, whose size increases towards the very top.

5 A Proxy for Missing Capital Income

As capital income was completely excluded from the PIT in 2009, our harmonized series including full capital incomes (scenario 1) ends in 2008 and cannot be extended

without imputation of capital incomes at the top.[11] In this section, we discuss several proxies for capital income. Our goal is to obtain top income shares including capital income for 2009 and 2010 extending the series of scenario 1.

In order to derive the best proxy for capital income, we test the correlation between external capital income aggregates described in Section 2 and the capital income reported in PIT microdata. As PIT microdata until 2008 display individual interest and dividend income separately, we can check the correlations between external aggregates of both dividends and interest income.

The external aggregates for dividend and interest incomes are shown in Figure 6. Aggregated dividends from national accounts, tax flow statistics and the German stock market (CDAX) are reported in the upper graph. Aggregated interest income from national accounts and tax flow statistics is given in the lower graph. Additionally, both graphs show the corresponding income aggregates from PIT microdata between 2001 and 2008.

All dividend aggregates show a drop in 2009, albeit of very different magnitude. The tax flow aggregate peaks in 2008 and displays a large drop by almost 50 % in 2009. This large change can be partly due to preponed dividend distribution in 2008 as discussed in Section 3. Stock market dividends also peak in 2008, but their development is much smoother over the years. They decline in 2009 and 2010, and slightly recover in 2011. National accounts dividends show a trend similar to stock market dividends. In sum, the time trend of aggregated PIT dividends seems to correspond closest with stock market dividends.[12] However, trends slightly differ in 2007 and 2008: PIT microdata display less dividend growth in 2007 and more dividend growth in 2008. This could reflect the same reaction to the potentially low tax rate in 2008 as described above for the tax flow aggregate.

The selected aggregates for interest income converged over the past two decades. The higher level of national accounts interest income as compared to the tax flow

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[11]The dualization of the income tax schedule does not necessarily lead to a lack of data on top incomes: in Scandinavian countries, information on capital income and other income can be linked using the individual taxpayer-ID. In Germany, data linkage by taxpayer is not available.

[12]Stock market dividends and dividends in PIT microdata also nearly coincide in levels – this is, however, rather a coincidence as German stocks are not entirely owned by German private households.

aggregate in the 1990s might be due to the prevailing high savers' allowance (see Appendix Figure E.4) and the inclusion of reinvested interest income from private pension insurances. The convergence could be explained by both the gradual broadening of the tax base and the decrease of the savers' allowance. The national accounts aggregate peaks in 2008, followed by a pronounced drop in 2009, while the tax flow aggregate peaks in 2009 and drops in 2010. To some extent, we expect that taxable interest income was postponed to 2009, as the final withholding tax substantially reduced the marginal tax rate on interest income for high-income tax units.[13] Both level and time trend of the tax flow aggregate largely coincide with the PIT aggregate. The smaller growth rate of the PIT aggregate in 2007 and 2008 might be due to income timing. If interest income was postponed to 2009, the PIT aggregate should reflect this timing effect more than the tax flow aggregate, which partly includes interest income of corporations and of non-resident persons who were not subject to an equally large tax rate reduction.

In sum, the time series reveal strong correlations between capital income aggregates in PIT microdata and two external aggregates in particular: PIT dividends follow German stock market dividends, while PIT interest income displays a similar trend to the tax flow aggregate. For both income sources, trends differ from the external totals' trends in 2007 and 2008, which can most likely be explained by taxable income reactions to tax law changes.

The selected proxy should not only correlate with the PIT aggregates of dividends and interest income, but also with capital income of the top fractiles. To test the correlation between proxies and certain fractiles' aggregates, we need to decide on which ranking these fractiles are based. We can either sort individuals according to their income with capital income or without capital income. If we aim to extend the 100 %-rule series, we would have to use the sorting according to income with capital income. However, we know that for 2009 and 2010 we can only observe the top income shares without capital income, as the 0 %-rule has been applied since 2009. Adding capital incomes corresponding to the 100 %-rule sorting to non-capital top

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[13]A second explanation for the tax flow aggregate's peak in 2009 could be the inclusion of capital gains from stock shares in the tax base since 2009. Since the introduction of the withholding tax in 2009, capital gains are part of the presented tax flow on interest income. However, as there were generous transitional rules, we expect this impact to be small in 2009.

Figure 6: External capital income totals, 1992–2013
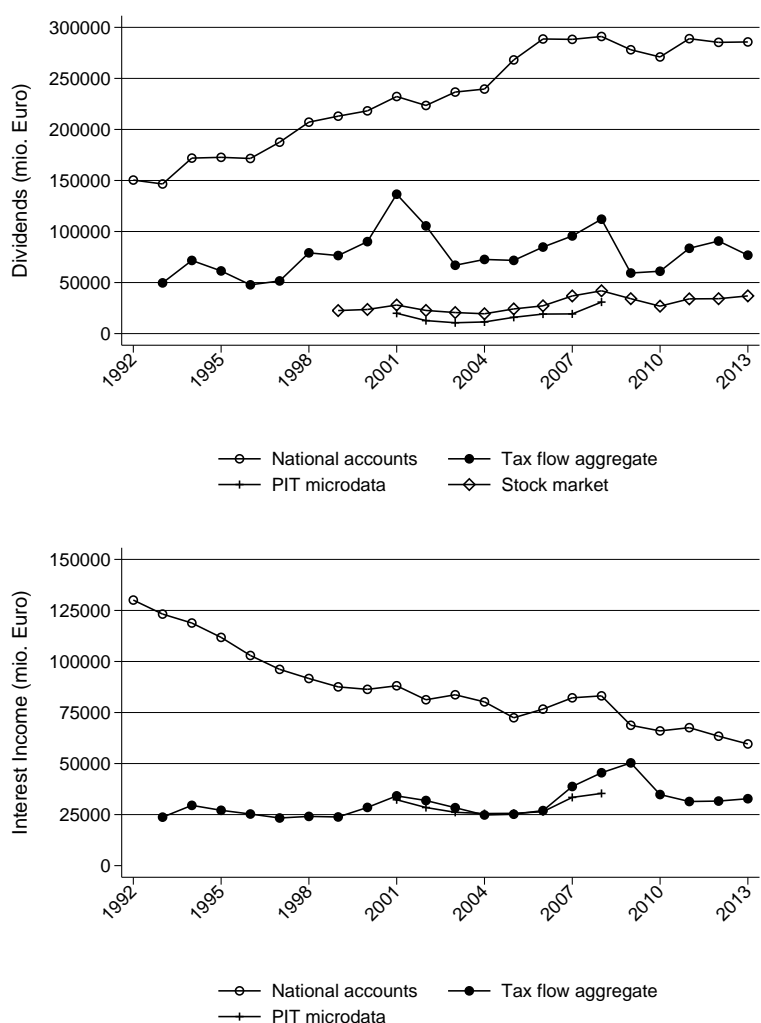
Source: Tax flow statistics, PIT microdata, stock market indices (CDAX), and German national accounts (household sector). *Note:* Values are in 2010 prices.

income shares assessed on 0 %-rule sorting would overestimate top income shares. We can therefore (i) correct the non-capital top income shares for the sorting effect, which brings us the closest we can get to the 100 %-rule shares. Or we can (ii) use 0 %-rule sorting observed in the raw data and add capital income shares to top non-capital income shares, which would enable us to derive a consistent series since 2001. We choose the 0 %-rule sorting (ii) as our preferred imputation, since it can be interpreted as a lower bound for top income shares and allows us to construct a consistent series.

Table 1 shows correlations between external aggregates and PIT fractiles' aggregates indicating to which extent the correlation varies over top income fractiles.

The upper part of Table 1 refers to dividends, while the lower part refers to interest income. The first column gives the correlation of fractiles aggregate dividend or interest income with the total observed in PIT microdata. The second to sixth columns give the fractiles' correlation with external aggregates. Additionally to the afore presented aggregates, we include capital income from the SOEP survey and GDP. For interest income, we include current GDP. For dividend income we include lagged GDP, as dividends are usually distributed profits earned in the previous year.

All fractiles' dividend or interest incomes show a high correlation with the corresponding PIT total which indicates stable shares in total capital income. Thus, the assumption that the distribution of total capital income remained stable in 2009 and 2010 does not seem strong.

Stock market dividends show the highest correlation with PIT dividend income for almost all top fractile groups with decreasing correlations towards the top: correlation coefficients exceed 0.90 for the top 10 % without the top 0.1 %, and decrease to 0.79 for the top 0.01 %. Lagged GDP and national accounts dividends show less correlation which also decreases towards the top. For the top 0.01 %, the correlation with national accounts dividends slightly exceeds the correlation with stock market dividends. Correlation with SOEP capital income is comparably low.

For interest income, the tax flow aggregate shows the highest correlation with fractiles' interest incomes. Correlations at the top are similar to dividend income. However, for the top 0.01 % the correlation coefficient drops to 0.51.

The correlations with external totals confirm for both capital income sources that the findings of Figure 6 hold over different top income fractiles. Based on these results, we chose stock market dividends and the tax flow aggregate as proxies for dividend income and interest income , respectively, and will apply the correlation coefficients observed between 2001 and 2008 to derive dividend aggregates by fractile for 2009 and 2010.[14]

Figure 7 and 8 display our extended series including capital income. As scenario 3 is constructed to match the taxable income definition since 2009, this series

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[14]Appendix Figure E.1 shows the level of capital income in selected (disjoint) fractiles between 2001 and 2008, as well as imputed values based on stock market dividends and the interest tax flow aggregate between 2001 and 2013.

Table 1: Correlation between fractile capital income and external aggregates

			Dividends			
$\text{DIV}_{FRACTILE}$	DIV_{PIT}	DIV_{NA}	DIV_{CDAX}	GDP_{LAG}	CAP_{SOEP}	DIV_{TF}
		sorting: 0 % rule (Scenario 3)				
<P90	0.98	0.86	0.97	0.90	0.23	0.68
90–P95	1.00	0.81	0.94	0.92	0.19	0.68
95–P99	0.99	0.74	0.93	0.94	0.18	0.70
99–P99.5	1.00	0.79	0.94	0.92	0.19	0.69
99.5–P99.9	1.00	0.79	0.91	0.90	0.17	0.67
99.9–P99.99	0.98	0.81	0.86	0.81	0.14	0.64
Top 0.01 %	0.93	0.80	0.79	0.71	0.10	0.61

|			Interest			
$\text{INT}_{FRACTILE}$	INT_{PIT}	INT_{NA}	–	GDP	CAP_{SOEP}	INT_{TF}
		sorting: 0 % rule (Scenario 3)				
<P90	0.99	0.68		0.67	0.49	0.96
P90-P95	0.95	0.37		0.87	0.36	0.96
P95-P99	0.98	0.45		0.82	0.39	0.96
P99-P99.5	0.99	0.59		0.69	0.49	0.94
P99.5-P99.9	0.96	0.67		0.65	0.42	0.89
P99.9-P99.99	0.97	0.49		0.76	0.54	0.94
Top 0.01 %	0.57	0.08		0.21	0.39	0.51

Notes: Correlations between aggregated dividends / aggregated interest income by fractile. Sorting sc3: fractiles defined excluding capital income (0 % rule) $\text{DIV}_{FRACTILE}$/$\text{INT}_{FRACTILE}$: Aggregated dividend/interest income in (disjoint) fractile groups in PIT microdata DIV_{PIT}/INT_{PIT}: Total dividend/interest income in PIT microdata DIV_{NA}/INT_{NA}: Household sector dividends/interest income in national accounts DIV_{CDAX}: Aggregated dividends from German stock companies (CDAX index) GDP/GDP_{LAG}: (Lagged) GDP CAP_{GSOEP}: Capital income of top 5 % from SOEP microdata; We use fractile thresholds including capital gains, but excluding capital income according to the thresholds derivable from PIT statistics since 2009. DIV_{TF}/INT_{TF}: Aggregated dividend/ interest income calculated from tax flow statistics
Source: Own calculations using PIT microdata, stock market indices (CDAX), SOEP microdata, national accounts, and tax flow statistics.

can be extended by the years 2009 and 2010 using PIT statistics. Scenario 3 corresponds to the simulated scenario 3 in Figure 5 applying the 0 %-rule. Scenario 1a is Scenario 1 in Figure 5 applying the 100 %-rule. Scenario 1b applies the 100 %-rule with tax units sorted excluding capital income, which is the most comparable concept to scenario 3 in 2009 and 2010. Scenario 1b is extended by the years 2009 and 2010 including imputed capital income using the capital income proxy discussed above.

Including capital income in 2009 and 2010 perpetuates the trend of increasing income concentration witnessed until 2008. As can be taken from Figure 7, we do not find a pronounced drop in top income shares when including capital income. Even though we find higher drops between 2008 and 2009 moving to the top, both the extended scenario 1b and scenario 3 are smoother than the series based on the original data suggest. Comparing scenario 1b and 3 we can conclude that neither

Figure 7: Top income shares with imputed capital income
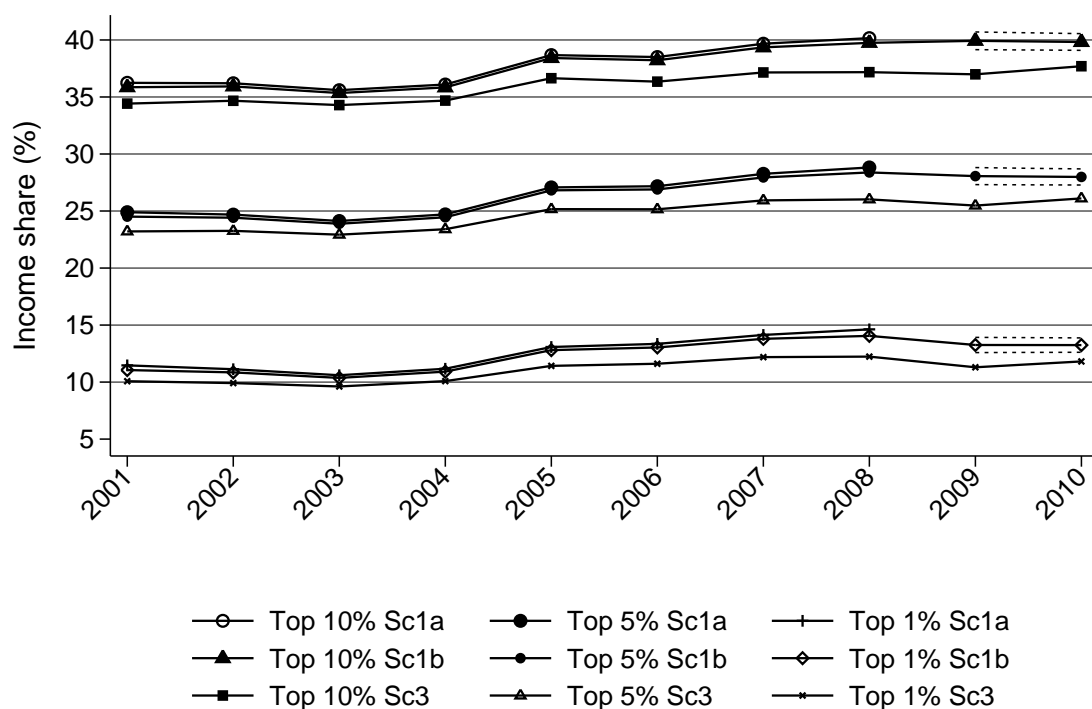
Source: PIT statistics, own calculations. *Note:* Scenario 1a applies the 100 %-rule with tax units sorted including capital income. Scenario 1b applies the 100 %-rule with tax units sorted excluding capital income. Scenario 3 applies the 0 %-rule.

the concentration of capital or non-capital income was substantially reduced by the crisis. The income share accruing to the top percentile fell by 6 % including capital income (Scenario 1b) and by 7 % excluding capital income (Scenario 3). In contrast, the original data suggest a decrease of 13 % for the top percentile. Consequently, the drop observed in the original data Section 3 is at least by half attributable to the exclusion of capital income from the tax base between 2008 and 2009.

In contrast to the series assessed on raw PIT statistics, our extended harmonized series hence shows an even steeper increase in income concentration between 2001 and 2010. The income share with capital income accruing to the top decile is 8 % higher than the shares assessed on the original tax data in 2009. The share of the top 0,01 % is 28 % higher.

Figure 8: Top income shares with imputed capital income
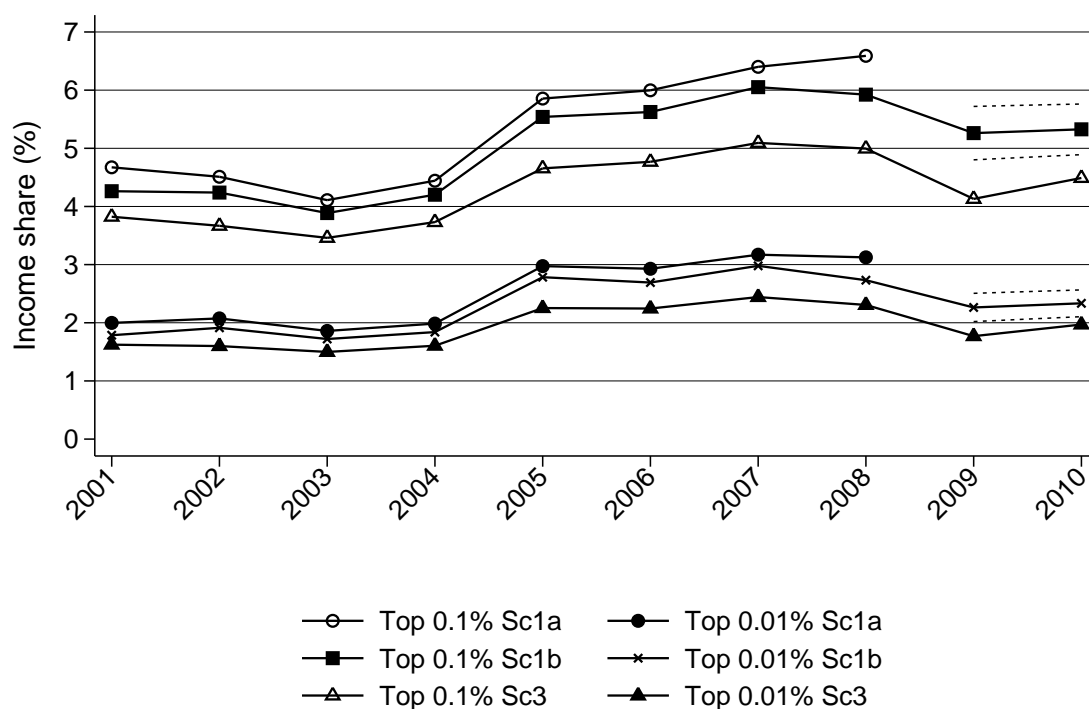
Source: PIT statistics, own calculations. *Note:* xx.

6   Conclusions

In this paper, we derived a homogeneous series of top income shares including full capital incomes for Germany to overcome the erosion of our data base. First, we extended the existing WTID series of top income shares based on PIT statistics. We extended the series including capital gains to 2010, and the series excluding capital gains to 2008. Excluding taxable capital gains reduces top income shares only by little, as capital gains were largely tax free in Germany before 2009. Second, we used PIT microdata to explore the impact of the gradual exclusion of capital income from PIT base on top income shares. We derived homogeneous series of top income shares corresponding to varying income tax legislations and capital income definitions. We find that the drop in unharmonized top income shares in 2009 is mainly attributable to the disappearance of capital income from the underlying data. The recession in 2009 seems to have had a minor impact on the top of the German income distribution. Second, we find that the uncorrected series of top

income shares understates the increase in income concentration that took place in Germany between 2004 and 2008. Third, we explored the correlations between top fractiles' capital incomes and external capital income aggregates. We find that a composite measure of stock dividends and interest income tax flows provides a good proxy for capital income accruing to the rich over time. Using this proxy, we extended our harmonized series of top income shares including capital income to 2010. We find that accounting for missing capital income increases top income shares by 6 % for the top decile and by almost 30 % for the top 0.01 % in 2009 and 2010. The output drop in 2009 did disproportionately hit the very top of the non-capital income distribution, albeit to a smaller degree than shares obtained from PIT statistics suggest. Missing capital income in income tax statistics will lead to an underestimation of German top income shares assessed on the commonly used income tax statistics in the future. At the same time, we expect higher income accumulation at the top of the distribution following the tax reduction on capital income which will not be documented by income tax statistics.

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Appendix A Sources of total income and total population

In the following, we explain the construction of our control totals in detail.

The control total for population is the number of individuals aged 20+ using population statistics from the Statistical Yearbooks following Dell (2007). E.g., numbers for the year 2008 are published in the Statistical Yearbook of 2010 (*Statistisches Jahrbuch 2010*). The number of tax units is computed using the following formula:

Tax Units = Married Couples/2 + Bachelors - Children (up to 19 years)

Table A.1: Control total for population, Germany, 1998-2010

Year	Total tax units in 1000	Total recorded in tax statistics in 1000
1998	45,155	28,293
2001	46,802	27,413
2002	47,584	27,294
2003	47,927	26,647
2004	46,338	26,154
2005	48,574	26,264
2006	47,942	25,934
2007	48,297	26,327
2008	48,578	26,128
2009	48,823	26,062
2010	49,192	26,411

Source: PIT statistics, own calculations.
Note: Total recorded in tax statistics refers to income and payroll taxpayers in 1998 and to only income tax payers from 2001 to 2010.

The income total is based on the national accounts published in *Fachserie 18 Reihe 1.5 Volkswirtschaftliche Gesamtrechnungen. Inlandsproduktberechnung, Lange Reihen ab 1970, Stand März 2014*. Total household income is the sum of

Compensation of employees (Residents) (*Arbeitnehmerentgelt (Inländer)*) (Table 1.3)

+ Operation surplus (*Betriebsüberschuss*) (Table 1.10)

+ Income of self-employed (*Selbständigeneinkommen*) (Table 1.10)

+ Property income (*Vermögenseinkommen*) (Table 1.10)

- Employers' actual social contributions (*Sozialbeiträge der Arbeitgeber*) (Table 1.8).

= Total household income

Total household income, total income recorded in income tax statistics and our control total is given in Table A.2. Control total is 90 % of total household income following Dell (2007).

Table A.2: Control total for income, Germany, 1998-2010

Year	Total household income (bio. €)	Total income recorded in tax statistics (mio. €)	Control total (mio. €)
1998	1,263.7	902,992	1,137,294
2001	1,354.0	963,858	1,218,627
2002	1,356.7	959,635	1,221,003
2003	1,375.3	939,915	1,237,761
2004	1,391.8	953,835	1,252,638
2005	1,423.9	996,304	1,281,483
2006	1,477.9	1,013,694	1,330,092
2007	1,528.14	1,067,377	1,375,326
2008	1,586.81	1,099,228	1,428,129
2009	1,544.41	1,061,489	1,389,969
2010	1,587.17	1,101,833	1,428,453

Source: National accounts (*Volkswirtschaftliche Gesamtrechnungen*), various years, own calculations.
Note: Values are in current Euro. Total income recorded in PIT statistics refers to income and payroll tax in 1998 and to only income tax from 2001 to 2010.

Appendix B Tables of Key Results

The key results on top income shares based on both PIT statistics and PIT microdata are given in Tables B.1 and B.2, respectively. Thresholds and average income for various fractiles based on PIT statistics and PIT microdata are given in Tables B.3 and B.4, respectively.

Table B.1: Top income shares based on PIT statistics, 2001-2010

Year	Top 10 %	Top 5 %	Top 1 %	Top 0.5 %	Top 0.1 %	Top 0.01 %
			including capital gains			
2001	35.91	24.60	11.19	8.34	4.48	1.89
2002	35.69	24.17	10.56	7.71	4.00	1.73
2003	34.97	23.54	10.05	7.26	3.68	1.58
2004	35.02	23.70	10.29	7.47	3.80	1.61
2005	37.39	25.82	11.88	8.87	4.85	2.28
2006	37.01	25.73	12.01	8.99	4.92	2.23
2007	38.08	26.73	12.73	9.59	5.30	2.47
2008	38.30	27.00	12.94	9.73	5.30	2.38
2009	36.99	25.48	11.30	8.20	4.13	1.77
2010	37.70	26.11	11.81	8.65	4.49	1.97

Source: PIT statistics, own calculations.
Note: Tax statistics include income and payroll taxpayers in 1998 and only income taxpayers from 2001 to 2010.

Table B.2: Top income shares based on PIT microdata, 2001-2008

Year	Top 10 %	Top 5 %	Top 1 %	Top 0.5 %	Top 0.1 %	Top 0.01 %
		including capital gains				
2001	36.04	24.70	11.28	8.42	4.52	1.90
2002	35.32	23.83	10.32	7.51	3.86	1.65
2003	34.89	23.45	9.99	7.20	3.64	1.56
2004	35.30	23.93	10.47	7.63	3.92	1.68
2005	37.28	25.71	11.81	8.81	4.81	2.25
2006	37.02	25.73	12.01	9.00	4.92	2.23
2007	38.09	26.73	12.72	9.58	5.30	2.47
2008	38.31	27.01	12.93	9.73	5.31	2.38
		excluding capital gains				
2001	35.82	24.44	10.99	8.13	4.29	1.78
2002	34.99	23.43	9.88	7.08	3.48	1.38
2003	34.69	23.20	9.71	6.94	3.42	1.42
2004	35.04	23.63	10.14	7.31	3.66	1.51
2005	36.78	25.13	11.15	8.16	4.22	1.81
2006	36.60	25.24	11.45	8.45	4.45	1.92
2007	37.55	26.11	12.04	8.92	4.72	2.08
2008	38.00	26.64	12.53	9.34	4.97	2.17
		excluding capital gains, ranked including				
2001	35.72	24.33	10.87	8.01	4.17	1.69
2002	34.89	23.33	9.76	6.96	3.36	1.28
2003	34.59	23.10	9.61	6.83	3.32	1.35
2004	34.94	23.54	10.04	7.21	3.56	1.43
2005	36.70	25.04	11.06	8.07	4.13	1.73
2006	36.48	25.11	11.31	8.30	4.30	1.77
2007	37.49	26.04	11.96	8.83	4.62	1.98
2008	37.91	26.55	12.43	9.23	4.85	2.07

Source: PIT microdata, own calculations.
Note: Tax statistics include only income taxpayers.

Table B.3: Thresholds and average incomes based on PIT statistics

Year	Top 10 %	Top 5 %	Top 1 %	Top 0.5 %	Top 0.1 %	Top 0.01 %
including capital gains						
thresholds						
2001	60,592	78,707	143,314	198,909	492,873	2,246,635
2002	58,899	76,069	136,378	191,218	423,507	1,736,659
2003	59,026	76,053	135,415	187,560	411,155	1,597,076
2004	60,021	78,834	143,314	196,258	438,440	1,732,794
2005	57,105	74,656	140,394	194,505	460,286	1,980,177
2006	58,197	76,652	148,273	206,986	498,124	2,245,317
2007	59,768	78,576	158,530	222,919	499,053	2,454,337
2008	59,536	79,104	162,319	230,545	531,899	2,501,911
2009	58,939	78,238	153,775	211,831	472,657	1,767,323
2010	59,659	79,621	157,161	217,574	497,781	1,988,181
average incomes						
2001	107,415	147,201	334,853	499,123	1,338,884	5,646,915
2002	101,045	136,833	298,802	436,686	1,131,571	4,887,672
2003	99,629	134,121	286,278	413,669	1,049,627	4,507,042
2004	104,430	141,380	306,741	445,488	1,133,249	4,787,375
2005	102,719	141,854	326,212	487,352	1,332,172	6,251,256
2006	106,905	148,675	346,961	519,684	1,422,471	6,455,387
2007	112,911	158,500	377,397	568,480	1,570,692	7,323,307
2008	114,232	161,075	385,838	580,665	1,581,202	7,110,313
2009	106,519	146,733	325,474	472,018	1,189,551	5,089,109
2010	109,484	151,640	342,813	502,643	1,302,720	5,711,967

Source: PIT statistics, own calculations.
Note: Tax statistics include only income taxpayers. All figures in 2010 prices.

Table B.4: Thresholds and average incomes based on PIT microdata

Year	Top 10 %	Top 5 %	Top 1 %	Top 0.5 %	Top 0.1 %	Top 0.01 %
including capital gains						
thresholds						
2001	59,219	78,524	147,133	205,219	498,301	2,238,996
2002	58,292	77,367	141,654	193,051	432,088	1,751,616
2003	57,626	76,795	140,275	189,490	413,570	1,604,844
2004	58,888	78,684	146,501	200,640	451,066	1,834,096
2005	57,314	77,330	147,448	204,569	478,436	2,062,078
2006	57,768	78,371	153,223	214,245	510,827	2,293,026
2007	58,181	79,463	159,104	225,108	541,863	2,454,649
2008	58,094	79,788	162,760	231,508	565,222	2,501,861
average incomes						
2001	107,383	147,187	336,115	501,487	1,347,296	5,664,665
2002	102,298	138,009	298,920	435,160	1,118,084	4,770,883
2003	100,576	135,166	287,863	415,264	1,049,526	4,487,702
2004	104,853	142,201	311,058	453,407	1,164,894	4,993,472
2005	106,329	146,654	336,696	502,632	1,372,144	6,427,489
2006	109,373	152,058	354,936	531,646	1,454,856	6,590,898
2007	112,881	158,406	377,018	567,929	1,569,966	7,317,652
2008	114,233	161,038	385,586	580,295	1,581,931	7,108,534
excluding capital gains						
thresholds						
2001	59,155	78,403	146,231	202,880	482,610	2,097,889
2002	58,216	77,223	140,646	190,627	416,537	1,568,500
2003	57,555	76,663	139,425	187,433	401,060	1,503,807
2004	58,815	78,540	145,525	198,270	436,414	1,703,690
2005	57,221	77,149	146,157	201,440	459,131	1,854,054
2006	57,668	78,174	151,709	210,868	488,197	2,067,020
2007	58,083	79,265	157,479	221,164	517,330	2,175,782
2008	58,076	79,740	161,942	229,230	548,887	2,317,341
average incomes						
2001	106,185	144,876	325,698	482,113	1,272,839	5,291,112
2002	100,632	134,779	284,069	407,018	1,000,168	3,983,845
2003	99,494	133,097	278,677	398,197	982,525	4,079,326
2004	103,540	139,674	299,705	432,244	1,080,645	4,472,641
2005	103,928	141,979	314,998	461,227	1,193,630	5,118,844
2006	107,159	147,763	335,337	494,685	1,302,461	5,623,890
2007	110,277	153,334	353,645	523,690	1,384,818	6,100,742
2008	112,783	158,167	371,961	554,388	1,474,699	6,445,920

Source: PIT microdata, own calculations.
Note: Tax statistics include only income taxpayers. All figures in 2010 prices.

Table B.5: Top income shares under simulated tax regimes

Year	Top 10 %	Top 5 %	Top 1 %	Top 0.5 %	Top 0.1 %	Top 0.01 %
100 % rule (Scenario 1), PIT microdata simulation						
2001	36.17	24.83	11.40	8.54	4.63	1.97
2002	36.11	24.60	11.05	8.21	4.45	2.04
2003	35.52	24.05	10.54	7.72	4.07	1.83
2004	36.01	24.63	11.10	8.23	4.40	1.96
2005	38.51	26.91	12.93	9.89	5.74	2.88
2006	38.35	27.03	13.22	10.15	5.90	2.86
2007	39.55	28.14	14.04	10.83	6.33	3.13
2008	40.03	28.69	14.52	11.23	6.51	3.07
50 % rule (Scenario 2), PIT microdata simulation						
2001	35.29	23.99	10.66	7.85	4.11	1.71
2002	35.28	23.79	10.29	7.48	3.84	1.64
2003	34.89	23.44	9.98	7.20	3.64	1.55
2004	35.30	23.93	10.47	7.63	3.92	1.68
2005	37.28	25.71	11.81	8.81	4.81	2.25
2006	37.02	25.73	12.01	9.00	4.92	2.23
2007	38.09	26.73	12.72	9.58	5.30	2.47
2008	38.31	27.01	12.93	9.73	5.31	2.38
0 % rule (Scenario 3), PIT microdata simulation						
2001	34.35	23.14	10.01	7.30	3.78	1.60
2002	34.58	23.18	9.84	7.10	3.61	1.56
2003	34.21	22.86	9.56	6.84	3.42	1.47
2004	34.60	23.33	10.02	7.25	3.69	1.58
2005	36.51	25.03	11.30	8.39	4.56	2.18
2006	36.21	25.02	11.49	8.56	4.68	2.18
2007	37.03	25.82	12.10	9.07	5.03	2.41
2008	37.05	25.90	12.13	9.06	4.92	2.25
0 % rule (Scenario 3), PIT statistics						
2009	36.99	25.48	11.30	8.20	4.13	1.77
2010	37.70	26.11	11.81	8.65	4.49	1.97

Source: PIT microdata and PIT statistics, own calculations.
Note: Shares refer to income including capital gains. The 100 % rule includes capital income (interest & gross dividends) fully and corresponds to pre-2002 PIT legislation. The 50 % rule includes 37.5 % of gross dividends and corresponds to PIT legislation from 2002 to 2008. The 0 % rule exludes capital income (interest & gross dividends) completely and corresponds to post-2008 PIT legislation.

Appendix C   Data

PIT Statistics

In Germany, there are two series of tabulated income tax statistics provided by Destatis: A payroll tax and income tax statistic is published every three years and includes both payroll and income taxpayers. These data are the source for the series 1891-1998 produced by Dell (2007). The personal income tax statistic is provided annually since 2001 and comprises all tax units that filed an income tax return in the respective year. These data are the source for the extension of the German series in the WTID by Dell (2011). Both data provide the number of tax units and reported income by income bracket. Threeannual data contain information on income composition by income bracket, additionally.

Tax Flow Statistics

Tax flow statistics are provided annually by Destatis and report aggregated tax flows by tax type. These types comprise the withholding tax on dividend income (since 1992) and on interest income (since 1993). Tax bases correspond to taxable income on the personal and on the corporate level. Since 2009, tax flows have continued to be reported for dividends and interest separately. However, the tax flow on interest has since been reported jointly with the tax flow on capital gains from stock shares.

Stock Market Indices

The most comprehensive German stock market index (CDAX) includes all German stocks that are traded on the Frankfurt stock exchange. There are two CDAX time series: the performance index describes the value of the market portfolio with reinvested dividends. The course index describes the value of the market portfolio without reinvested dividends. Both are corrected for events that have no impact on portfolio values, such as the issuing of new stocks. The dividend sum can be computed by multiplying the difference between the two indices' monthly growth rates by the market capitalization. Both indices are published as a monthly time series by the German Central Bank (*Bundesbank*) since 1994. Time series nos. are BBK01.WU001A (CDAX course index), BBK01.WU018A (CDAX performance index), and BBK01.WU080U (CDAX market capitalization, since 1999). For details on index computation see Deutsche Börse AG (2014).

PIT Microdata

We use microdata on PIT returns from 2001 to 2008. The data is the full sample of all German income tax returns for these years and serves also as the basis for annual tabulated statistics. Like the annual statistics, these data do not contain tax units who receive wage income only and do not file an income tax return. The impact of these missing cases for the top is limited as explained in **??**. The data comprise details on the tax unit's income composition. In particular, the level of taxable capital gains, capital income and dividends are reported. The microdata are provided by Destatis.

Appendix D   Changes to the Definition of Taxable Income in Germany

Capital income consisting of interest income and divideds gradually disappeared from the progressive PIT base over the past 15 years in Germany. Reforms since 2001 most frequently modified the taxation of dividends, but also the taxation of interest income and capital gains. Finally in 2009, the introduction of a flat tax on capital income (*Abgeltungsteuer*) removed this income source from the PIT base completely and consequently from income tax statistics as well. In the following, we describe regulatory changes to the taxation of capital gains and capital income and their impact on income tax data as a data source for the estimation of top income shares. Since we use both PIT statistics and PIT microdata, we focus on the reforms' impact on both gross taxable income as reported in the PIT statistics and the PIT microdata quality with respect to top incomes.

D.1   Composition of Taxable Income

The composition of aggregate taxable income and its development over the period 1992-2010 is illustrated in Figure D.1. Wages are by far the most important income source in Germany amounting to about 80 % of aggregate taxable income, whereas income from agriculture and forestry contribute an almost negligible share. The share of capital income consisting of interest income and dividends decreases sharply both after the exclusion of a large part of dividends in 2002 and after the introduction of a flat tax for capital income in 2009. Since then, capital income is not documented in income tax data with only few exceptions described in Section D.3.

Table D.1: Composition of aggregate taxable income in billion Euro)

	GTI[a]	A & F[b]	Business[c]	Self-Empl.	Wage[d]	Capital[e]	R & L[f]	Other[g]
			pre 2001/2002					
1992	792.6	6.2 (0.8)	73.4 (9.2)	35.1 (4.4)	649.1 (81.6)	27.4 (3.4)	-5.5 (-0.7)	10.2 (1.3)
1995	843.7	6.3 (0.7)	69.9 (8.3)	39.4 (4.7)	711.3 (84.0)	16.9 (2.0)	-11.3 (-1.3)	14.2 (1.7)
1998	890.9	7.7 (0.9)	86.7 (9.7)	48.6 (5.4)	729.5 (81.6)	22.7 (2.5)	-16.5 (-1.8)	15.2 (1.7)
2001	959.2	7.8 (0.8)	71.4 (7.5)	51.9 (5.4)	775.6 (81.3)	32.2 (3.4)	-3.3 (-0.3)	18.9 (2.0)
			50 % Rule					
2002	949.9	7.0 (0.7)	70.2 (7.4)	52.6 (5.6)	776.5 (82.3)	19.3 (2.0)	-1.3 (-0.1)	19.4 (2.1)
2003	934.9	6.8 (0.7)	71.8 (7.7)	52.4 (5.6)	765.3 (81.9)	17.0 (1.8)	0.9 (0.1)	20.0 (2.1)
2004	945.5	7.2 (0.8)	78.8 (8.3)	55.3 (5.8)	767.4 (80.7)	16.4 (1.7)	5.1 (0.5)	20.5 (2.2)
2005	990.1	7.7 (0.8)	93.9 (9.5)	58.9 (5.9)	768.6 (77.5)	19.0 (1.9)	7.1 (0.7)	37.1 (3.7)
2006	1008.2	8.2 (0.8)	104.7 (10.3)	60.9 (6.0)	772.8 (76.3)	20.2 (2.0)	8.5 (0.8)	38.0 (3.8)
2007	1061.4	9.2 (0.9)	113.8 (10.7)	65.8 (6.2)	797.3 (74.7)	29.1 (2.7)	10.9 (1.0)	41.0 (3.8)
2008	1092.3	8.9 (0.8)	118.0 (10.7)	69.6 (6.3)	811.9 (73.9)	35.9 (3.3)	12.0 (1.1)	41.8 (3.8)
			Dual Tariff					
2009a[h]	1054.8	7.9 (0.7)	101.0 (9.5)	68.9 (6.5)	812.5 (76.6)	11.9 (1.1)	14.5 (1.4)	43.7 (4.1)
2009b[h]	1074.9	7.9 (0.7)	101.0 (9.4)	68.9 (6.4)	812.5 (75.4)	29.7 (2.8)	14.5 (1.3)	43.7 (4.1)

Notes: Values are in current billion €. Values in parentheses are the share of each income source in total taxable income. Annual tax statistics do not include non-filers (filing is not mandatory for tax units who earn exclusively wage income). Exact shares can therefore differ from shares in the three-annual statistic, which comprises all wage earners (1995-2007 figures in Table **??**). [a]GTI: gross taxable income. [b]A & F: Agriculture and Forestry. [c]Business: unincorporated business income. [d] Wage: includes pensions from civil servants (Beamte) [e]Capital income: taxable dividends and interest income. [f]R & L: Renting and Leasing. [g]Other: predominantly pensions and some taxable capital gains (from stock shares and real estate). [h]2009a and 2009b define capital income differently: 2009a shows figures for those capital incomes that are taxed with the personal tax rate, and the corresponding GTI (tax statistics definition). 2009b additionally includes those capital incomes, that are taxed at the withholding tax rate, but are nonetheless reported in the PIT files. Capital income shares in 2009b refer to a correspondingly corrected measure of GTI.
Source: own calculation based on Destatis (1996, 1998-2007, 2000, 2001-2010).

Figure D.1: Composition of taxable income in Germany, 1992-2010
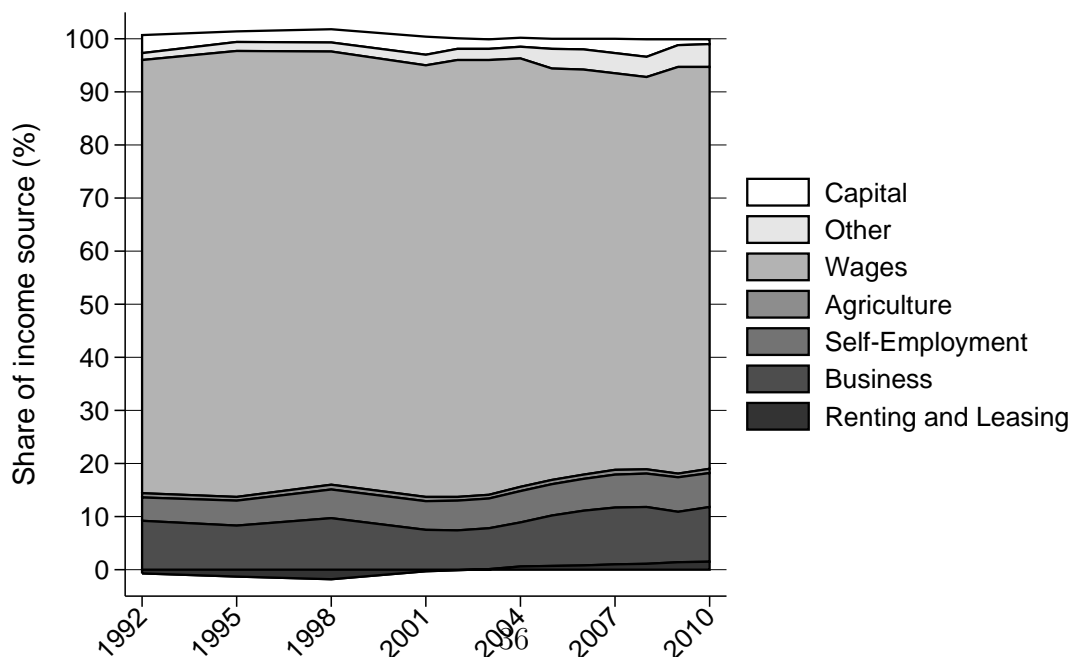
Source: Own calculations since 2001.

D.2 Taxation of Capital Gains

German tax law distinguishes five types of capital gains: capital gains from financial assets (i), capital gains from real estate (ii), capital gains from selling a not incorporated business (iii), capital gains from selling shares of a closely held corporation (iv) and capital gains realized inside the unincorporated business sphere (v).[15] In post-war Germany, a large portion of these capital gains has always been tax exempt. As a consequence, private capital gains reported in German tax statistics are fairly low[16] and can only be reconstructed partly by using PIT microdata.

Capital gains from financial assets (i) and real estate (ii) were tax exempt if held longer than a certain time period. We therefore observe them only to a limited degree in microdata. For those capital gains from stock shares that were reported, only 50 % were taxable between 2002 and 2008. For capital gains from financial assets, this exemption ended in 2009: since then, they have been excluded from the PIT and instead fully subject to the flat tax on capital income.[17]

Capital gains from selling an unincorporated business (iii) are only taxable if exceeding a quite elevated threshold. But if these capital gains exceed the threshold, the taxable share is reported quite consistently in PIT files over time. Capital gains from selling shares of a corporation (iv) are taxable if the tax unit's share exceeds a certain threshold.[18] Capital gains of this type typically stem from closely held companies, but apply to stock company shares as well, if the tax unit's capital share is high enough. Capital gains (iv) have thus always been included in PIT files, and their size is reconstructible from micro data. Their taxable share, however, changed from 100 % before 2002 to 50 % in 2002, and 60 % in 2009. Their contribution to gross taxable income in PIT statistics is thus mechanically reduced in 2002 and slightly increases again after 2009.

Last, capital gains can also be realized inside the business sphere (v) as part of the business profit. In these cases, we do not observe capital gains as such in the microdata, but it is included in the business profit and therefore in gross taxable income. This might be relevant after 2009, as it has become more attractive to shift capital income to the business sphere.

As capital gains from financial assets and real estate have been mostly tax

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[15]None of the five types of capital gains was ever part of the PIT's definition of capital income until 2009. Type (i) and (ii) were classified as "other" income, and type (iii) to (v) accrue to agriculture and forestry, self-employed, or business income. Only type (i) has been classified as capital income since 2009, if it is reported in the PIT file.

[16]In some years, capital gains reported in tax statistics were even negative in sum, as losses were deductible from other income sources under certain conditions.

[17]For financial assets (i), this period was six months until 1998 and one year from 1999 to 2008. For real estate, the period was two years until 1998 and since then ten years.

[18]The threshold for corporation shares was 1 % until 1995, 25 % from 1996 to 1998, 10 % from 1999 to 2001, and since then 1 % again.

exempt, capital gains in German PIT files predominantly stem from selling unincorporated businesses (iii) and corporation shares (iv) where the tax unit holds a considerable share.

D.3 Taxation of Capital Income

In the last two decades, two tax reforms (2001/02, 2009) reduced the level of taxable capital income and hence reduced the level of gross taxable income (GTI) (*Gesamtbetrag der Einkünfte*) reported in PIT files. As capital income is concentrated at the top of the income distribution, top income shares based on PIT statistics are also reduced mechanically. Reforms mainly changed the taxation of dividends. Legislative changes to the taxation of capital income are summarized in Table D.3.

Table D.2: Changes in Capital Income Taxation

	GTI Definition in PIT
pre 2001	$Y_{-C} + (INT - Deduct_{INT}) + (D_{gross} - Deduct_{D_{gross}})$
2001/02–2008	$Y_{-C} + (INT - Deduct_{INT}) + (D_{gross} \cdot (1 - t_{corp}) - Deduct_{D_{gross}}) \cdot 0.5$
since 2009 (i)	$Y_{-C} + INT + (D_{gross} \cdot (1 - t_{corp}))$
(ii)	Y_{-C}
(iii)	$Y_{-C} + Y_{shifted}$

Notes: D_{gross}: gross dividend before corporate taxation; INT: interest income; Deduct: deductions always refer to expenses that directly relate to the tax base. t_{corp}: corporation tax rate applied to dividends
Source: German income tax law (ESTG).

Pre 2001

- Dividends from German corporations are subject to the corporation tax. Before 2001, the corporation tax on distributed dividends was a pure pre-tax to the PIT. The gross dividend, say, e.g., 100 €, was subject to the corporation tax of 30 %. The shareholder received the cash dividend of 70 €. However, the shareholder's GTI comprised the full gross dividend of 100 €, which was then taxed at the personal tax rate. The corporation tax could be credited against the resulting PIT tax claim. GTI before 2001 thus included gross dividends before taxes on the corporation level.

- Interest income was also fully taxable at the personal PIT rate.

- Capital income related expenses[19] could be fully deducted and therefore reduced GTI.

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[19]These are, e.g., capital costs, travel expenses related to general meetings, etc.

Table D.3: Changes in Capital Income Taxation

	pre 2001	2001/02–2008	since 2009
	Gross Dividends (D_{gross})		
tax base	100 %	$(1 - tcorp) * 50 \%$	$(1 - tcorp) * 100 \%$
deductions	100 %	50 %	–
tax rate	PIT	PIT	$min(W, PIT)$
corp. tax credit	yes	no	no
income source	$capital$	$capital$	$capital$
	Interest (INT)		
tax base	100 %	100 %	100 %
deductions	100 %	100 %	–
tax rate	PIT	PIT	$min(W, PIT)$
income source	$capital$	$capital$	$capital$
	Cap. Gains from Stock Shares (GC I)		
tax base	100 %	50 %	100 %
deductions	100 %	50 %	–
tax rate	PIT	PIT	$min(W, PIT)$
definition	$specific\ cases^a$	$specific\ cases^a$	$comprehensive^b$
income source	$other$	$other$	$capital$
	Cap. Gains from Closely Held Corporations (GC II) & Dividends / CG I in Private Business Sphere		
tax base	100 %	50 %	60 %
deductions	100 %	50 %	60 %
tax rate	PIT	PIT	PIT
income source	$business$	$business$	$business$
tcorp(%)	30 %	25 %	15 %

Notes: D_{gross}: gross dividend before corporate taxation; INT: interest income; CG I: capital gains from stock shares; CG II: capital gains from closely held corporations; deductions always refer to expenses that directly relate to the tax base. [a]specific cases: CG I were only taxable if the assets had been held less than one year. [b]comprehensive: all CG I are taxable if the assets were acquired in 2009 or later. Otherwise, CG I are still tax exempt.
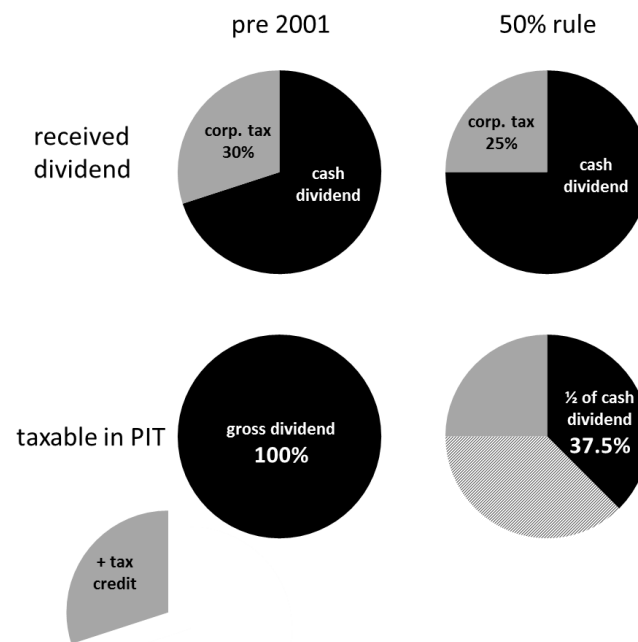Source: German income tax law (ESTG)

2001/2002-2008: 50 % Rule

- The definition of taxable dividend income in the PIT changed in 2001/2002.[20] Instead of gross dividends, the new taxable income definition was half the cash dividend (50 % rule; 35 € in the example above). At the same time, the corporate level taxes could not be credited against the PIT any more. The resulting effective tax rate on the gross dividend was comparable to the tax rate before 2001/2002,

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[20]For dividends issued by German corporations, legislative changes started to apply in 2002 in most cases. This was the case for the largest share of dividends.

but GTI observed in the income tax data was considerably reduced. In addition, the 50 % rule also applied to capital gains from corporation shares (if taxable), which similarly reduced GTI if capital gains were positive (see section 2.1).

- Interest income remained fully taxable at the personal PIT rate.

- Only half of the capital income related expenses could be deducted, as far as the expenses were related to dividends. Capital income related expenses that stemmed from interest income remained fully deductible.

Figure D.2: Changes in GTI due to 50 % rule

Notes: Pre 2001: 100 % of the gross dividend before corporate taxation entered GTI. The 50 % rule reduced the share to 37.5 %. Effective tax rate changed only to a little extent, as the tax credit was abolished at the same time.
Source: German income tax law.

Post 2009: Dual Tariff

Since 2009, capital income is not included in the PIT schedule any more and thus in PIT files neither. Capital income from dividends, interest income, and capital gains from stock shares are taxed at a flat withholding tax rate of 25 %.[21] At the same time, negative capital income and capital income related expenses cannot

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[21]This reform also broadened the tax base, since capital gains from stock shares were typically not taxable before 2008. Before 2008, capital gains from stock shares were only taxable if the shares had been held less than one year. However, the base broadening only applies to stock shares that have been obtained after 2008. We therefore do not expect any effect of the tax base broadening in 2009, but an increasing effect on taxable capital income since 2010.

be deducted from taxable income any more. However, it is still possible to report capital income in the PIT and is favorable for the tax unit in the following cases:

(i) If the personal tax rate undercuts the withholding tax rate, the personal tax rate is applied. In these cases, the reported capital income is also included in the tax units' GTI.

(ii) Capital income is only taxable as far as it exceeds the saver's allowance of 810€. Some tax units do not claim the full allowance towards the institutions that withhold the tax (e.g. banks, corporations). Then, the allowance can be obtained by reporting capital income in the PIT file. Capital income above the allowance is then taxed at the withholding tax rate (or with the personal tax rate in case (i)). In these cases, the reported capital income is not included in the tax units' GTI.

(iii) If capital income is realized in the private business sphere instead of the private sphere, the former 50 % rule is changed to a new 60 % rule: 60 % of cash dividends and capital gains from stocks are taxable at the personal PIT rate, and 100 % of interest income. In turn, the same share (60 % or 100 %) of capital related expenses is deductable again. Therefore, shifting capital income from the private to the business sphere is favorable for tax units with high capital related expenses. Before the introduction of the reform, this type of shifting was indeed recommended by the tax adviser literature (Maier and Wengenroth, 2007, Worgulla and Söffing, 2007). The 60 % rule also applies (in any case) to capital gains from closely held corporations' shares (see Section 2.1). If capital income has been shifted to the business sphere, it is reported in the PIT records again, albeit only 60 % of dividends and capital gains from corporation shares enter the GTI definition. In addition, this capital income is reported as business income.

The tariff dualization reduced the capital income observed in the PIT to zero in most cases. Only capital income that is taxed at the personal tax rate is still included in GTI and reported in tax statistics (case (i)). If the savers' allowance was not fully claimed, capital income is still reported, but not included in GTI and not necessarily reported in income tax statistics (case (ii)). Last, a portion of capital income is likely to have been realized in the private business sphere reported as business income in the PIT files. Consequently, in the first post-reform year 2009, the capital income share in positive GTI as reported in tax statistics dropped from 3.3 % in 2008 to 1.1 % in 2009.[22]

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[22]Table D.4 shows the share of capital incomes in GTI since 1992.

## Table D.4: Taxable income composition by fractile

Fractile	GTI (€)	Composition of GTI (% of GTI)								CG (% of GTI)	
		GTI	a&f	bus	self	wage	cap	r&l	other	business	private
						2001					
0.01	5,740,096	100.00	0.30	60.67	2.38	9.22	23.81	0.37	0.75	11.96	-0.17
P99.9–99.99	873,837	100.00	0.83	32.22	15.92	27.15	19.84	1.22	0.70	6.19	-0.50
P99.5–99.9	291,011	100.00	0.85	15.45	27.33	42.79	9.96	0.21	0.69	2.25	-0.27
P99–99.5	171,040	100.00	0.89	11.53	22.07	58.52	5.26	-0.38	0.68	0.80	-0.17
P95–99	100,026	100.00	0.83	7.59	8.38	80.59	2.28	-0.45	0.53	0.27	-0.04
P90–95	67,605	100.00	0.68	5.05	2.95	89.87	1.27	-0.35	0.48	0.11	-0.04
						2002					
0.01	4,879,585	100.00	0.53	72.17	4.05	9.66	11.05	1.03	0.89	23.14	0.14
P99.9–99.99	717,663	100.00	0.91	29.60	21.51	30.90	9.88	2.28	0.78	7.03	-0.07
P99.5–99.9	265,366	100.00	0.79	16.16	29.26	46.14	5.14	0.75	0.68	2.08	0.06
P99–99.5	162,995	100.00	0.83	11.42	21.49	61.96	2.92	0.10	0.66	0.82	0.05
P95–99	97,855	100.00	0.73	7.12	7.87	82.37	1.44	-0.20	0.52	0.24	0.03
P90–95	66,615	100.00	0.62	4.87	2.93	90.35	0.94	-0.21	0.49	0.10	0.01
						2003					
0.01	4,566,071	100.00	0.49	73.56	4.05	9.33	9.32	1.36	1.31	13.11	0.46
P99.9–99.99	672,551	100.00	0.91	33.66	23.06	29.42	8.32	2.76	0.95	5.45	0.41
P99.5–99.9	257,612	100.00	0.79	16.58	29.19	46.47	4.39	1.22	0.74	1.70	0.21
P99–99.5	160,766	100.00	0.84	11.67	20.96	62.56	2.62	0.33	0.71	0.62	0.15
P95–99	97,069	100.00	0.71	7.09	7.72	82.52	1.30	0.03	0.55	0.21	0.08
P90–95	66,016	100.00	0.62	4.90	2.93	90.23	0.87	-0.06	0.53	0.07	0.04
						2004					
0.01	5,060,803	100.00	0.30	75.46	3.42	9.16	9.09	1.42	1.09	14.60	0.50
P99.9–99.99	746,177	100.00	0.91	37.35	21.74	28.36	7.60	3.20	0.88	5.26	0.48
P99.5–99.9	276,635	100.00	0.89	18.50	29.80	44.00	4.28	1.91	0.73	1.80	0.25
P99–99.5	169,073	100.00	0.95	12.99	22.07	59.86	2.54	1.02	0.70	0.62	0.17
P95–99	100,078	100.00	0.82	7.74	8.29	80.99	1.28	0.45	0.56	0.23	0.09
P90–95	67,539	100.00	0.68	5.26	3.12	89.46	0.84	0.26	0.53	0.08	0.04
						2005					
0.01	6,613,365	100.00	0.24	77.93	2.95	9.15	8.30	0.74	0.67	24.33	0.53
P99.9–99.99	817,761	100.00	0.81	38.07	19.93	28.72	8.38	3.05	1.10	6.29	0.65
P99.5–99.9	286,471	100.00	0.88	19.50	28.66	43.62	4.47	2.01	0.96	2.15	0.37
P99–99.5	171,157	100.00	0.99	13.50	21.85	58.93	2.52	1.34	1.00	0.80	0.27
P95–99	99,245	100.00	0.89	7.95	8.30	80.15	1.30	0.69	0.86	0.24	0.14
P90–95	66,041	100.00	0.75	5.41	3.09	88.67	0.88	0.46	0.94	0.09	0.07
						2006					
0.01	6,766,318	100.00	0.33	77.89	2.83	9.84	7.03	0.57	1.51	20.71	1.25
P99.9–99.99	892,534	100.00	0.89	40.66	17.45	28.01	8.86	2.76	1.42	6.24	0.94
P99.5–99.9	302,308	100.00	0.98	21.18	26.82	43.12	4.75	2.17	1.08	2.12	0.48
P99–99.5	178,713	100.00	1.05	14.78	21.77	57.18	2.77	1.54	1.04	0.78	0.30
5P95–99	101,462	100.00	0.99	8.97	8.80	78.20	1.43	0.85	0.89	0.24	0.15
P90–95	66,735	100.00	0.80	5.98	3.28	87.70	0.94	0.55	0.95	0.08	0.08
						2007					
0.01	7,416,255	100.00	0.36	78.21	3.04	8.79	7.75	0.53	1.30	19.66	0.98
P99.9–99.99	940,272	100.00	0.95	41.28	17.00	27.45	9.38	2.42	1.57	6.61	1.03
P99.5–99.9	318,904	100.00	1.16	21.13	26.36	42.08	5.94	2.31	1.12	2.19	0.48
P99–99.5	186,618	100.00	1.29	14.95	22.71	54.64	3.74	1.76	1.05	0.83	0.25
P95–99	103,895	100.00	1.18	9.24	9.12	76.46	2.11	1.10	0.93	0.26	0.14
P90–95	67,406	100.00	0.88	6.17	3.37	86.58	1.45	0.76	0.99	0.09	0.07
						2008					
0.01	7,261,580	100.00	0.35	74.92	2.93	8.75	11.46	0.66	0.93	13.33	-0.12
P99.9–99.99	976,117	100.00	0.92	41.87	15.94	25.85	11.96	2.52	0.99	5.80	-0.46
P99.5–99.9	331,312	100.00	1.07	22.69	26.18	39.59	7.30	2.38	0.90	2.01	-0.38
P99–99.5	191,375	100.00	1.18	16.41	22.95	52.39	4.47	1.76	0.97	0.74	-0.24
P95–99	105,034	100.00	1.09	9.79	9.42	75.33	2.43	1.19	0.90	0.23	-0.13
P90–95	67,475	100.00	0.81	6.11	3.44	86.35	1.65	0.82	1.02	0.08	-0.08

Notes: Fractiles defined including capital gains. Average GTI in prices of 2010.
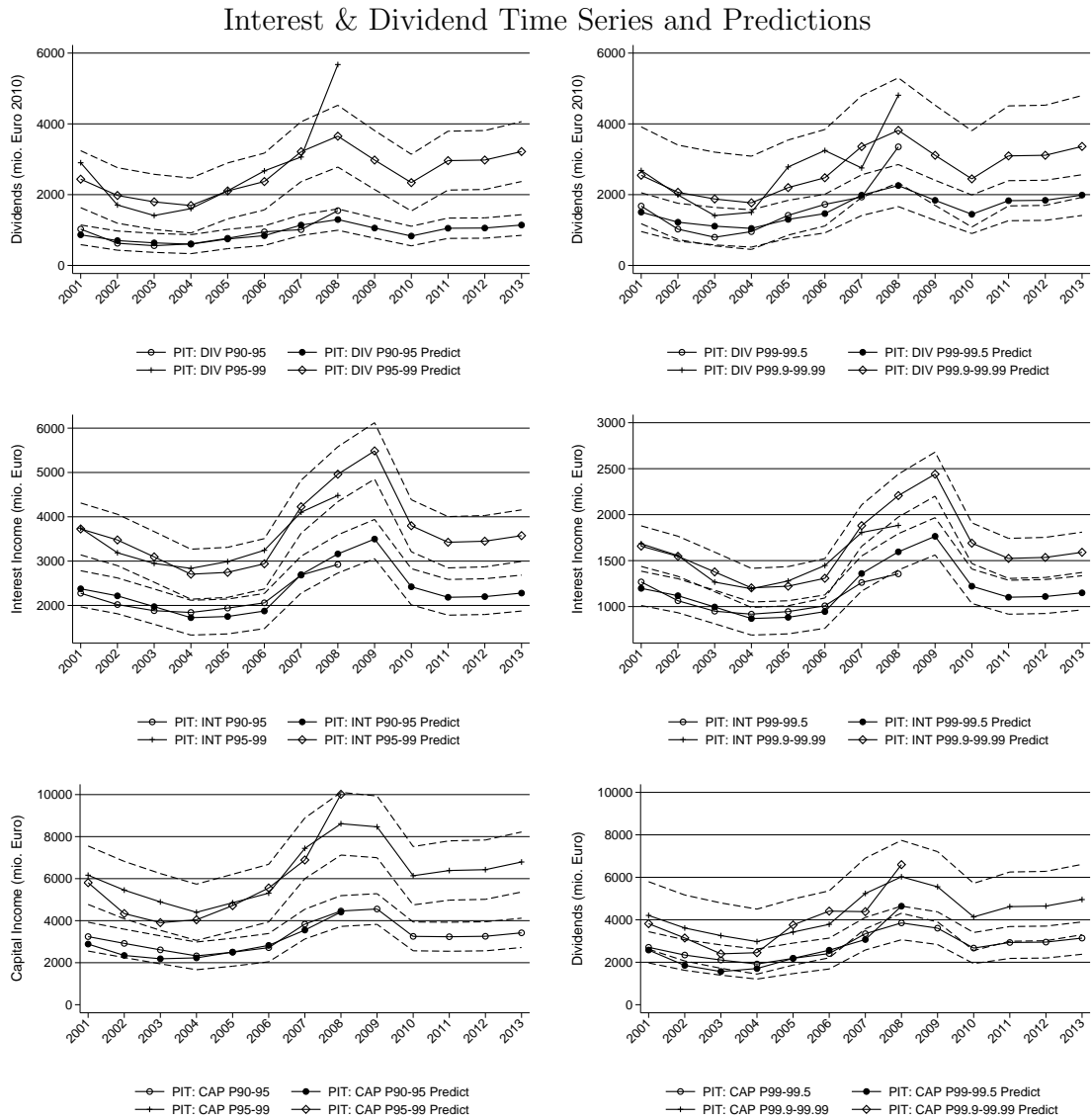Source: PIT microdata, own calculations.

Appendix E   Imputing Missing Capital Income, 2009–2010

Figure E.1: PIT Fractile Totals and Predictions (2001–2008) sample
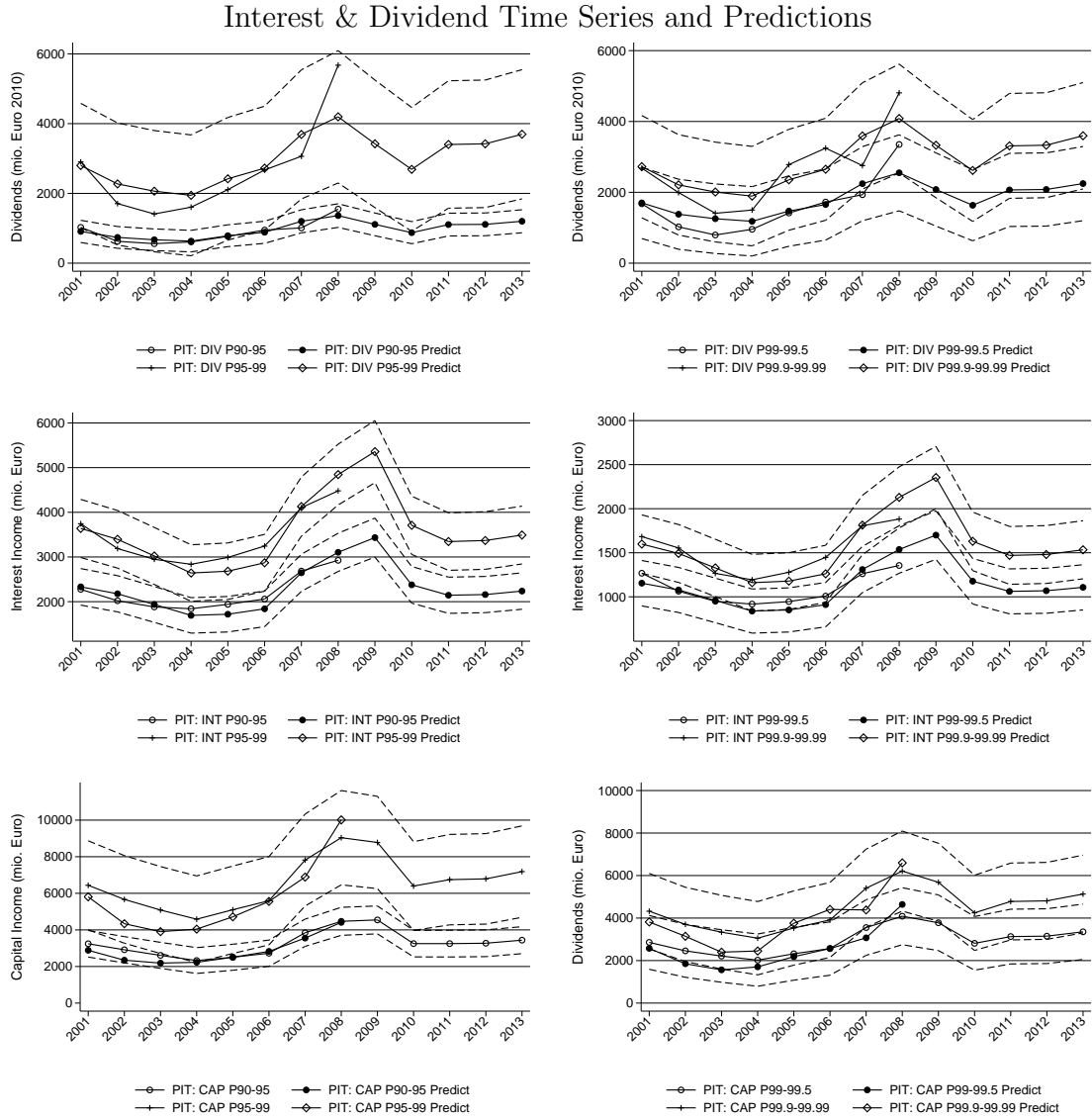
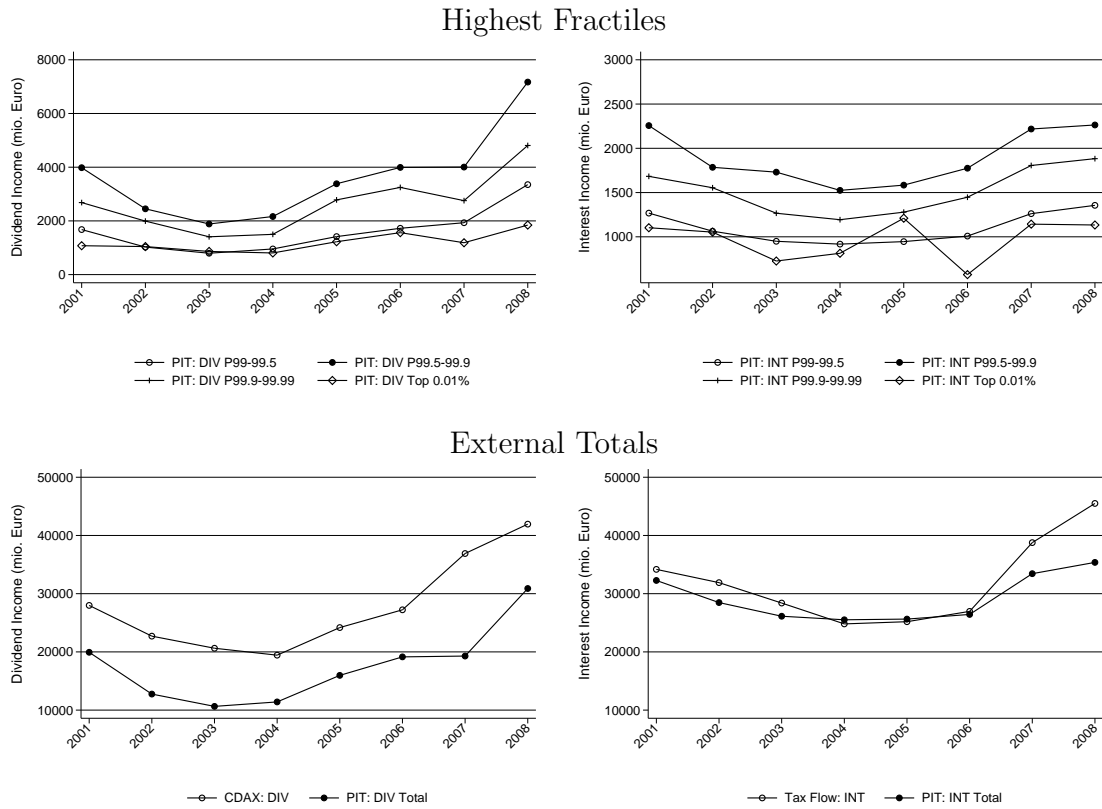Interest & Dividend Time Series and Predictions

Source: Own calculations using PIT Microdata, tax flow statistics, PIT Statistics, stock market indices (CDAX), and German national accounts. Real values in 2010 prices. Dashed lines are 95 % confidence intervals for forecasts. Fractiles defined without capital income as to match 0 % rule sorting after 2009. Predictions based on 2001–2008 sample.

Figure E.2: PIT Fractile Totals and Predictions (2001–2007 sample)

Interest & Dividend Time Series and Predictions

*Source:*Own calculations using PIT Microdata, tax flow statistics, PIT Statistics, stock market indices (CDAX), and German national accounts. Real values in 2010 prices. Dashed lines are 95 % confidence intervals for forecasts. Fractiles defined without capital income as to match 0 % rule sorting after 2009. Predictions based on 2001–2007 sample.

Figure E.3: Highest Fractiles: Correlation with External Totals

Highest Fractiles

External Totals

Source: Own calculations using PIT Microdata, Tax flow statistics, Tabulated Income Tax Statistics, stock market indices (CDAX), and German national accounts. Real values in 2010 prices. Dashed lines are 95 % confidence intervals for forecasts.

Figure E.4: Evolution of Real Saver's Allowance, 1975–2013
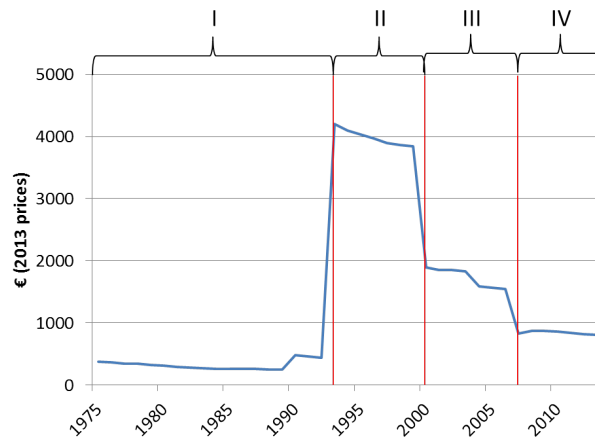
Notes: All figures in real prices 2013. Phases I to IV separate phases of comparable levels of the savers' allowance
Source: Own calculations using German income tax law and German consumer price index.

Figure E.5: Top income shares using SOEP data, 2001-2011
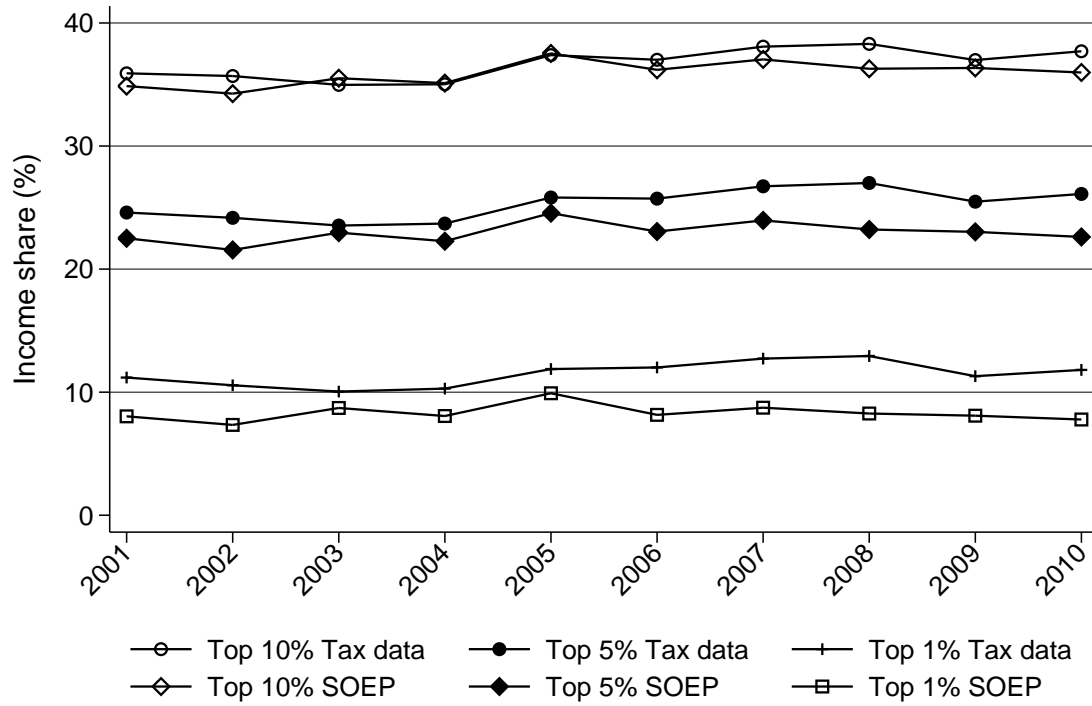
Source: Own calculations using SOEP data.

Table E.1: Correlations: fractile capital income and external aggregates

Dividends

$\mathrm{DIV}_{FRACTILE}$	DIV_{PIT}	DIV_{NA}	DIV_{CDAX}	GDP_{LAG}	CAP_{SOEP}	DIV_{TF}
		sorting: 100 % rule (Scenario 1)				
<P90	0.90	0.94	0.88	0.75	0.08	0.48
P90–P95	0.97	0.89	0.97	0.89	0.22	0.63
P95–P99	0.98	0.83	0.97	0.93	0.24	0.68
P99–P99.5	0.99	0.78	0.95	0.95	0.19	0.69
P99.5–P99.9	0.99	0.78	0.95	0.94	0.21	0.70
P99.9–P99.99	0.99	0.81	0.90	0.86	0.19	0.68
Top 0.01 %	0.98	0.71	0.84	0.85	0.10	0.68
DIV_{NA}	0.80	1.00				
DIV_{CDAX}	0.93	0.80	1.00			
GDP_{LAG}	0.90	0.61	0.94	1.00		
CAP_{SOEP}	0.18	0.10	0.31	0.17	1.00	
DIV_{TF}	0.68	0.30	0.72	0.71	0.64	1.00

Interest

$\mathrm{INT}_{FRACTILE}$	INT_{PIT}	INT_{NA}	–	GDP	CAP_{SOEP}	INT_{TF}
		sorting: 100 % rule (Scenario 1)				
<P90	0.99	0.55	–	0.78	0.48	0.98
P90–P95	0.96	0.41	–	0.85	0.33	0.98
P95–P99	0.99	0.53	–	0.78	0.40	0.98
P99–P99.5	0.97	0.69	–	0.58	0.46	0.91
P99.5–P99.9	0.92	0.73	–	0.46	0.52	0.82
P99.9–P99.99	0.90	0.75	–	0.45	0.48	0.80
Top 0.01 %	0.70	0.37	–	0.29	0.51	0.60
INT_{NA}	0.59	1.00	–			
GDP	0.72	0.08	–	1.00		
CAP_{SOEP}	0.47	0.26	–	0.34	1.00	
INT_{TF}	0.97	0.54	–	0.75	0.34	1.00

Notes: Correlations between aggregated dividends / aggregated interest income by fractile. Sorting sc1: fractiles defined including capital income (100 % rule). Sorting sc3: fractiles defined excluding capital income (0 % rule) $\mathrm{DIV}_{FRACTILE}$/$\mathrm{INT}_{FRACTILE}$: Aggregated dividend/interest income in (disjoint) fractile groups in PIT microdata DIV_{PIT}/INT_{PIT}: Total dividend/interest income in PIT microdata DIV_{NA}/INT_{NA}: Household sector dividends/interest income in national accounts DIV_{CDAX}: Aggregated dividends from German stock companies (CDAX index) GDP/GDP_{LAG}: (Lagged) GDP CAP_{GSOEP}: Capital income of top 5 % from SOEP microdata DIV_{TF}/INT_{TF}: Aggregated dividend/ interest income calculated from tax flow statistics
Source: Own calculations using PIT microdata, stock market indices (CDAX), SOEP microdata, national accounts, and tax flow statistics

Table E.2: Top income shares including capital income (Scenario 1b), 2001-2010

Year	Top 10 %	Top 5 %	Top 1 %	Top 0.5 %	Top 0.1 %	Top 0.01 %
2001	35.86	24.51	11.06	8.17	4.26	1.79
2002	35.93	24.41	10.85	8.00	4.24	1.91
2003	35.35	23.89	10.37	7.55	3.89	1.72
2004	35.84	24.45	10.92	8.03	4.20	1.84
2005	38.42	26.82	12.80	9.73	5.54	2.78
2006	38.22	26.89	13.04	9.93	5.62	2.69
2007	39.35	27.95	13.79	10.55	6.05	2.98
2008	39.75	28.39	14.05	10.69	5.92	2.73
2009	39.93	28.06	13.25	9.90	5.26	2.26
2010	39.82	27.90	13.25	9.90	5.33	2.34

Source: PIT statistics, stock market indices (CDAX),tax flow statistics , own calculations.
Note: Share are computed according to Scenario 1b: Tax units are sorted by non-capital income and post-2008 rules are applied. Shares are including capital gains.

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