Top Incomes: the Case of Germany

Inaugural-Dissertation

zur Erlangung des akademischen Grades einer

Doktorin der Wirtschaftswissenschaft

vorgelegt am Fachbereich Wirtschaftswissenschaft

der Freien Universität Berlin

vorgelegt von Dipl.-Vw. Katharina Jenderny

Berlin 2015

Erstgutachter: Prof. Dr. Ronnie Schöb

Zweitgutachter: Prof. Dr. Dr. Giacomo Corneo

Tag der Disputation: 9. Februar 2015

Erklärung zu Koautoren

Die vorliegende Dissertation umfasst eine Einleitung (Kapitel 1) und drei Forschungspapiere (Kapitel 2 bis 4). Die Kapitel 1, 2 und 3 sind allein verfasst worden. Das Kapitel 4 ist in Ko-Autorenschaft mit Charlotte Bartels entstanden. Für die Dissertation ist dieses Kapitel gegenüber dem gemeinsam verfassten Manuskript redaktionell leicht angepasst worden. Eine Liste mit Vorveröffentlichungen von Kapiteln befindet sich auf Seite 152.

Acknowledgements

I am indebted to many friends and colleagues for their advice and support. First of all, I thank my supervisors Ronnie Schöb and Giacomo Corneo, to whose advice this thesis owes a lot.

I also thank Charlotte Bartels who co-authored the fourth chapter of this thesis: our joint work has been fruitful and enriching. Furthermore, I thank my present and former colleagues at the Chair of International Public Economics and at the department for their company, support, and advice, in particular Cordula Arlinghaus, Timm Bönke, Frank Fossen, Katja Görlitz, Frank Hechtner, Clemens Hetschko, Jan König, Daniel Nachtigall, Frank Neher, Malte Preuß, Justine Röhmel, David Saha, Carsten Schröder, Christoph Skupnik, Viktor Steiner, Max Stockhausen, and Tobias Wolf, as well as our student assistants. My research has also been enriched by discussions with Andreas Peichl and the research group on International Distribution and Redistribution at ZEW, whom I thank for their hospitality.

The analyses of this thesis would not have been possible without the staff of the German Federal Statistical Office (Destatis) whom I thank for their hospitality at the Berlin office and the provision of the data remote execution access, in particular Rafael Beier, Ulrike Gerber, Daniel O'Donnell, Melanie Scheller, Wolf Tölke, and Stefanie Uhrich.

A special thanks goes to my friends and family: I thank my parents, Sigrid and Robert Jenderny, for constant support and cookies, Kai Jenderny, Christina Schön, and Rasmus Jenderny for advice, food, and everything else, Lukas Enke for library company, Rinah Lang and Hendrik Jonas for being there (among other things), and Kalle Flammsen for soup, diversion and deep friendship.

Last, the work on this thesis was inseparably connected to Clive Werdt, with whom I shared the data access, many times an office, both fruitful and superfluous discussions, and lots of coffee.

Contents

List of Tables

List of Figures

List of Abbreviations

CDAX	Composite Dax, German stock market index
CG (i)	Capital gains from closely held corporations
CG (ii)	Capital gains from stock shares
Deduct	Income related deductions income in simulation
Destatis	German Federal Statistical Office
DIV	Dividends in simulation
EGI	Economic Gross Income
ENI	Economic Net Income
GDP	Gross Domestic Product
INT	Interest income in simulation
NA	Natinal accounts
NIE	Net Income Effect
PIT	Personal Income Tax
TF	Tax flow
TPP	German Taxpayer Panel (Database)

Chapter 1

Introduction

1.1. Literature and Issues

1.1.1. Top Incomes

The realm of top incomes and related research has gained popularity over the last decade, both inside the economic research community and, very recently, also in the international press and public debate. One obvious reason is that income concentration is a social issue: the more resources are controlled by a small group of persons at the top of the distribution, the more this group may influence collective decisions to a larger extent than their democratic rights would grant them. The seminal contribution by Piketty (2001) brought back to the academic debate issues that had been discussed decades before, but which had relied on far less data than is available today: the long-run development of income and wealth inequality, and the search for their driving forces. The most prominent example of the earlier debate is Kuznets (1955) who had studied "the character and causes of long-term changes in the personal distribution of income" (p.1) back in 1955, suggesting that inequality might rise in the beginning of economic development, and decrease in later stages.

The top income literature exploits data in very long time spans, taking into view developments over centuries: Piketty (2001) collected data on both the income and the wealth distribution in France over virtually the entire 20th century from income and inheritance tax returns. His analysis soon triggered similar research for other countries, culminating in two collective volumes on top incomes and a database that is continuously updated and to which chapter 4 of this doctoral thesis also contributes (Alvaredo et al., 2014, Atkinson and Piketty, 2007, 2010).

While tax data provide the huge advantage of availability over long time periods, they suffer the drawback that they are typically restricted to high incomes. The indicators derived therefore relate to income concentration, and are silent about distributional issues at the lower part of the distribution. The basic method used in all of these studies had been applied by Kuznets (1953) before: the income share of a given fractile, e.g. the richest percentile of the population, in total income is derived using the income reported by the richest tax units in tax statistics. The size of the fractiles and their shares in total income are derived using control totals for both population

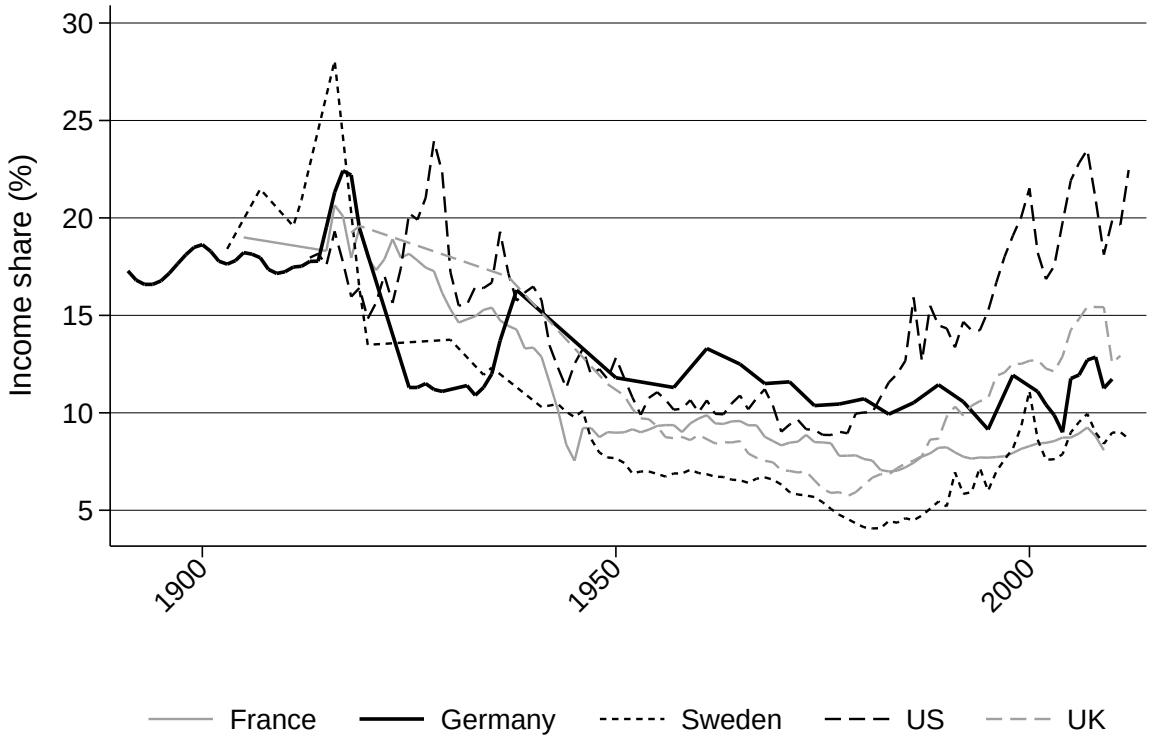


Figure 1.1.: Long-run development of top 1% income share for selected countries

Notes: France: excluding capital gains. Germany: excluding capital gains, from 1950 onwards including capital gains. Sweden, US: including capital gains UK: refers to married couples and singles, from 1990 onwards to adults. Series are subject to some additional breaks, see sources for details

Source: (Alvaredo et al., 2014, Atkinson, 2007b, 2012, 2014, Bartels and Jenderny, 2015, Dell, 2007, 2011, Landais, 2007, Piketty, 2001, 2007, Piketty and Saez, 2007, Roine and Waldenström, 2010)

and income from population statistics and national accounts. Major efforts have been put into developing a common method, rendering results as comparable as possible across countries (see, e.g. Atkinson, 2007a). The realm of analysis has been broadened toward related issues such as income composition concentration in permanent incomes. Unlike Kuznets (1955), the more recent academic research does not suggest a decrease in income inequality in the long run.

Data availability and methodological choices, for all of their importance, are not the only difference between the former and the new debate – a third ingredient is simply that time has passed: it turns out that the 20th century has seen substantial changes in the distribution of income and wealth, and that time trends were far from monotonous. A mid-century researcher studying the dynamics of income inequality saw highly unequal 19th-century societies, and far

less concentrated current incomes, both in the US and in European countries. On this basis, it was possible to argue "that the relative distribution of income [...] has been moving toward equality." (Kuznets, 1955, p.4). Nowadays, this picture has changed. In particular, in the US and other English-speaking countries income concentration has massively increased since the 1980s (see Figure 1.1). In other countries, the increase was less extreme but also present (e.g. Sweden), while in Central European countries, changes in income inequality have been much more modest, if present at all. This poses a puzzle: Why did inequality increase so massively in the US? Why did it not in other countries with roughly comparable economies? Many of the classic explanations of inequality dynamics, such as skill-biased technological change, failed to explain why inequality increased in the US, but not in the Netherlands (the debate that is sketched here has been summarized in various articles and chapters, see e.g. Alvaredo et al., 2013, Atkinson et al., 2011, Roine and Waldenström, 2015).

Contrasting classic explanations that relied on market processes such as changes in the skill premium due to technological development, institutional settings came into focus. Referring to the inter-war dynamics in income concentration in France, Piketty (2007) argues that income dynamics at the top are most likely driven by the progression of the tax system: First, because simple calculations suggest that the accumulation process of capital highly depends on the tax rate. Second, because other factors failed to explain why the share of the top percentile declined, while the share of the top 5% and the top 10% increased. The impact of institutional settings and progressive taxation in particular on distributional developments has been modeled in several dimensions: Piketty and Saez (2012, 2013a) model the long-run distribution of income with heterogeneity in both inheritances and ability, focusing on optimal taxation of capital income and inheritances. Optimal tax rates depend on growth rates and distributional preferences. Piketty et al. (2014) model the impact of progressive taxation of labor incomes on compensation bargaining of CEOs. Both analyses suggest that the impact of progressive taxation on income concentration could be substantial.

1.1.2. Wealth

One channel through which progressive taxation influences the dynamics of top income shares is the accumulation of wealth. For Germany, this is also the more relevant effect of the two theoretical arguments cited above – while CEO compensation is likely to play an important role where labor incomes represent a substantial portion of incomes at the top (e.g. in the US), German top incomes stem largely from unincorporated and incorporated businesses and financial assets. The close link between income and wealth concentration will be sketched in the following: first, an overview on available wealth and wealth concentration series is given, then the theoretical arguments accounting for the facts and linking the wealth and income concentration dynamics are briefly summarized. The description draws to a large part on Piketty and Zucman (2014).

While Piketty (2001) had provided time series on both income and wealth concentration, much of the subsequent literature has focused on income, mostly due to the scarcity of data on the wealth distribution, particularly in the long run. Recently, long-run analyses on both the level of wealth as compared to national income and the distribution of wealth have been collected for several countries (like the indicator of top income shares, many of the methods in the construction of wealth distribution series rely on earlier research. See Piketty and Zucman, 2014 for a recent overview of theoretical frameworks, methods, and results).

As far as available, the European dynamics of both the level of wealth and the wealth distribution share features of the dynamics of the income distribution: the development has been U-shaped. In the 18th and 19th century, the level of wealth amounted to about seven times national income in both France and the UK, then plummeted in WWI and recently regained almost its pre-WWI level (about six times national income). Wealth concentration follows a similar pattern, but current levels undercut pre-WWI levels by far: high wealth concentration at the eve of WWI was followed by substantial decline in the following decades. The 1970s and 1980s mark a turning point, from which wealth concentration has been increasing again. Again, the US development is different from the European: while in Europe (France, the UK, and Sweden) wealth concentration was huge in the 19th century with a top 1% wealth share exceeding 50%, current levels are far less (around 25%). By contrast, the US levels of both wealth and wealth

concentration undercut the European in the 19th century. While wealth levels are below European levels also today, US wealth concentration exceeds the European, with the top percentile owning roughly 40%.

Piketty and Zucman (2014) review models including Piketty and Saez (2012, 2013a) that can account for these developments and argue that without major distortions like the world wars, the wealth concentration is likely to converge toward a steady state distribution that depends on the growth rate and the net-of-tax rate of return. The basic argument is that if the net-of-tax rate of return exceeds the growth rate of the economy, wealth grows faster than the rest of the economy, which increases the portion of wealth income in total income and induces disparity in wealth. The more unequal the wealth distribution, the more unequal are also inheritances, which reduces the degree of meritocracy as the position in the income and wealth distribution depends increasingly on birth instead of own efforts.

In the current European setting, with low growth rates and comparatively high net-of-tax rates of return, wealth concentration is likely to converge toward high levels, rendering plausible an increasing path of wealth concentration and, concomitantly, income concentration. The channel of wealth accumulation thus provides a theoretical argument that wealth taxation (or, equivalently, capital income taxation) does have an impact on the dynamics of both income and wealth inequality. Furthermore, the same results suggest that in the absence of capital income taxation, the path of inequality is most likely an increasing one.

1.1.3. The German Case

Turning to Germany, one can state that the picture of the dynamics of income concentration has changed over the last decade: when the international academic debate on top incomes started out in the first half of the 2000s, Germany was found to be a classic Central European country, in the sense that income concentration had not changed since the 1980s , even though it had been comparatively high since WW2 (Dell, 2005, 2007, see also Figure 1.1 above). By contrast, subsequent research did indeed find an increase in top income shares (Bach et al., 2009, 2013, Bartels and Jenderny, 2015, Dell, 2011).

Most disturbingly, the increase in top income shares took place following a series of regressive tax reforms between 2001 and 2005, suggesting that shares may keep rising if progressive taxation is actually an important driving force. In 2009, an additional reform took place: capital income (dividends and interest income) was excluded from the personal income tax schedule and is now taxed at a lower rate in a final withholding tax system. At the same time, capital gains from stock shares became taxable in the same withholding tax regime. While the reform eliminates one channel of tax avoidance, the total reform effect is most likely regressive (see chapter 3), adding to the institutional change of reduced progression at the top.

Most importantly, this reform also changed the availability of top income data in Germany. As top income shares relied on personal income tax records so far, the reform causes a series break and renders a significant portion of incomes at the top invisible. Even though capital incomes can be extrapolated from pre-reform data (see chapter 4), this causes a severe drawback in the construction of long-term series of top income shares. In sum, if the role of progressive taxation and progressive capital taxation in particular corresponds to the results derived by Piketty and Saez (2012, 2013a), we expect income and wealth concentration to increase. If capital income taxation continues to occur outside the personal income tax, it will be a challenge to researchers to document any such increase.

1.2. Contribution

1.2.1. Common Features

The chapters of this doctoral thesis add to the literature sketched above in several dimensions that will be discussed below. All chapters share some common features: they largely rely on similar data, which makes them share the time horizon, the subject of analysis, and the geographical focus of the empirical analyses: in all chapters, I use micro data on German income tax returns, that are the most reliable data source on incomes at the very top, but nonetheless restrict the analyses to incomes and to the German case. The data sources used in chapters 2 to 4 are very similar, but not identical: chapter 2 and 3 use panel data of these tax returns between 2001 and

2006. The panel structure allows me to follow tax units and their income structure over time, which is indispensable for the analysis of income mobility and of permanent incomes. As these datasets are extremely large, the panel structure data is only available as a stratified sample, which is highly oversampled at the top. By contrast, chapter 4 does not use the panel structure. It relies on the cross-sectional data which is the basis of the panel data and uses the full samples of the years 2001 to 2008.

All of the contributions of the chapters relate to the literature on top incomes, yet they add to very different strands in detail. In chapter 2, mobility at the top of the distribution is analyzed, which mainly adds to the discussion of the reliability of cross sectional results (mobility issues have been analyzed by Aaberge et al., 2013, Auten and Gee, 2009, Auten et al., 2013, Landais, 2008, Saez and Veall, 2005, 2007, Salverda and Atkinson, 2007). By contrast, chapter 3 analyzes the effect of a change in German capital income taxation, relating to the debate on the impact of progressive taxation on top income shares and, related, capital accumulation in the long run. In chapter 4, the focus is again largely methodological: we harmonize the series of top income shares with respect to capital income, whose taxation was massively changed between 2001 and 2009, culminating in the complete exclusion of the income source from the personal income tax. While in chapter 2 and 3 I put emphasis on a comprehensive and exact definition of gross income, in chapter 4 we are rather concerned with comparability to long-term time series provided by the earlier literature (Dell, 2005, 2007, 2011) and therefore use gross taxable income as our main income concept. In the following, I provide a brief summary of the contribution of each of the three remaining chapters.

1.2.2. Chapter 2: Mobility of Top Incomes in Germany

In chapter 2, I analyze the extent to which tax units at the top are mobile in terms of income ranks, and the resulting differences in income concentration of annual incomes and of permanent incomes. This analysis adds to three issues in the top income literature: The first issue relates to the reliability of the increase in income concentration. As top income studies typically rely on cross sectional data, the increase in annual concentration might be offset by an increase in

income mobility over time. If that is the case, it would not be true that income concentration actually increased, but everybody's income would have become more volatile instead. While this certainly entails other issues such as insecurity, it would raise doubts about the core finding of the top income literature that concentration processes can actually change direction, partly depending on institutional choices of governments. The second issue relates to the actual level of concentration across countries. Similar to the inter-temporal change in concentration, differences between countries could be explained by different levels of mobility, with similar concentration levels in permanent incomes. Last, the analysis tackles the question in how far fractile changes at different income levels can be compared in a meaningful way.

The empirical analysis consists of two parts: First, mobility is directly analyzed by means of fractile and rank changes across the data period (mobility analysis). Second, annual and permanent concentration are compared (distributional analysis). In the mobility analysis, three findings are obtained: First, mobility between fractiles has been roughly constant over the data period, suggesting that changes in concentration cannot be explained by changes in mobility. Second, tax units at the top are less mobile than in those countries where comparable analyses have been conducted, i.e. Canada, France, and the US. After one year, however, mobility levels are roughly comparable to Canada and France. Third, mobility in terms of ranks decreases towards the top. Tax units at the very top thus hardly change over time. In the distributional analysis, I find that annual and permanent concentration follow each other quite closely. Annual concentration is therefore a suitable indicator for concentration in permanent income. Similar results have been found for Norway and Canada. When it comes to quantification of the reduction in concentration results, both the relative reduction and the absolute reduction in top income shares seem to be lower than Norwegian results.

In sum, German income mobility is rather stable, suggesting that dynamics of top income shares reflect true dynamics of concentration and are not offset by changes in mobility. The extent of mobility in terms of rank changes is within plausible levels, albeit at the lower bound of international results.

1.2.3. Chapter 3: Top Tax Progression and the German Dual Income Tax

Chapter 3 relates to the institution of progressive taxation by simulating the progression effect of a recent German tax reform: in 2009, capital income (defined as dividend and interest income) was excluded from the personal income tax schedule, and has since been taxed at a significantly lower rate. In general, two effects are expected: First, tax progression on comprehensive personal incomes is expected to have declined, as capital income is concentrated at the top of the distribution. Second, a reduced tax rate at the top is expected to accelerate the income accumulation process. In the long run, it is likely to cause an increase in both income and wealth concentration.

The analysis in chapter 3 is largely restricted to the first question: the reform is simulated in detail using pre-reform data that provide the synthetic income information. The reform was not restricted to a mere tax rate reduction: e.g. several deduction possibilities were abolished, the tax based was broadened so as to include capital gains from stock shares, and the corporate tax rate changed. Furthermore, marginal tax rates had differed by income source even before the reform, and dividends are subject to double taxation. In consequence, the changes in marginal tax rates differ across income sources: the tax rate on interest income was reduced by 20 percentage points in the top bracket, while the tax rate on gross dividends was reduced by roughly seven percentage points. All observable reform components are separately simulated, providing a detailed picture of the relative impact of different reform components across fractiles. The simulation includes a day-after scenario, and a second scenario where tax units can chose simple adjustments in reporting behavior in order to regain deduction possibilities. The reform effect is found to be both regressive and horizontally unequal within the top, potentially leading to much faster wealth accumulation for few tax units at the top, while the tax liability of the bulk of tax units remains unchanged. Even though the tax rate change on dividends was much smaller than on interest income, the dividend effect is a substantial portion of the total effect in top fractiles.

As the analysis is restricted to pre-reform data, several caveats are discussed. First, the reform may have induced income shifting and changes in reporting behavior. A priori, behavioral responses could both increase or decrease the tax revenue: if income is shifted towards income sources whose tax rate decreased, the reform effect will be larger than the simulated scenarios.

If tax evasion and avoidance is reduced, progression will most likely increase. Evidence on responses to the reform is scarce. While taxable income responses in the Nordic countries have typically been large, similar effects for Germany have been found to be rather small. While declarations of previously evaded income seems to have increased, this is most likely due to increased pressure by bilateral tax agreements and increased fines, suggesting evasion possibilities to be the more relevant margin. However, even if taxable income has increased following the reform, the progression effect is unlikely to have been reversed. Last,wealth accumulation will be accelerated for some tax units, depending on the income composition.

1.2.4. Chapter 4: The Role of Capital Income for Top Income Shares in Germany

Chapter 4 aims at extending the German long-term series of top income shares to the most recent available years, i.e. up to the year 2010. This aim is complicated by the exclusion of capital income from the personal income tax schedule by the withholding tax reform in 2009, which reduced the portion of income at the top that is visible in tax records. Furthermore, even before the withholding tax reform, dividend taxation had changed since 2001 is such way that the tax base as reported in personal income tax records substantially undercut gross income (we refer to the intermediate tax regime from 2001 to 2008 as 50% rule). Thereby, top income shares as derived using tax statistics were mechanically reduced, rendering the interpretation of the uncorrected series of top income shares from 2001 onwards more difficult. Further complicating the issue, the exclusion of capital income from the personal income tax occurred together with the 2009 recession. While top income shares in the raw data series show a pronounced drop, it is unclear whether this indicates that the top was disproportionately hit by the recession, or whether it is a statistical artefact attributable to the break in the data series.

Our contribution is twofold: First, we gauge the mechanical effect on top income shares caused by the 50% rule and by the withholding tax reform by deriving homogeneous series of top income shares for all three legislations toward capital income: the pre-2001 regime, the intermediate 2001 to 2008 regime, and the post-2008 regime which excludes capital income. Second, we

extrapolate capital income by top income fractile to 2009 and 2010, using the pre-reform distribution of capital income of our harmonized series (pre-2001 regime) and external information on the evolution of capital income, such as tax flows, national accounts, survey data, and stock market dividends. Based on both steps, we then derive a homogeneous series of top income shares including comprehensive capital income up to 2010.

We find that the impact of the 50% rule on top income shares was substantial, causing the uncorrected series of top income shares to understate the increase in income concentration that took place in Germany between 2004 and 2008. Our extrapolations of capital income to 2009 and 2010 suggest that the drop in raw data, i.e., unharmonized top income shares in 2009 is largely attributable to the disappearance of capital income from the underlying data. In consequence, the recession seems to have had a minor impact on the top decile of the German income distribution. Yet, the impact on the very top, i.e., the top 0.1% and top 0.01% is present and substantial, albeit seemingly not permanent.

1.2.5. Concluding Remarks

Taken together, chapter 1 to 4 document that German top incomes are comparatively concentrated, less mobile than in other countries, and likely to keep increasing if progressive taxation has an impact on income concentration. While the difference in dynamics of income concentration between the US and Central European countries posed a puzzle when series were restricted to (by and large) the 20th century (Atkinson and Piketty, 2007, Dell, 2007), the more recent picture for Germany suggests that concentration has increased since the mid-1990s, and in particular since 2004. Even though top income shares showed different dynamics over the data period of chapter 2, including a steep increase from 2004 to 2006, mobility is fairly stable and does not seem to offset the increasing trend.

The documented increase in income concentration followed some regressive tax reforms between 2001 and 2005, supporting the view that progressive taxation has an impact on income concentration. If that impact is present, the withholding tax reform in 2009 will most likely add to the trend of increasing income concentration by accelerating wealth accumulation. The

effects of an increase in wealth accumulation and concentration exceed the realm of capital income concentration: wealth concentration also translates into more concentrated inheritances, thereby decreasing the degree of meritocracy in the German society.

While the present thesis is restricted to the German case, the issues of its analyses are not: First, both the similarities and differences in country experiences provide the basis for the theoretical discussions on the driving forces of the income and wealth distribution. Thorough analyses at the country level are therefore indispensable elements of a discussion of issues as multidimensional as the driving forces of the income distribution. Second, the policy choices regarding capital income taxation are not taken at the national level: e.g., the degree to which capital income taxation can be enforced in Germany is a political issue at the European level and beyond – at the same time, whether or not capital income can be taxed according to its changing role in total income will have a distributional impact that is not restricted to a specific national case.

Chapter 2

Mobility of Top Incomes in Germany[*]

[*]This Chapter (pp. 16–47) is published in The Review of Income and Wealth. DOI: 10.1111/roiw.12184 Link.

Chapter 3

Top Tax Progression and the German Dual Income Tax

3.1 Introduction

Capital income is typically concentrated at the top of the income distribution. In many countries, capital income taxes are lower than taxes on other income sources such as taxes on labor income. For instance, the dual income tax systems in Scandinavian countries combine a comparatively flat tax on capital income with a progressive surtax on labor income. While these reforms were usually motivated by efficiency arguments (Adam et al., 2010, Mirrlees et al., 2011, Nielsen and Sørensen, 1997, Sørensen, 2005), this differential taxation also tends to lower the degrees of horizontal equity and of income tax progression[24]. In 2009, German personal income taxation was massively changed by the dualization of the income tax schedule. Capital income, defined as dividend and interest income, was excluded from the progressive tax schedule. Since then, capital income has been taxed with a flat final withholding tax. The flat tax rate is much lower than the top marginal tax rate in the progressive schedule (25%, as opposed to 45%). I expect this reform to have increased inequality in net incomes in Germany, and in particular to have benefited the very top of the distribution.

Why should we care about tax progression at the top, and in particular on capital incomes? Indeed, for a long time, tax rates at the top were considered not to be worth any discussion, as the revenue effect was expected to be negligible (Atkinson, 2007a). Two recent strands of literature claim the opposite: First, effective tax rates at the top in general and on capital income in particular matter for both income and wealth concentration. Second, the level of private wealth has increased in relation to national income (in Europe, in particular), rendering capital income a more desirable tax base than before.

Both income and wealth concentration in industrialized countries were typically high at the beginning of the 20th century and declined roughly until the 1980s. Income concentration is far better documented: it has increased in many industrialized countries since the 1980s. This rise in income concentration was particularly strong in Anglo-American countries (Atkinson et al., 2011), but recently has also been documented for Central European countries, notably for Germany (Bach et al., 2009, 2013, Bartels and Jenderny, 2015, Dell, 2011), France (Alvaredo et al., 2014, Landais, 2008), and Switzerland (Foellmi and Martínez, 2013). Wealth concentration typically exceeds income concentration by large, but is more difficult to trace due to a shortage of appropriate data. As a general pattern, wealth concentration seems to have increased as well since the 1970s, and more so in the US than in European countries (France, the UK, and Sweden. See Piketty and Zucman, 2014 for a comprehensive overview). Tax progression, on top of its normative desirability as a prerequisite for equal sacrifices, is considered a strong means against

[24] Kristjánsson and Lambert (2012) show that progression of the tariff decreases for all classic structural progression measures. Lambert and Thoresen (2012) derive conditions under which dual income tax systems are unambiguously inequality-reducing and argue that the conditions were not met when the Norwegian dual income tax system were introduced in 1992.

income and wealth concentration. In turn, declining tax progression has the opposite effect and enforces the concentration trend.

In particular, capital income taxation has an impact on the speed of wealth accumulation, and consequently on the trend of increasing levels of private wealth as compared to national income. The ratio of private wealth and national income has been referred to as the wealth-income ratio. Wealth-income ratios have increased in several developed countries, including Germany, since the 1970s. The increase in wealth-income ratios in Europe is most likely driven by low growth rates and comparatively high rates of return on capital (Piketty and Zucman, 2013, 2014). While an increase in private wealth as such is not undesirable, the concentrated nature of wealth renders the increase in the wealth-income ratio a distributional issue. Theoretically, the link between capital income taxation and the wealth-income ratio has been established by Piketty and Saez (2013a).[25] Their results commend high taxes on wealth or wealth income under current European circumstances for two reasons: First, wealth income represents a rising share of total ability to pay, which renders wealth income a more appropriate tax base than before. Second, if the wealth-income ratio is high and wealth is concentrated, inheritances are concentrated. Concentrated inheritances come along with low equality of opportunity and are therefore undesirable from an equity point of view.[26] The progression effect of the decline of the German capital income tax rates has therefore most likely direct consequences for the long-run distribution of wealth, and therefore inheritances: a decline in capital income taxation decreases the degree of meritocracy that our society provides.

The German withholding tax reform adds to two prior regressive developments in the German personal income tax (PIT): First, the threshold income above which the top marginal tax rate is applied has declined. This decline took place over the whole second half of the last century. It caused an ever growing fraction of tax payers to enter the highest (proportional) bracket of the tariff and to pay the top marginal tax rate (Corneo, 2005).[27] In consequence, progression between the middle of the income distribution and the top also declined, since progression within the proportional bracket is low. Therefore, in 2005 the very top of the income distribution was not taxed at a pronouncedly higher rate than tax payers who earned the double per capita GDP (Corneo, 2005). The second development is the decline of the top marginal tax rate. While

[25]Piketty and Saez, 2013a model individual income in two stochastic dimensions: labor income and inherited wealth. The capital income's share (which stems from inherited wealth) in national product is unbounded above, and depends inter alia on the tax system. If the future rate of return keeps exceeding the growth rate, wealth income ratios are likely to increase.

[26]In the recent public debate following the publication of the English translation of T. Piketty's book "Capital in the 21st Century", the r>g-rule has almost become a commonplace. Taxation of capital income comes in as it reduces the net rate of return and therefore decreases the speed at which capital income grows compared to the whole economy.

[27]The German tariff traditionally consists of several brackets, the first of which are directly progressive (the marginal tax rate rises with taxable income), while the highest bracket has a constant marginal tax rate. Progression is stronger in the directly progressive brackets. In 2007, a second proportional bracket with a much higher threshold income (250.000 €for singles, 500.000 €for married couples) was introduced.

the top marginal tax rate had reached 56% during the late 1970s and throughout the 1980s, it was reduced to 53% in 1990. Between 2000 and 2005, it was further reduced in several steps to 42%. In 2007, a second proportional bracket was introduced which lifted the top tax rate to 45% again for taxable incomes above 250,000 € (singles) or 500,000 € (married couples). This top marginal tax rate is still well below its levels during the second half of the last century, but the threshold income relative to per capita GDP is much higher, which increases progression at the very top (within the top 0.5%). Figure 3.1 shows the evolution of the German top tax rate and the relative size of its threshold income in multiples of per capita GDP since the late 1950s.[28] The decline of the top marginal tax rate suggests a concomitant decline in effective progression of the German PIT even before the withholding tax reform. The threshold income's effect is ambiguous: The threshold income's decline for the first proportional bracket lowered progression at the top, while the introduction of a second proportional bracket re-introduced some progression at the very top. Bach et al. (2013) empirically show that progression in the PIT declined between the 1990s and 2005. They find that apart from the decline of the top tax rate, tax exemptions for capital gains and some loopholes did also enforce this trend.[29]

It is the aim of this analysis to quantify the impact of the withholding tax reform on vertical and horizontal equity in the German personal income tax. The analysis is based on panel data on income tax returns between 2001 and 2006, and thus uses pre-reform data. These data are used for two reasons: First, only pre-reform tax data contain information on the synthetic incomes including interest income and dividends, as these were excluded from the progressive schedule (and thus from the income tax returns) when the reform was implemented in 2009. Second, panel data allow me to construct a permanent reform effect, that is more suitable to derive a longterm effect of the tax reform than annual data, as the composition of annual data is volatile due to the business cycle and income shifting. Four main results are obtained: First, the reform effect is regressive. Noticeable changes in net income predominantly occur at the very top of the income distribution. Second, the benefit of the reform is distributed unequally within the top fractiles. Third, some reform components have negative impacts on the tax units' net incomes, such as the abolition of deduction possibilities for capital income related expenses. However, the net income of the bulk of tax units at the top increases due to the reform. Fourth, when adjustments in reporting behavior are taken into account, very few tax units at the top suffer net income losses, if any. The analysis therefore shows that the reform has a regressive impact on the German PIT. By and large, a portion of the topmost income recipients benefited from the reform,

[28]The appendix figure 3.A.1 compares the whole tariffs on real taxable income and tariffs on multiples of GDP between 1958 and 2007.

[29]Taxation of other sources than personal income follow a similar trend: In 1997, the German wealth tax was abolished. The corporation tax was reduced from 56 % in the 1980s to 15% in 2008. In 2012, the inheritance tax on firm wealth was reduced by 85% under certain conditions, or even to zero, under somewhat stronger conditions (§§ 13a, 13b ErbStG).

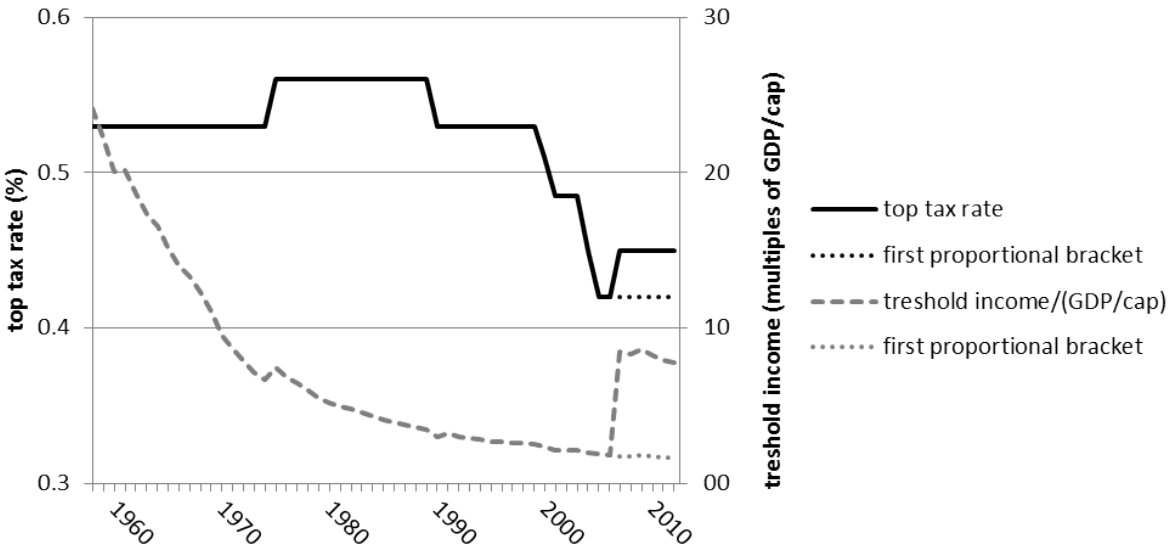


Figure 3.1.: top tax rate and relative size of threshold income

Notes: The introduction of the second proportional bracket was postpones to 2008 for self-employed income (mostly lawyers and physicians) and entrepreneurial income from unincorporated business.
Source: tax rates: German income tax law (ESTG); per capita GDP: Destatis, 2014b.

while the rest of the distribution was hardly affected. The current taxation of capital income thus enforces the decline of top tax progression in Germany. The remainder of this paper is structured as follows: Section 3.2 describes details of the German withholding tax reform. Section 3.3 describes the dataset used for the empirical analysis and discusses the methodology. Section 3.4 presents empirical results. Section 3.5 discusses the impact of behavioral responses. Section 4.6 concludes.

3.2 The German Withholding Tax Reform

The withholding tax reform on capital income was part of a broader tax reform of corporate and business taxation legislated in 2008 (Unternehmensteuerreform (UStR) 2008). The core elements of the withholding tax reform were the exclusion of capital income (defined as interest income and dividends) from the PIT schedule and the introduction of a flat tax rate of 25% on these two income sources. This flat tax rate vastly undercuts the top marginal PIT rate of 45%.

Despite the global reduction of the top marginal tax rate on capital income, the effective change in top marginal tax rates differs across income sources, as dividends are additionally taxed at the corporate level, and only 50% of dividend income was taxable in the PIT between 2002 and 2008. At high personal tax rates, gross dividends were therefore taxed at a slightly lower rate

than interest income before the reform. Since the withholding tax reform, dividends have been taxed at a higher rate, because they are subject to the corporation tax in addition to the PIT. Some additional changes in capital income taxation were implemented in the broader framework of UStR 2008: The main additional reform components were a massive reduction of the corporation tax rate, several changes in deduction rules in the corporation tax, the local business tax, and the PIT, and changes in capital gains taxation. In addition, since the reform the tax rate on capital income has depended on whether the income is realized on the personal level or on the firm level.

It is instructive to analyze these reform components separately for two reasons: First, the single reform components' impacts on effective taxation are heterogeneous. While the overall reform effect is expected to decrease tax progression, distributional effects of the single reform components are not always clear. Second, as marginal tax rates on capital income changed to different degrees across income sources and tax units, behavioral responses are expected to change the post-reform composition of capital income. The first issue will be the subject of the simulated reform effect. The effect of behavioral responses will be discussed in section 3.5.

The global reform effect can be broken down by component. In the following, the detailed changes in effective tax rates and the availability of the relevant incomes in the data are described for interest income, dividends, capital gains and deductions. The corresponding acronyms will be used in the empirical part of the paper. Table 3.1 summarizes the description. Changes in marginal tax rates are reported for the highest tax bracket, as this is the PIT rate that applied to the largest portion of capital income.

(I) Interest Income [INT]: Interest income can be seen as the benchmark case of the introduction of the final withholding tax, because there were no special rules regarding its taxation before or after the reform. Interest income had been taxed at the individual PIT rate until the withholding tax reform was implemented in 2009. Since then, it has been taxed at the final withholding tax rate of 25%. In the highest tax bracket, the marginal tax rate changed from 45% to 25%.

(II) Dividends [DIV]:The top marginal tax rate on dividend income was effectively reduced to a lesser degree. Dividends from both stock shares and closely held corporations had been taxed at a different tax rate than other income even before the withholding tax reform in 2009. To understand the rationale behind the pre-reform tax rules on dividend income, it is useful to consider the dividend taxation that had prevailed over several decades: Before 2002, dividends from corporations were taxed as gross dividends (before corporation taxes) at the PIT rate. The corporation tax could be credited against the PIT (tax credit regime). Gross dividends were thus taxed at the same marginal rate as interest and other income, and the corporation tax on distributed profits was a pure pre-tax to the PIT. In 2002, the corporation tax on dividends ceased to be creditable against the PIT. As a compensation for the resulting

Table 3.1.: reform components

acronym	type of income	details of taxation	top tax rate	reported
INT	interest income	pre reform *100% taxable at PIT tax rate*	*45.0%*	yes
		post-reform *100%)taxable at 25% withholding tax rate*	*25.0%*	
DIV	dividends from corporations *from corporations of type (i) and type (ii)*	pre-reform *corporation level: 25% corporation tax; 20% local business tax PIT: 50% of cash dividend(net of corporation level taxes) taxable at PIT tax rate*	*41.9%*	yes
		post-reform *corporation level: 15% corporation tax; 20% local business tax withholding tax: 100% of cash dividend(net of corporation level taxes)taxable at 25% withholding tax rate*	*36.3%*	
CG (i)	capital gains type (i) *tax unit holds at least 1% of corporation's capital; primarily closely held corporations with German legal form "GmbH"*	pre-reform *50% of capital gain taxable at PIT tax rate*	*22.5%*	yes
		post-reform *60% of capital gain taxable at PIT tax rate*	*27.0%*	
CG (ii)	capital gains type (ii) *tax unit holds less than 1% of corporation's capital; primarily stocks from stock corporations*	pre-reform *50% of capital gain is taxable at PIT rate if the share was held for less than one year, tax free if share was held at least one year*	*22.5%*	in parts
		post-reform *total capital gain is taxable at 25% withholding tax rate (with transitional regulations)*	*25.0%*	
DEDUCT	capital income specific deductions *all expenses related to the income generation of dividends and interest*	pre-reform *100% deductible from PIT tax base*	*-45.0%*	yes
		post-reform *not deductable, lump-sum allowance of 801 €. Some tax units can chose PIT option and then deduct 60% of deductions*	*-25.0%*	

Notes: Capital gains of type (i) are taxes like other capital income realized inside the unincorporated business sphere. This income is therefore included in the CG (i) effect in the simulation.
Source: Source: German PIT legislation, 2008 and 2009

.

double taxation of dividends, only half of the cash dividend (after corporation taxes) was taxable in the PIT (50% regime). This regime constitutes the pre-reform marginal tax rate on gross dividends[30] $t_{div}^{m\,pre}$:

$$t_{div}^{m\,pre} = 1 - (1 - t_{corp}^{pre}) \cdot (1 - t_{PIT}^{m\,pre} \cdot 0.5) \leq 41.9\%$$

, with t_{corp}^{pre} denoting the pre-reform corporation tax rate and $t_{PIT}^{m\,pre}$ denoting the marginal pre-reform PIT tax rate. The UStR 2008 changed the tax rate on gross dividends in two ways. First, the corporation tax rate was reduced from 25% to 15%, which increased the cash dividend, given the gross dividend. Second, the tax rate on the cash dividend was increased from half the personal tax rate (always below 22.5%) to 25% final withholding tax. This results in the post-reform tax rate on gross dividends $t_{div}^{m\,post}$:

$$t_{div}^{m\,post} = 1 - (1 - t_{corp}^{post}) \cdot (1 - t_{wh}) = 36.3\%$$

, with t_{corp}^{post} denoting the post-reform corporation tax rate and t_{wh} denoting the withholding tax rate. In the highest tax bracket, the marginal tax rate on gross dividends was thus reduced from 41.9% to 36.3%.[31]

(III) Capital gains [CG]: Capital gains from corporation shares, both in the pre-reform and the post-reform legislation, have been taxed depending on the share in the corporation's capital that the tax unit held:

(i) If the tax unit owned at least 1% of the corporation's capital (typically true for closely held companies), capital gains were taxable at the full PIT rate before 2001. Between 2002 and 2008, the 50%-regime applied to these capital gains, even though they were not subject to double taxation. The same legislation applied to capital income that was realized held in the unincorporated business sphere. UStR 2008 raised the taxable share of these income types from 50% to 60% (60% regime). In the highest tax bracket, the marginal tax rate on capital gains of type (i) was thus raised from 22.5% to 27.0%.

(ii) If the tax unit owned less then 1% of the corporation's capital (typically true for stock shares), the capital gain was tax free in the pre-reform legislation if the stock shares had

[30] At a critical PIT tax rate of 40%, the marginal tax rate on gross dividends in the 50% regime equalled the marginal tax rate in the tax credit regime. For tax units whose marginal PIT rate exceeded 40%, the marginal tax rate on dividends was lower in the 50% regime than in the tax credit regime. At the top, the 2002 reform therefore already lowered effective tax rates on dividends. Dividends from foreign corporations were taxed in the 50%-regime since 2001.

[31] If the personal tax rate undercuts the withholding tax rate t_{wh}, the personal tax rate is applied instead of t_{wh} if the tax unit reports capital income in its PIT return.

been held for at least one year. It was taxable (since 2002 in the 50%-regime) if the stock share had been held for less than a year. With UStR 2008, capital gains of type II became fully taxable with the final withholding tax. The marginal tax rate on capital gains type (ii) was thus raised from 0.0% to 25.0%. As this type of capital gains was typically tax-exempt before the reform, the tax base broadening is the only component that cannot be simulated in the empirical analysis. Yet, note that these capital gains are also the most volatile income component – they are therefore less suitable for deriving a medium-term reform effect, because the (mostly bear-) market in our data period does not inform us on a reasonable long-run size of this income source. See Appendix 3.D for a detailed discussion.

(IV) Deductions [DEDUCT]: A last feature of the final withholding tax on capital income is the abolition of several deduction possibilities. First, deduction possibilities for capital income related expenses have been abolished. Until 2008, all expenses related to the acquisition of dividend or interest income reduced the PIT tax base. Classic expenses of this kind were e.g. capital costs for the acquisition of company shares or financial assets, consulting or administration costs, or capital income related travel expenses. Second, negative capital income and capital losses of type (ii) cannot be credited against other income sources any more. The shortfall of deduction possibilities for these expenses has raised average tax rates on the respective income components depending on the share of income related expenses and negative incomes in total capital income.

Last, even though the withholding tax regime excludes capital income from the PIT in general, two exceptions lead to a taxation of capital income under the PIT schedule as before:

(i) If the personal tax rate is lower than the final withholding tax rate, the capital income (cash dividends, interest income, and capital gains of type (ii)) can be taxed with the personal tax rate if the tax unit choses to include this income in the PIT file. Capital income taxation has therefore still been progressive up to the marginal PIT tax rate of 25%,[32] provided that the tax units at the bottom of the income distribution are informed about this possibility and consequently actually file an income tax return (both of which is not necessarily the case).

(ii) If capital income is realized in the unincorporated business sphere, the final withholding tax does not apply. Instead, dividend income and capital gains of type (ii) are then taxed in the 60% regime. Interest income is fully taxable. In this case, the tax increasing components of the withholding tax regime do not apply: all capital income related deductions can be claimed (60% if they refer to dividend income or capital gains), and negative capital income can be

[32] which corresponded to a gross annual income of about 15,000 € in 2008 (single assessed tax unit; 16,000 € in 2013. For married couples, the threshold incomes are doubled).

deducted from any other income source. The same rules apply for capital income from closely held companies, if the tax unit choses the filing option.[33]

The introduction of the German withholding tax on capital income thus comprises several reform components, which are much more complex than a sole reduction of the marginal tax rate on capital income. In addition, the changes in marginal tax rates differ across income sources. Moreover, not all reform components necessarily reduce tax progression. While marginal tax rates on gross dividends and on interest income decreased, the abolition of deduction possibilities may have increased the tax burden of some tax units. The reform effect on the personal average tax rate thus depends on the size and the composition of income, and the size of capital income specific deductions. Last, if capital income is realized in the unincorporated business sphere rather than the private sphere, the final withholding tax does not apply altogether, and the income is taxed in the progressive PIT schedule. For tax units with high income related expenses, it might thus be favorable to shift income to the unincorporated business sphere. The following analysis simulates the reform effect and considers all components described above. However, the tax base broadening with respect to capital gains of type (ii) cannot be simulated. Its impact is discussed in Appendix 3.D. Two post-reform simulations will be considered: First, the day-after taxation is simulated with income sources as reported in the data. In the second scenario, I allow for income shifting to the business sphere, if it is favorable for the tax unit. Both the overall effect and its decomposition by reform component will then be analyzed by top income fractile, in order to assess the reform's impact at the top of the income distribution.

3.3 Data and Methodology

3.3 Database

The progression effect is derived using panel data of income tax returns on the micro level for the years 2001 to 2006 (Taxpayer Panel, TPP). The TPP is composed by the German federal statistical office (Destatis). It is a balanced panel of all German tax filers between 2001 and 2006. To be a member of the panel population, it is thus necessary to file in all six years. Out of this population, our dataset is a 5% sample, stratified by states, assessment type (single/married couple), main income source (business/wage/other), average annual gross taxable income (GTI, Gesamtbetrag der Einkünfte) as well as GTI's coefficient of variation. Tax units at the top are strongly oversampled. 85% of all tax units in the panel population whose average GTI over the

[33] if the tax unit owns at least 25% of the firm's capital or if the tax unit owns at least 1% of the firm's capital and works for the corporation.

data period was at least 150,000 € are included. The data is thus particularly representative for the top of the income distribution.

In the German PIT, filing an income tax return is mandatory for the self employed but not for wage earners, as payroll taxes are withheld by the employer. For most high-income wage earners, filing is nonetheless favorable.[34] In addition, filing is mandatory if the tax unit receives income from other sources than wage, such as capital income above the annual allowance[35], income from renting and leasing, or self-employed income. Wage earners at the bottom of the income distribution are therefore underrepresented among tax filers,[36] while above-average income recipients and especially the top of the income distribution are well represented. Top taxpayers usually have a significant share of non-wage income, which requires an income tax return. They are thus expected to file in all six years and consequently belong to the panel population. Exceptions might be due to death, migration or marriage.[37] Note that a tax unit can be a single or a married couple.

The TPP contains detailed information on all types of taxable income: wage income, three types of entrepreneurial income, capital income (defined as dividends from corporations and interest income), income from renting and leasing, and pensions. Capital income as defined above is only taxable (and hence only included in PIT returns) as far as it exceeds the savers' allowance. Dividends and interest income are separately reported. Capital gains are only partly included: only capital gains of type (i) as described in section 3.2 are reliably observable during the data period. Capital gains of type (ii) were to a large extent completely tax-exempt and are then not included in the data.

3.3 Tax Reform Simulation

The reform simulation compares the pre-reform tax burden to the day-after taxation without adjustments in income generation or reporting (post-reform I) and then allows capital income to be shifted to the business sphere in order to minimize the tax burden (post-reform II).

The data spans the period from 2001 to 2006. As these years preceded the dualization of the income tax tariff, the data include the comprehensive synthetic income information including capital income. Both the pre-reform legislation and the introduction of the dual tariff are

[34] High marginal tax rates raise the attractiveness of claiming allowances. For high-income wage earners with children, it is also more favorable to claim a childrens' tax allowance than to receive the alternative childrens' transfer (Kindergeld).

[35] Saver's allowance, between 1,370 € and 1,550 € per person during the data period.

[36] Households who do not pay income taxes at all, like some pensioners or recipients of governmental transfers, are also not included. These households are expected to have low incomes, too, because filing becomes mandatory as soon as capital incomes exceed the annual threshold.

[37] If two single tax units marry during the period in focus, one of them loses his or her tax id, which then drops out of the panel completely.

Table 3.2.: Tax bases in reform simulation

	pre-reform	post-reform I	post-reform II
		PIT	
Non-capital income	$Y^{i,t}_{non\text{-}cap}$	$Y^{i,t}_{non\text{-}cap}$	$Y^{i,t}_{non\text{-}cap}$
Dividends	$0.5 \cdot DIV^{i,t}_{cash} - 0.5 \cdot DEDUCT^{i,t}_{DIV}$	–	$[0.6 \cdot DIV^{i,t}_{cash} - 0.6 \cdot DEDUCT^{i,t}_{DIV}]$
Interest	$INT^{i,t} - DEDUCT^{i,t}_{INT}$	–	$[INT^{i,t} - DEDUCT^{i,t}_{INT})$
Capital Gains	$0.5 \cdot CG(i)^{i,t}[+0.5 \cdot CG(i)^{i,t}]$	$0.6 \cdot CG(i)^{i,t}$	$0.6 \cdot CG(i)^{i,t}[+0.6 \cdot CG(i)^{i,t}]$
Saver's allowance	-810 €	–	–
		Corporation Tax	
Dividends	$0.25 \cdot DIV^{i,t}_{gross}$	$0.15 \cdot DIV^{i,t}_{gross}$	$0.15 \cdot DIV^{i,t}_{gross}$
		Final Withholding Tax	
Dividends	–	$0.25 \cdot DIV^{i,t}_{cash}$	$[0.25 \cdot DIV^{i,t}_{cash}]$
Interest	–	$INT^{i,t}$	$[INT^{i,t}]$
Capital Gains	–	$CG(ii)^{i,t}$	$[CG(ii)^{i,t}]$
Saver's allowance	–	-810 €	$[-810$ €$]$

Notes: $Y^{i,t}_{non\text{-}cap}$ denotes taxable income other than dividends, interest income and capital gains of type (i) or (ii) after personal and income-specific deductions. This income enters the simulation as reported in data, but adjusted to correspond to 2008/2009 tax law. $DIV^{i,t}_{gross}$ gross dividends (before corporation tax) of tax unit i in datayear t, $DIV^{i,t}_{cash}$ cash dividend (after corporation tax), $INT^{i,t}$ interest income, $CG(i)^{i,t}/CG(ii)^{i,t}$ capital gains of type (i) or (ii). Capital gains of type (ii) are only included in the simulation as far as reported. In the post-reform II scenario, either dividends or interest income or both are taxed within the PIT as business income if this yields a lower tax than the withholding tax regime. Capital gains from other assets than corporation shares (e.g. from real estate) are taxed within the PIT as far as they are taxable. The taxable share of capital income realized inside the unincorporated business sphere in the data is increased from 50% to 60% in the simulation.
Source: German personal income tax law *EStG*

simulated for each of the six years[38]:

In the pre-reform scenario, the synthetic PIT schedule of the year 2008 (deflated to match each data year's income components) is applied to the tax unit's taxable income. Taxable dividend income in the PIT corresponds to the 50% regime as described in section 3.2. In addition, the pre-reform corporation tax rate (25%) is applied to gross dividends[39].

[38] All three scenarios are summarized in table 3.2

[39] This simulation includes several harmonization steps concerning the definition of taxable income. First, all dividends are treated as if they were taxed in the 50% regime, including 25% corporation taxes. Dividends that were originally still taxed in the tax credit regime (primarily in 2001) are harmonized to match the 2008 legislation, keeping the gross dividend constant. Capital gains of type (i) and (ii) that were realized in 2001 are also adjusted to the 50% regime legislation. Second, the saver's allowance (personal allowance for capital income) is harmonized to the 2008 level of 750 € (1,500 € for married couples) This allowance changed over the data period: 1,534 € in 2001, 1,550 € in 2002 and 2003, and 1,370 € in 2005 and 2006. In 2007, it was reduced to 750 € plus a standardized deduction of 51 €, if no higher capital income related deductions were claimed. Both personal allowance and standardized deduction were merged to a new personal allowance of 801 € in 2009, with no further possibilities to claim capital income related deductions. The harmonization can only be applied to tax units whose annual capital income exceeded the allowance in the data period. For tax units whose capital income was below the allowance,

In order to evaluate the reform effect on tax progression, this pre-reform scenario is compared to two post-reform scenarios: In the first post-reform scenario (post-reform I), the withholding tax legislation is applied to the (harmonized) income components as observed in the data. Taxation of all observed incomes is adjusted according to the legislational changes as described above in section 3.2: The personal tax rate is calculated for the tax base without dividends and interest income[40]. Capital gains of type (i) are taxed in the PIT with the increased taxable share of 60%. Gross dividends are taxed with the post-reform corporation tax rate (15%). The remaining cash dividends and interest income are taxed with the final withholding tax rate. All deductions of capital income related expenses are disregarded, with exception of the saver's allowance which is deducted from the withholding tax base. The filing option for capital income is chosen if the personal tax rate is less than the final withholding tax rate. The post-reform I scenario thus corresponds to a day-after effect, that does not take into account adjustments in income generation or reporting behavior.

In the second post-reform scenario (post-reform II), the most plausible shifting reactions to the reform are simulated. The most negative impact of the 2009 reform for the individual taxpayer is the prohibition of capital income related deductions. This issue has been broadly discussed in the tax adviser literature.[41] This literature often recommended to shift capital income from the private to the business sphere, in order to have the capital income taxed in the 60% regime in the PIT, and to regain the possibility of deductions of capital income related expenses, and of loss deduction across income sources. A second recommendation was to shift credit financing to those income sources where interest payments could still be deducted from the tax base. I capture these shifting possibilities by simulating for each tax unit a choice between the withholding tax regime (25%, no deductions) and the taxation of dividend and/or interest income as business income in the PIT (60% taxable under PIT schedule, 60% of deductions admitted (100% for interest income)). I assume that tax units can chose which of their capital income they shift to the business sphere. Therefore, I simulate the shifting of dividend and interest income separately, and adopt the most favorable choice as post-reform II taxation. However, I cannot distinguish capital related expenses by capital income type (dividend or interest income). I therefore split these expenses according to the income types' relative sizes.

The simulation thus includes all reform components described in section 3.2. Capital income that was realized inside the unincorporated business sphere is included in the component of capital gains of type (i). The tax base broadening with respect to capital gains of type (ii) can only be simulated as far as these capital gains are reported in the data. As tax reform simulation considers gross dividends as tax base, the simulated tax includes the corporation tax on these

however, the reform effect on the overall tax rate can be expected to be low.

[40] The PIT tariff is kept constant between pre and post-reform scenarios.

[41] E. g. Maier and Wengenroth (2007), Worgulla and Söffing (2007). I thank Frank Hechtner for this hint.

dividends.

3.3 Definition of Reform Effect

Two measures are needed to assess the reform's effect on horizontal and vertical equity: First, a measure of the individual taxpayer's ability to pay is required, according to which tax units can be ranked. Second, a measure of the individual reform effect is needed, which can serve for both vertical and horizontal comparisons.

I measure the tax unit's ability to pay using economic gross income (EGI), which is the broadest income concept that can be derived based on tax data.[42] EGI is defined as gross income before taxes and before all income specific and personal deductions. It includes transfers as far as they are visible in the data (mostly pensions), but excludes capital gains, as they are a volatile income component and do not necessarily reflect the long-term ability to pay. Economic gross income includes gross income before allowances and deductions, including tax-exempt income components such as the tax-exempt portions of dividends, capital gains (type (i) and (ii) in the 50% regime), and pensions. Labor income includes employees' social security contributions, but not the employers' contributions. For civil servants, the employees' pension insurance payments are imputed[43]. The ability to pay is thus assessed using a broad definition of gross income that includes full market incomes as well as transfers.

By contrast, the individual reform effect is assessed using net income: the net income effect (NIE) is measured by the growth rate of net income induced by the tax reform, so as to reflect the relative change in the tax unit's consumption possibilities, and to capture the deviation from a proportional effect[44]. Economic net income (ENI) is computed as economic gross income (EGI) less simulated income tax in the respective scenario[45]. The NIE is computed both for each tax unit and by fractile. For each fractile, the NIE is computed as the growth rate of average ENI due to the reform. A proportional tax reform would yield an equal NIE distribution over all tax units. If net income grows stronger in higher income fractiles than in lower income fractiles, progression decreases. If NIE differs across tax units with comparable ability to pay, horizontal equity is changed.

[42] This gross income measure was also used in a previous analysis, where its construction is discussed in further detail (Jenderny, forthcoming). It is defined similarly to the gross income measure used by Bach et al., 2013.

[43] Civil servants receive a pension after retirement, but do not pay pension insurance during their working life. The insurance payment is thus not included in the reported gross wage.

[44] This measure is closely related to the residual progression (the elasticity of net income with respect to gross income), a classic measure of the local redistributive effect of a tax system (Jakobsson, 1976). As to comparisons across countries and over time, this measure has been debated (Dardanoni and Lambert, 2002). Here, I not measure the redistributive effect of the tax schedule, but of the tax reform instead.

[45] As taxable income includes taxable capital gains but excludes loss deductions, economic net income is also corrected for these two dimensions.

The NIE is measured for both post-reform scenarios (NIE I, NIE II). It is assessed for all annual distributions and as a permanent effect over three-year rolling averages and over the whole data period of six years. The permanent effect is based on the annual tax simulations: for each tax unit, it is defined as the average annual effect.[46] The permanent effect can control for volatility in both capital and other income. This provides a more reliable estimate of the distribution of capital income, which is especially valuable given that the data period spans the whole business cycle and that there were several changes in the top marginal tax rate over the data period.

As capital income is concentrated at the top of the income distribution, the empirical analysis pays special attention to the effects at the top. In particular, the analysis is conducted for several top income fractiles (the richest 10%, 5%, 1%, 0.1%, 0.01%, and 0.001%), whose size is defined using an external population control total. The fractiles thus refer to all potential taxpayers[47], not to the panel population. Top income fractile members are defined as the *N* richest tax units in the database whose aggregated weight adds up to the respective number of potential taxpayers. Panel weights are adjusted as to correct for panel attrition[48].

3.4 Results

3.4 Descriptives

Table 3.3 shows descriptive results for those income sources that are affected by UStR 2008. The first panel shows the share of tax units that were subject to the reform at all, i.e. that received the relevant income types by fractile (results are shown for 2006). For example, virtually all tax units in the top 0.001% fractile received capital income of some kind (denoted by the acronym CAP), and 89.9% of them received dividends. 79.9% claimed capital income specific deductions.

[46] It can be debated whether the permanent effect should be based on annual simulations, so as to capture annual volatility's effect on average tax rates, or if the simulation itself should be based on permanent income. If annual income is used, annual volatility is seen as a fundamental feature of the income realization process. If income is volatile due to the business cycle, annual simulations provide the more reliable measure of permanent tax rates. On the contrary, if income is volatile due to income shifting caused by tax reforms, a simulation based on permanent income would be the more reliable indicator for permanent tax rates. As the marginal top tax rate changed several times over the data period, income shifting is expected to play some role. Then, the tax burden in the permanent effect as assessed by my method is too high, and the corresponding NIE is too low. In that respect, the NIE can be seen as a lower bound. I thank Frank Fossen and Viktor Steiner for pointing out this issue.

[47] Potential taxpayers are all singles or married couples older than 20. The external population control is computed based on population statistics published by Destatis (2005). It comprises all persons older than 20, minus all married women older than 20.

[48] Compared to annual tax statistics, the weighted annual panel population shows a rather constant missing rate of about 15%, which does not seem to be systematic with respect to income size. Adjusted panel weights thus divide panel weights by 0.85. Tax units with gross incomes below 20,000 € show a higher attrition, which is not reflected in the weight adjustment.

Table 3.3.: EGI size and composition by income fractile

fractile[a]	EGI[b]	CAP[c]	DIV[d]	INT[e]	DEDUCT[f]	CG (i)[g]	CG (ii)[h]
			% Share of tax units with income source (2006)				
<P90	100.0	23.8	11.5	23.6	0.6	0.7	0.0
P90–95	100.0	35.1	21.1	34.7	1.4	1.9	0.1
P95–99	100.0	51.2	34.6	50.5	3.1	3.6	0.3
P99–99.9	100.0	80.7	62.3	79.8	11.4	9.8	1.0
P99.9–99.99	100.0	96.3	81.5	95.8	35.0	23.3	2.9
P99.99–p99.999	100.0	98.9	86.3	98.6	61.0	37.3	5.7
Top 0.001%	100.0	99.3	89.9	99.3	79.6	50.9	12.2
			permanent income mean (all tax units)				
<P90	31,752	647	74	573	38	-1	-2
P90–95	66,079	1,410	267	1,143	105	6	-5
P95–99	96,671	3,061	881	2,181	262	56	-1
P99–99.9	210,246	16,385	8291	8,094	1,434	1,309	-46
P99.9–99.99	751,006	122,595	80,008	42,586	8344	12,779	-224
P99.99–99.999	3,241,792	635,082	423,363	211,719	51,057	133,796	-1,402
Top 0.001%	18,584,131	3,406,572	2,699,346	707,225	266,734	219,060	-25,919
			% EGI				
<P90	100.0	2.0	0.2	1.8	0.1	0.0	0.0
P90–95	100.0	2.1	0.4	1.7	0.2	0.0	0.0
P95–99	100.0	3.2	0.9	2.3	0.3	0.1	0.0
P99–99.9	100.0	7.8	3.9	3.8	0.7	0.6	0.0
P99.9–99.99	100.0	16.3	10.7	5.7	1.1	1.7	0.0
P99.99–99.999	100.0	19.6	13.1	6.5	1.6	4.1	0.0
Top 0.001%	100.0	18.3	14.5	3.8	1.4	1.2	-0.1
			% CAP[c]				
<P90	–	100.0	11.4	88.6	5.9	-0.1	–
P90–95	–	100.0	18.9	81.1	7.5	0.4	–
P95–99	–	100.0	28.8	71.2	8.6	1.8	–
P99–99.9	–	100.0	50.6	49.4	8.7	8.0	-
P99.9–99.99	–	100.0	65.3	34.7	6.8	10.4	–
P99.99–99.999	–	100.0	66.7	33.3	8.0	21.1	–
Top 0.001%	–	100.0	79.2	20.8	7.8	6.4	–

Notes: All income figures are deflated to 2001 price levels using the German consumer price index. [a]fractiles of 6 year average EGI (without capital gains). Bottom 90 group excludes cases with negative incomes. [b]EGI including pre-reform taxable capital gains. [c]CAP refers to total capital income i.e. the sum of interest income and gross dividends (before corporation tax and deductions) [d]Gross dividends [e]Interest Income [f]capital income specific deductions. Share of tax units refers to cases with deductions exceeding · the 2008/09 saver's allowance. [g]Capital gains type (i) [h]Capital gains type (ii) (only to a small part in data).
Source: own computation based on TPP 2001-2006

50.9% received capital gains of type (i), and 12.2% received taxable capital gains of type (ii). The occurrence of all income components relevant for the reform decreases in lower income fractiles. Above the 0.1% percentile point, virtually all tax units are affected by UStR 2008, while only one a quarter of tax units below the top 10% percentile point is affected[49]. The first panel also shows the low share of tax units who report capital gains of type (ii) The second panel of table 3.3 shows average incomes of the respective income source (averages refer to all tax units). The size of all relevant income types increases in higher fractiles. The increasing capital income suggests a higher absolute gain from UStR 2008, while the increasing size of capital gains type (i) and capital income related deductions is expected to lessen the gains at the top. The third and fourth panel of table 3.3 show the income types' percentage shares in EGI (EGI includes taxable capital gains) and in capital income (gross dividends and interest income before deductions). The share of all income types in EGI increases towards the top, with exception of interest income, deductions, and capital gains of type (i) in the top 0.001% fractile. Both the tax rate reductions and the negative reform effects are thus expected to have the highest net income effect in the topmost groups. Given the size of capital income, however, the interest share decreases towards the top, which results in a lower tax rate reduction, as the tax rate on interest income decreases more than the tax rate on gross dividends.

3.4 Vertical Effect

Table 3.4 shows the NIE for both post-reform scenarios by gross income (EGI) fractile. The left hand side of the table shows NIE I, the net income effect of the post-reform I scenario. The right hand side of the table shows NIE II, the net income effect of the post-reform II scenario. Both upper panels show annual net income effects, both lower panels show net income effects on permanent income. The upper left panel shows annual results for NIE I. The vertical reform effect is regressive in all annual distributions. Notably, net income growth rates are negligible for all income fractiles below the annual top 1%. For the overwhelming part of the income distribution, capital incomes do not provide a sufficient share of overall income to impact much on tax progression. In almost all top fractiles, net income clearly increases in all years, albeit to different extents. The net income growth rate usually exceeds 1% in the annual top 0.01% and richer subgroups. However, the net income effect at the top differs across the annual distribution, and even turns negative for the annual top 0.001% in 2005. The upper right panel shows annual results for NIE II, which includes shifting possibilities to maintain the deduction of capital income expenses. The reform effect stays negligible for all income fractiles below the annual top

[49]Note that these figures refer to tax units who filed an income tax return, who are more likely to receive capital income than non-filers. Below P90, these figures most likely overstate the share of tax units that is affected by the reform.

Table 3.4.: net income effect of UStR 2008[b]

	annual income fractiles											
	NIE I						NIE II					
fractile[a]	2001	2002	2003	2004	2005	2006	2001	2002	2003	2004	2005	2006
<P90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
P90–95	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
P95–99	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.3
P99–99.9	0.8	0.5	0.6	0.6	0.6	0.6	1.2	0.8	0.8	0.8	0.8	0.8
P99.9–99.99	2.4	1.3	1.5	1.4	1.3	1.5	3.0	1.9	1.9	1.8	1.7	1.9
P99.99–99.999	3.0	2.4	1.7	1.5	1.7	0.8	3.9	3.1	2.9	2.2	2.5	2.5
Top 0.001%	2.2	2.0	2.3	1.6	-0.2	1.0	3.8	2.9	3.0	2.0	0.4	3.0

	permanent income fractiles									
	NIE I					NIE II				
	3 years				6 years	3 years				6 years
fractile[a]	01/03	02/04	03/05	04/06	01/06	01/03	02/04	03/05	04/06	01/06
p0-p90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
p90-p95	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
p95-p99	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.3	0.3
p99-p99.9	0.7	0.6	0.6	0.6	0.6	1.0	0.8	0.8	0.8	0.9
p99.9-p99.99	1.8	1.4	1.2	1.4	1.6	2.3	1.9	1.6	1.8	2.1
p99.99-p99.999	2.2	1.8	1.6	0.9	1.5	3.3	2.6	2.4	2.0	2.3
p99.999-p100	2.3	2.0	0.9	0.5	1.1	3.2	2.7	1.6	1.6	2.6

Notes: [a]All fractiles refer to the gross income concept EGI without capital gains. Bottom 90 group excludes cases with negative incomes.[b]Tax reform as described above in section 3.3.2.
Source: own computation based on TPP 2001-2006.

1%. For all top fractiles, NIE II is positive and clearly exceeds NIE I, reaching almost 4% for the richest groups in 2001.

The lower left panel of table 3.4 shows results for NIE I using permanent incomes. The lower right panel shows the same figures for NIE II. In both lower panels, the NIE shows the reform effect with respect to the fractile's permanent ENI over the respective period. The general pattern of the vertical effect mirrors the annual effect in both lower panels. The NIE is low below the top 1% and then generally grows with income. However, on permanent incomes the largest NIE is not always in the topmost group, albeit the top 0.01% are always the group with the largest effect. If shifting possibilities are allowed (NIE II), the effect is considerably higher. In the most longterm permanent income over six years, NIE II clearly exceeds 2% of ENI for all fractiles above the 0.01% percentile point, while it is below 1% in all lower fractiles.[50]

[50]See Appendix table 3.E.1 for simulated effective tax rates. Note that the simulation does not correct for personal

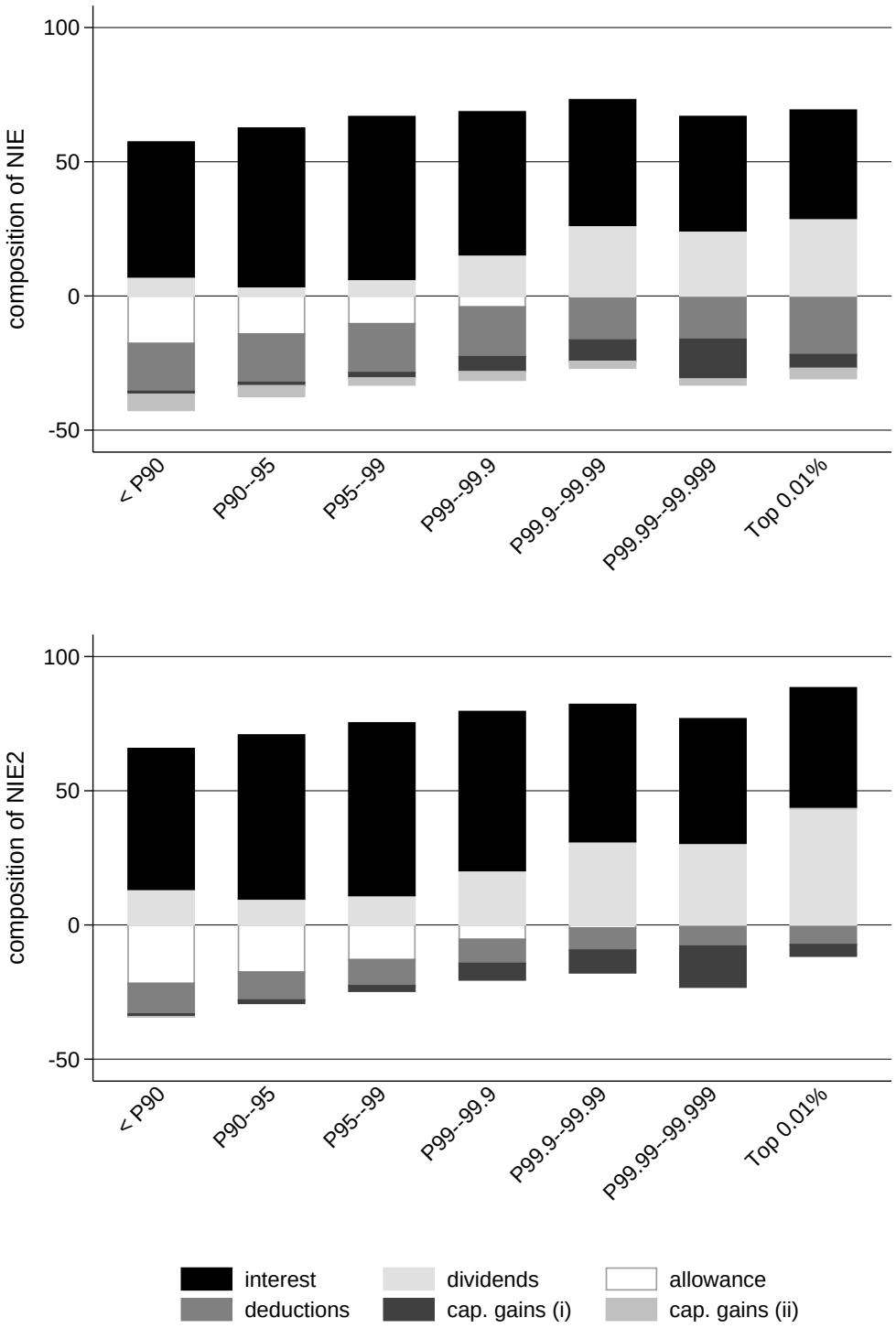


Figure 3.2.: composition of permanent NIE by income fractile

Notes: NIE for 6 year permanent income.
Source: own computation based on TPP 2001-2006.

We now turn to the decomposition of NIE I and NIE II by the reform components described in section 3.2. Figure 3.2 shows the decomposition by fractile for both post-reform scenarios. The upper figure refers to the first post-reform scenario, the lower figure refers to the second post-reform scenario. The decomposition shows that both positive and negative reform components have a considerable impact. Interest and dividend income increase the NIE as UStR 2008 reduced marginal tax rates on these income types. Income specific deductions and capital gains of type (i) decrease the NIE due to reduced deduction possibilities and the increased taxable share of capital gains of type (i). In addition, each tax unit has an allowance for capital income. This saver's allowance is deducted from the PIT tax base in the pre-reform scenario, and it is deducted from the withholding tax base in the post-reform I scenario. In the latter scanario, the tax rate is lower than in the former. This causes a degression effect that decreases the NIE and is reported separately. The average NIE is positive for all fractiles and in both scenarios. The tax rate change on interest income is the largest single component for all fractiles. The importance of dividends and capital gains of type (i) strongly increases towards the top, while the importance of the saver's allowance decreases. Income related deductions play a considerable role in all fractiles. Those capital gains of type (ii) that are reported reduce the NIE I: they are negative to a large part, thereby decreasing the pre-reform tax base, while they cannot be credited against positive income from other sources in the withholding tax regime. When realized inside the unincorporated business sphere (post-reform II), the taxable share of capital gains of type (ii) increases, thereby slightly increasing NIE II. In post-reform scenario II, the negative impact of deductions is reduced, albeit still present. The reduction is relevant for all fractiles, but larger towards the top.[51]

In sum, the vertical effect is regressive, as the reform has virtually no impact below the top percentile, while it ever more increases net income towards the very top. The effect of the tax base broadening by capital gains of type (ii) can only be simulated to a small extent. Its impact depends on the level of stock dividends (as opposed to dividends from closely held corporations). In general, capital gains of type (ii) are extremely volatile, yet they might sum up to income levels comparable to stock dividends in the long run (see Appendix figure 3.D.3). While the share of dividends in total income increases towards the top, survey data suggests that dividends stem increasingly from closely held corporations towards the top, rendering the progression effect ambiguous – yet, available figures suggest that the tax base broadening reduces NIE II by roughly two-thirds in the three richest fractiles if one expects the capital-gain return to equal the dividend return in the long run, suggesting that the effect is reduced, but not offset (see Appendix 3.D for a detailed discussion).

deductions such as charitable giving, which can have a substantial regressive effect even in the pre-reform scenario.

[51] The simulated annual tax expenditure amounts to roughly 1.1 billion € in the post-reform I scenario and 1.7 billion € in the post-reform II scenario. See Appendix figure 3.B.1

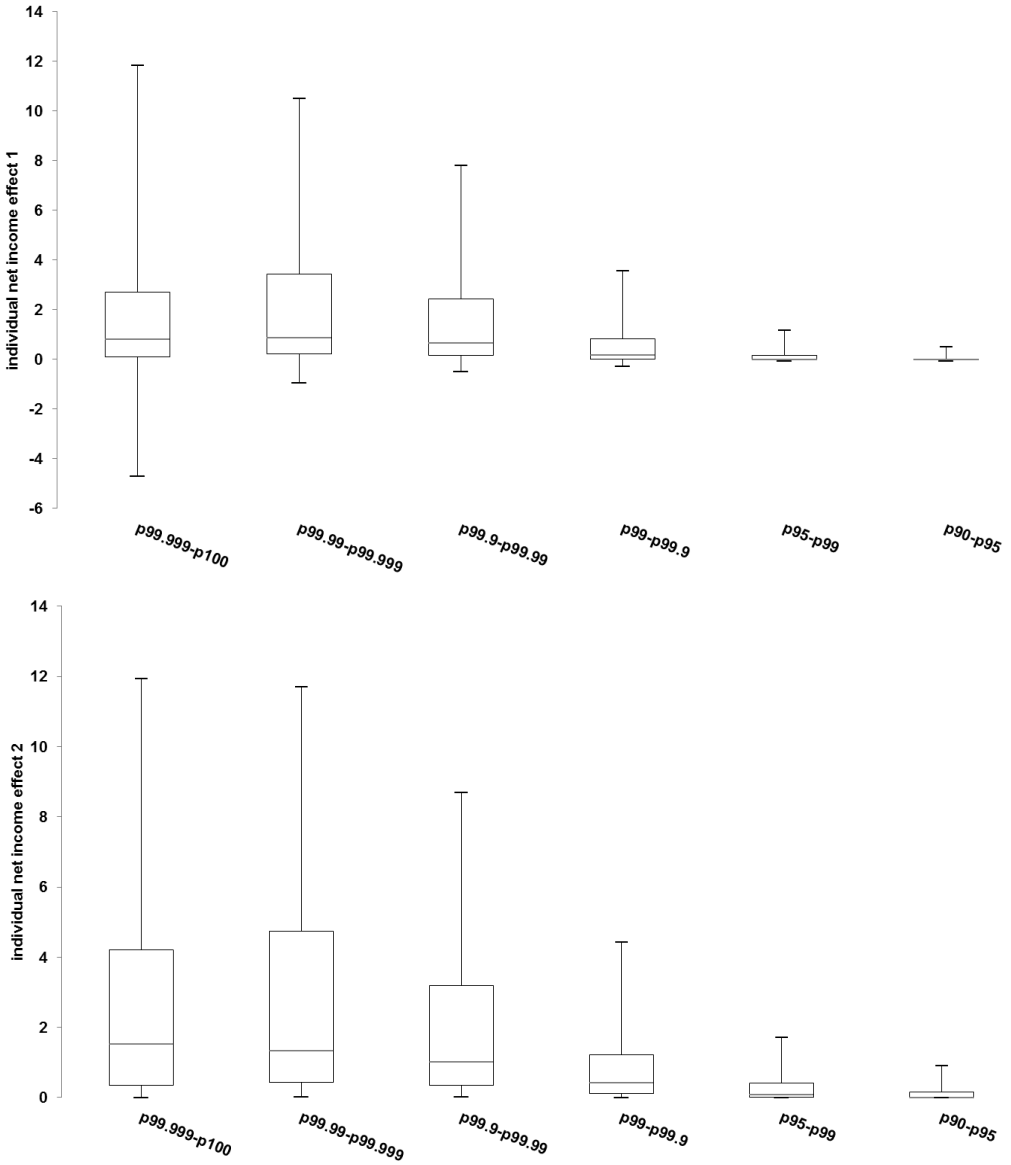


Figure 3.3.: distribution of net income effect by income fractile
(permanent effect, fractiles based on 6 year mean income)

Notes: Whiskers correspond to 5 % and 95 % percentile points.
Source: own computation based on TPP 2001-2006.

3.4 Horizontal Effect

While the vertical effect has been shown to be regressive, positive and negative components may be distributed unequally across the tax units within a given fractile, as their relative size depends on the composition of income and deductions. The horizontal effect is of particular importance if we think about the accumulation effects of the reform and their impact on income concentration. If capital income at the top is owned by few tax units within the top, their wealth will accumulate faster than that of tax units with high labor or business incomes. Figure 3.3 shows the distribution of individual net income effects by income fractile. The picture below the top 5% does not change much. The net income of most tax units between P90 and P95 does not change much. In the higher fractiles, individual net income effects are more heterogenous. The bulk of the top income tax units has considerable positive net income effects. For the first post-reform scenario, the 75% percentile tax unit in the group between P99 and P99.9 gains roughly 1% of its net income, while the 95% percentile tax unit gains about 4%. In the three fractiles above P99.9, the share of tax units with high net income effects is higher. The NIE I of the 75% percentile tax units in all three groups exceeds 2%, the 95% percentile tax units gain between 8% and 12%. However, some members of these three richest groups also suffer net income losses. In the top 0.001%, the reform reduces the net income of a quarter of all tax units in the post-reform I scenario. In the second post-reform scenario these losses can be prevented. For 95% of the fractile members in all groups NIE II is positive. As in the first post-reform scenario, high gains are predominantly present in the topmost fractiles: The 95% percentile tax units of the two richest groups gain about 12% of their previous net income. The horizontal analysis thus shows that the NIE distribution inside the fractiles is widely spread within the top income fractiles, suggesting that the bulk of the benefit accrues to few tax units.[52] Yet, the chance to exceed a given NIE threshold generally rises towards the top, confirming the regressive result found in the vertical analysis.

3.5 Limitations and Caveats

3.5 Shifting, Evasion and Real Responses

The main caveat of this paper's analysis is the restriction to the pre-reform capital income level and composition. If capital income is elastic with respect to marginal tax rates, we expect reported capital income to increase as a consequence of the tax rate reduction. Reported income may increase due to increased income realization, or due to decreased evasion and avoidance.

[52] Appendix figure 3.C.1 reinforces this finding: 80% of all tax units do not benefit from the reform, and the NIE exceeds 0.5% for roughly 5% of tax units. For tax units with positive NIE, average and median income strongly increase towards the highest NIE percentiles.

The withholding tax reform increased the tax rate on capital gains from stock shares, decreased the tax rate on interest and dividend income, and let the (zero) tax rate on other capital gains from private assets unchanged (see Appendix Table 3.A.1). Ceteris paribus, we would therefore expect income realization to have been shifted between income sources whose relative tax rates were changed: away from income sources whose marginal tax rates increased (primarily of type (ii)) or decreased less (e.g. unincorporated business profits that are still subject to the PIT), and towards corporate dividends and particularly interest income instead. Between the capital income sources, we expect shifting from corporate dividends towards interest income. A last possibility for income shifting is the realization of capital income inside the corporated business sphere – this yields the possibility of claiming income related deductions, but also opens the possibility of keeping returns inside the corporate sphere, where they are only taxed with the corporate tax rate of 15%. In the long run, this accelerates the capital accumulation inside the corporation. If avoidance and evasion occur at some cost, we also expect both to have decreased and taxable capital income to have increased in consequence. Last, there may have been real responses to the tax rate changes, in the sense that tax units put more effort in obtaining a high rate of return.

It is certainly beyond the scope of this paper to provide evidence on which of these reactions actually took place, and to what extent. Yet, it is insightful to discuss the general directions that have been found in the literature. In general, responses to changes in relative tax rates of different income sources have been found to include income shifting. For the Finnish dual income tax reform in 1992, Pirttilä and Selin (2011) find that capital income of the self-employed increased, while their total income did not. One obvious shifting possibility is an increase in the leverage ratio of privately owned firms: for non-listed Norwegian firms Alstadsæter and Fjærli (2009) find strong timing effects of dividends prior to and a reduced leverage ratio after an increase in the tax rate on dividends. For the German withholding tax reform, Fossen and Simmler (2015) find that leverage at the unincorporated firm level increased in reaction to the decreased marginal tax rate on interest income, but only to a small degree. This comparatively small effect in Germany might be a consequence of restricted applicability of the reduced tax rate on interest income for loans between family members, firm owners and firm, and similar cases (see §32d EStG) as it impedes shifting from business profits (both incorporated and other) to interest income. If shifting occurs from dividend income or unincorporated business profits towards interest income, the effect on progression depends on where in the distribution the shifting occurs. As both dividends and unincorporated business profits are concentrated at top of the distribution, it is not unlikely that progression further decreases – in particular, as the easy ways such as giving a loan to one's own firm are prevented by the tax law, and more elaborate ways might prevail at the top of the distribution.

Tax avoidance may have taken the form of income realization in tax-exempt income sources,

mainly capital gains from private assets like real estate, art or stock shares.[53] Relative to these income sources, the withholding tax reform should ceteris paribus have increased the after-tax return of taxable capital income, thereby increasing progression if avoidance increases towards the top. Tax evasion may have taken the form of income realization abroad. Here, we would expect a reform-induced shift to legal income realization in those income sources whose marginal tax rates were reduced. While this shift is likely to have taken place in reality, it is hard to prove whether it is reform-induced, because both the probability of detection and the penalties have recently increased.[54] The gain from income realization abroad is therefore likely to have decreased independently of the withholding tax reform. In addition, several states bought data on German capital incomes in Switzerland. Circumstantial evidence from the treasury of North Rhine-Westphalia (the largest German State) suggests that the treasury's purchases of data on tax evasion from Swiss bank employees since 2010 might have had a bigger impact on capital income declarations of previously evaded income than the withholding tax reform in 2009, suggesting that the enforcement margin is a promising one.[55]

Yet, to the extent to which the reform actually increased reporting, it increased annual progression compared to the results presented in section 3.4. In order to gauge the size of the effect, I suggest the following thought experiment: Suppose that reported capital income increased entirely due to reduced evasion. Then, true gross capital income stayed constant, while the reported portion increased, which increases the tax liability and therefore reduces the reform's effect on net income. As plausible sizes of the elasticity of capital income cover a considerable range,[56] I consider a range of different magnitudes of the elasticity of reported capital income in a back-of-the-envelope calculation: Figure 3.4 shows the change of the NIE and NIE2 by income fractile if reported capital income reacts to its marginal net-of-tax rate with an elasticity between zero

[53]Capital gains from real estate are tax-exempt if the estate had been held at least ten years. Capital gains from other private assets such as art or vintage cars are tax-exempt if the asset had been held at least one year.

[54]In 2005, most European countries agreed on mutually reporting interest income realization of other EU countries' citizens to the respective home countries. Those countries that did not agree to mutual reporting agreed to an anonymous withholding tax on these capital incomes. Furthermore, there were generous rules for unsolicited declarations of previous tax evasion until recently, which are about to become stricter from 2015 onwards.

[55]The treasury provides data on unsolicited declarations of previous evasion, see Finanzministerium des Landes Nordrhein-Westfalen, 2010, 2014

[56]Estimates of the elasticity of taxable income (ETI) in general cover a wide range, primarily depending on the instrumentation of the net-of-tax rate (see Saez et al., 2012 for a recent review). Doerrenberg et al. (2014) review more recent literature and show that the ETI in Germany seems to be primarily driven by deductions rather than real income generation: in their baseline specification, they find an ETI with respect to the net-of-tax rate of 0.49, but a zero elasticity of gross income. Lagging the instrument by one period increases the elasticity of gross income to 0.36, yet preserving the importance of deductions. In addition to the wide range of plausible estimations of the ETI, estimates typically refer to all income sources alike. One exemption is Kleven and Schultz (2014) who find a capital income elasticity for Denmark between 0.08 and 0.16 depending on specification and the size of the tax rate difference. They also find that the elasticity is larger when tax rate changes are large, extending a result of Chetty et al. (2011) to capital income. This would suggest comparatively large reactions to the German withholding tax reform, particularly for interest income.

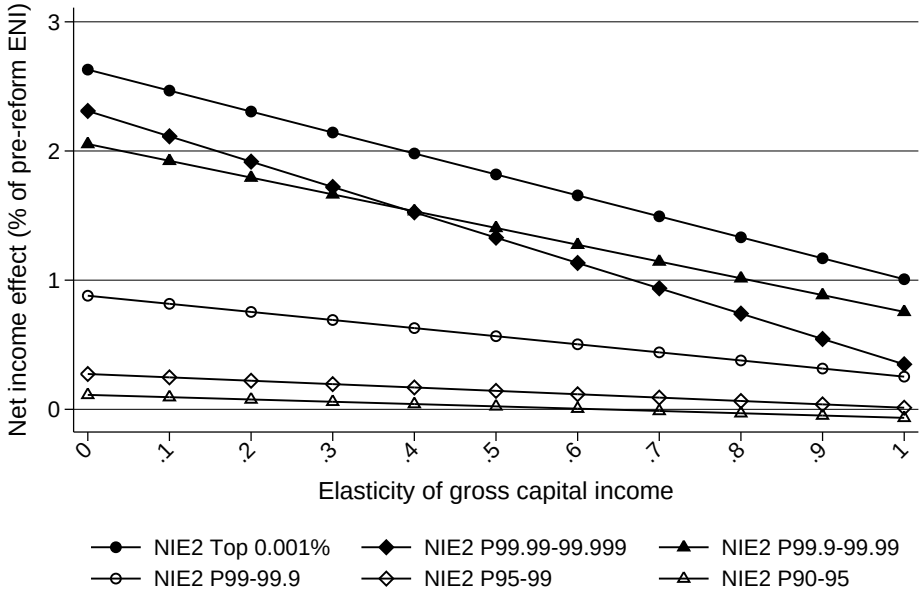


Figure 3.4.: NIE with different taxable income reactions

Notes: fractiles based on 6 year permanent income.
Source: own computation based on TPP 2001-2006.

(corresponding to results in section 3.4) and one. The change in the fractiles' tax liabilities is calculated assuming a marginal PIT tax rate of 42% for P90–99.9 and of 45% for the top 0.1%. These, I apply to dividend and interest income in the fractile corresponding to the pre-reform legislation, without considering reductions (as it is not clear whether these are relevant at the margin). For the post-reform marginal tax rates, I use the withholding tax rate and additionally the corporate tax rate (for dividends) corresponding to the post-reform legislation. The increase in reported capital income is then taxed in the post-reform legislation and the resulting additional tax is substracted from the increase in net incomes when calculating NIE. The NIE thus still refers to pre-reform ENI as reported, to keep results comparable. The additional tax can exceed the benefit from the reform if the benefit was comparatively low, e.g. due to high income-related deductions (more probable for NIE I), or because taxable capital income did not exceed the saver's allowance by much (more probable in lower fractiles), rendering the resulting NIE negative. This calculation thus only considers additional cost due to taxation, but not the reduced risk of being fined for tax evasion. Results suggest that the elasticity would have to be quite sizable compared to empirical findings in order to substantially reduce the reform's progression effect: at an elasticity of broad capital income of 0.4, the average NIE is still around 2% of ENI for the top 0.01% and around 1.5% of ENI for the top 0.01%.

3.5 Accumulation Effects in the Long Run

The analysis of this paper was restricted to the reform effect on tax units' annual net income. However, the importance of taxation in the long-run dynamics of the income distribution comes in with the accumulation effects of the increased net income. Piketty (2003, 2007) argues that progressive taxation was the main reason for the post-WWII decrease in income concentration in Europe and the US and gives example calculations on how fast a capital stock accumulates depending on the rate of return and the tax rate. Applying these calculations to the German withholding tax reform leads to very different results depending on the composition of income. Table 3.5 gives an example: it shows the multiplication of the asset value for tax units in the top PIT bracket. It considers two consumption levels (50% of the initial pre-tax asset returns and zero consumption) and three real rates of return (2%, 5%, and 8%). Before the tax reform, the tax rate interest income was 45%. A tax unit consuming 50% of the pre-tax return thus saved 5% of the return (8.1% for dividends). After the tax reform, the tax unit saves 25% of the interest or 15% of the return on dividends. Without consumption, the figures increase. The accumulation effect depends on the rate of return: with a comparatively low rate of return, after 50 years the asset value has grown by 70% for the pre-reform interest tax rate, and by 110% for the post-reform interest tax rate. With a higher rate of return, the effect rapidly increases. Note that the rate of return is likely to depend on the size of wealth: while the real rate of return on small bank accounts doesn't have to be positive at all, Piketty (2014) finds real rates of return for US universities with large fortunes well above 8% between 1980 and 2010 (Table 12.2, p.448). The accumulation effect of the reform is thus twofold: first, it increases the speed at which fortunes grow, for rentiers more than for tax units who receive primarily labor or unincorporated business income. Second, if the rate of return increases with wealth, the accumulation effect at the top further increases.

Table 3.5.: Accumulation effect: multiplication of assets after 50 years

			c = 50%			c = 0%		
			r = 2%	r = 5%	r = 8%	r = 2%	r = 5%	r = 8%
Interest:	pre	t = 45.0%	1.1	1.3	1.7	1.7	3.9	8.6
	post	t = 25.0%	1.4	2.8	6.8	2.1	6.3	18.4
Dividends:	pre	t = 41.9%	1.1	1.4	2.2	1.8	4.2	9.7
	post	t = 35.0%	1.2	1.9	3.7	1.9	4.9	12.6

Notes: c denotes the consumption level as portion of the pre-tax return. r denotes the rate of return. Tax rates correspond to pre and post-reform tax rates on interest and dividend income (see Table 3.A.1).
Source: Application of Piketty (2007) (Table 3.2) to the German withholding tax reform

3.6 Conclusion

This paper analyzed the effect of the introduction of a final withholding tax on capital income on the progression of the German personal income tax. The final withholding tax was introduced in the broader tax reform framework of UStR 2008. Those reform components of UStR 2008 that directly impact on the PIT are taken into account in this paper's simulation, with partial exception of a tax base broadening with respect to capital gains from stock shares. The analysis is based on a microlevel panel dataset of income tax returns between 2001 and 2006. The data thus stems from a pre-reform period. It therefore contains all taxable income types including capital income (but excluding most realized capital gains). It is thus suitable to explore the distribution of total taxable income by income source and income fractile. For all data years, the pre-reform scenario of the 2008 legislation was derived and compared to two post-reform scenarios. The first post-reform scenario captures the first-round effect of the reform if tax units to not adjust their income reporting. The second post-reform scenario allows for a choice between realizing the capital income in the private sphere or in the business sphere. Using the panel structure of the data, a permanent reform effect was derived, which depends less on annual changes in income composition. The reform effect was shown to be regressive. Below the P95 percentile point, the reform's effect on net income is negligible. Decomposing the net income effect by reform component reveals that negative components play a major role and reduce the net income effect to a considerable extent. The negative effect of deductions and capital gains is important in all top fractiles. While the effect of the abolition of income source specific deductions is stable over the years, the size of the negative effect of a higher tax rate on capital gains differs between the six analyzed years. Within the top fractiles, the benefit of the reform is distributed unequally. Although some reform components reduce net incomes, the net income of most tax units in the top fractiles increases. When tax units can chose between the withholding tax and declaring their capital income as business income, the negative impact of the deduction restriction decreases. The horizontal distribution of the net income effect is heterogeneous in the top fractiles, but the bulk of the tax units at the top gains due to the reform. If a change in reporting behavior is allowed for, 95% of tax units in the top income fractiles have positive net income effects. In the second post-reform scenario, almost no tax units at the top suffer net income losses. The analysis has shown that the reform has a regressive impact on the German PIT. While some tax units at the top of the distribution benefit strongly, the rest of the distribution was almost not affected.

Behavioral responses to the reform could both increase or decrease the progression effect – if income is shifted towards sources whose marginal tax rates were reduced, the simulated progression effect undercuts the true effect. By contrast, if the reform induces the declaration of income that was previously hidden from the tax authorities, the true progression effect is reduced. However, even if only the latter reaction took place, the elasticity of reported capital

income would have to exceed plausible levels in order to reverse the progression effect. In the long run, reduced taxation of capital income is likely to accelerate capital accumulation at the top - first, because the current top fractiles have a comparatively high share of capital income, second, because rentiers will move to the top as capital income grows faster as income from other sources. The reform thus enforces the decline of top tax progression in Germany, that has been recognized by earlier research.

Appendix 3.A Tax Reforms and Tariff Evolution

Table 3.A.1.: Evolution of top tax rates 1999-2009

	PIT[a]	dividends[b]		interest[c]	cg (i)[d]	cg (ii)[e]	Δ[f]				corp.[g]
[1ex]		*cash*	*gross*				*div*	*int*	*cg I*	*cg II*	
					synthetic PIT: full corporation tax credit						
1999	53.0		53.0	53.0	53.0	0.0	0.0	0.0	0.0	100.0	40.0
2000	51.0		51.0	51.0	51.0	0.0	0.0	0.0	0.0	100.0	40.0
2001	48.5		48.5	48.5	48.5	0.0	0.0	0.0	0.0	100.0	25.0
					synthetic PIT: 50% regime						
2002	48.5	24.3	43.2	48.5	24.3	0.0	11.0	0.0	50.0	100.0	25.0
2003	48.5	24.3	44.3	48.5	24.3	0.0	8.6	0.0	50.0	100.0	26.5
2004	45.0	22.5	41.9	45.0	22.5	0.0	6.9	0.0	50.0	100.0	25.0
2005	42.0	21.0	40.8	42.0	21.0	0.0	3.0	0.0	50.0	100.0	25.0
2006	42.0	21.0	40.8	42.0	21.0	0.0	3.0	0.0	50.0	100.0	25.0
2007	45.0	22.5	41.9	45.0	22.5	0.0	6.9	0.0	50.0	100.0	25.0
2008	45.0	22.5	41.9	45.0	22.5	0.0	24.2	0.0	50.0	100.0	15.0
					withholding tax						
2009	45.0	25.0	35.0	25.0	27.0	25.0	22.2	44.4	40.0	44.4	15.0

Notes: Top marginal rates: [a]in progressive PIT [b]on dividends [c]on interest [d]on capital gains type (i) [e]on capital gains type (ii) (see section 3.2 [f]Difference between top PIT tax rate and top tax rate of respective income source (%) [g]Corporation tax rate.
Source: German PIT legislation, 1999 - 2009.

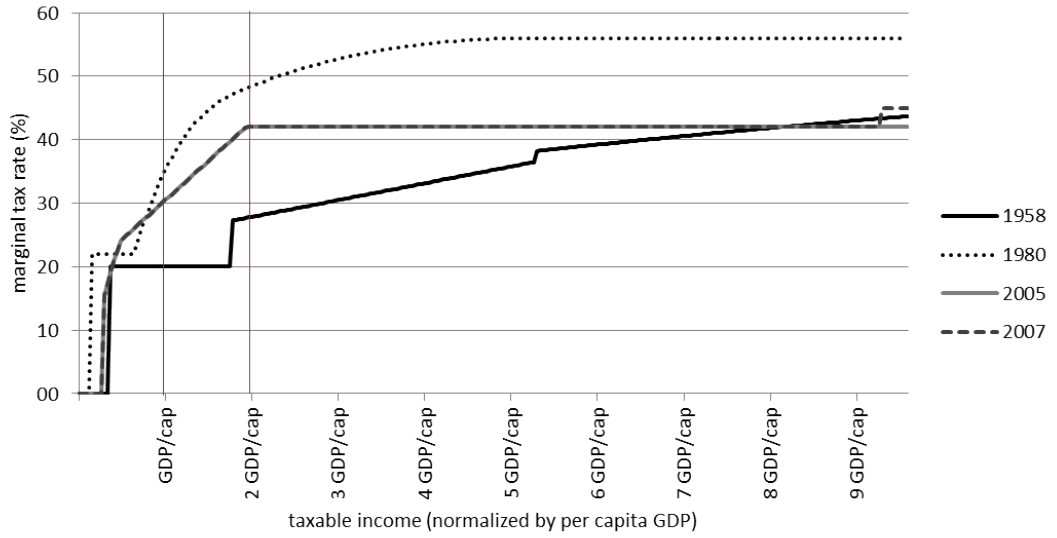


Figure 3.A.1.: Evolution of marginal tax rates on multiples of per capita GDP

Notes: [a]y denotes per capita GDP.
Source: own computation based on income tax tariffs and per capita GDP (**StaBAbip_cap**).

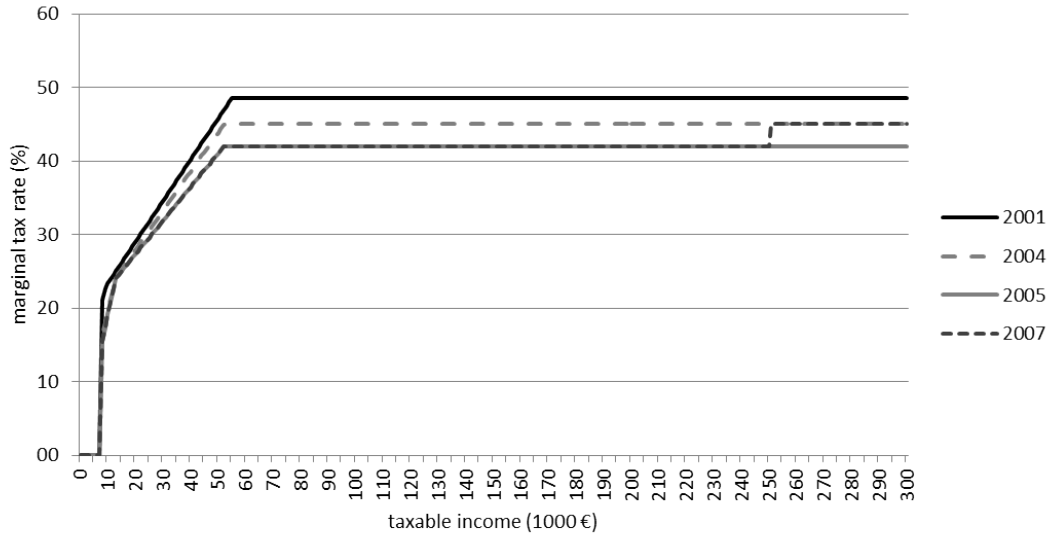


Figure 3.A.2.: Marginal tax rates, 2001-2007

Notes: All Tarrifs refer to single tax units. Married couples are taxed at the rate that corresponds to the single-tax unit tariff at half their joint income. Tariffs for 2005 and 2007 coincide with exception of the second proportional bracket (taxable incomes above 250,000 € in 2007. The second proportional bracket was postponed to 2008 for self-employed and entrepreneurial income from unincorporated business.
Source: own computation based on German income tax tariffs.

Appendix 3.B Aggregated Reform Effect

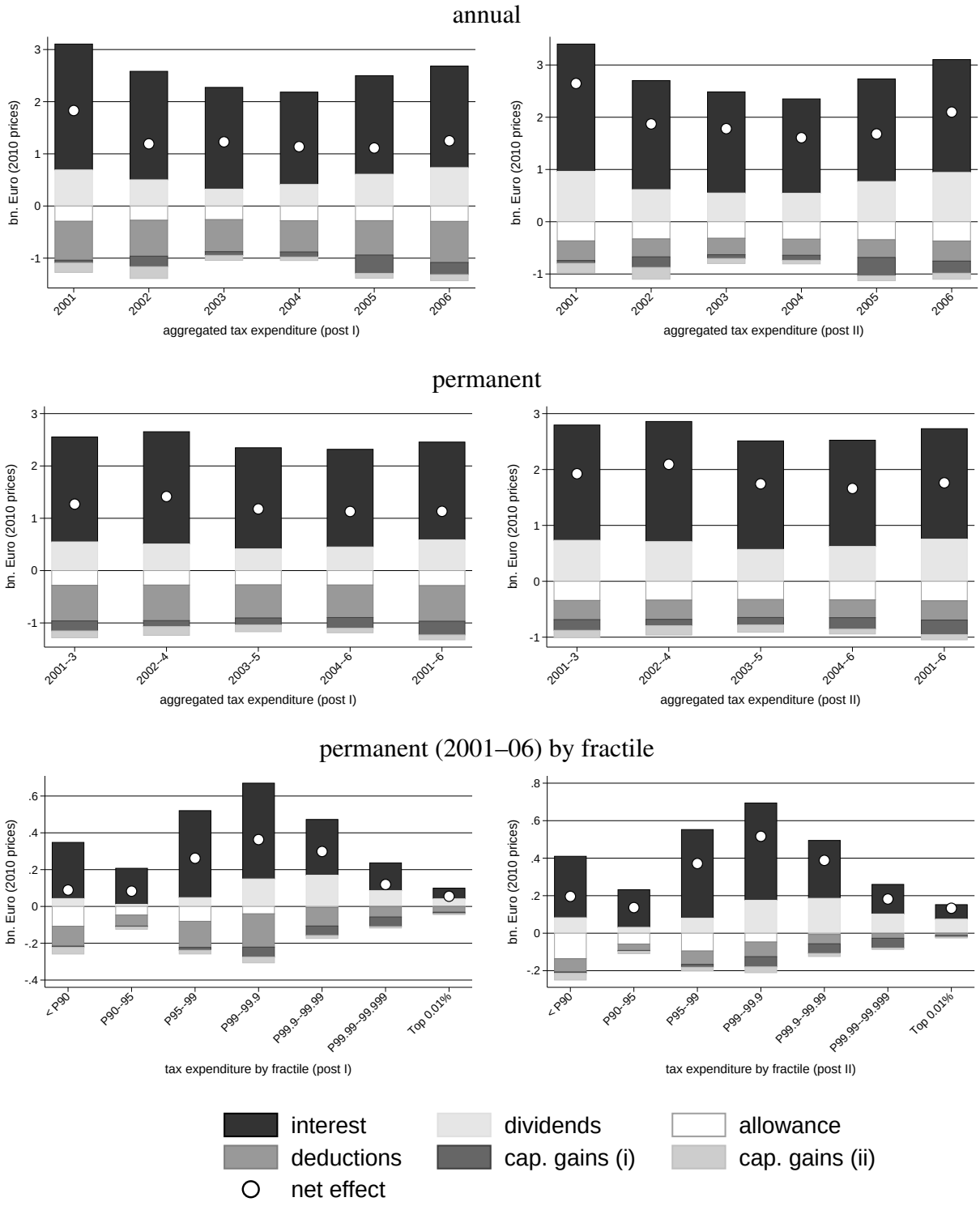
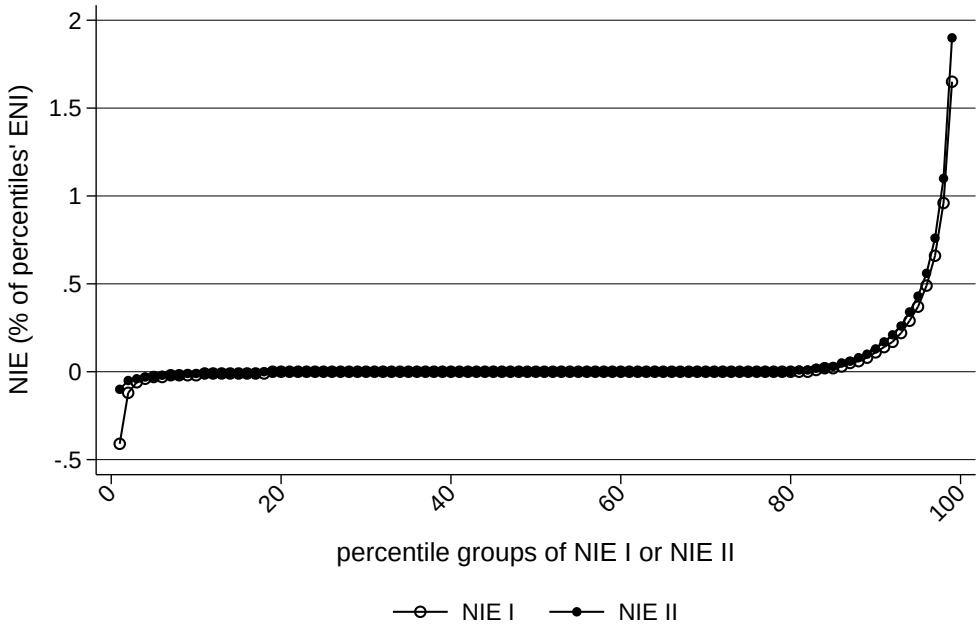


Figure 3.B.1.: aggregated Tax expenditure by reform component and period

Notes: Annual aggregate of TPP population (adjusted panel weights).
Source: own computation based on TPP 2001-2006.

Appendix 3.C Distribution of NIE by Percentiles



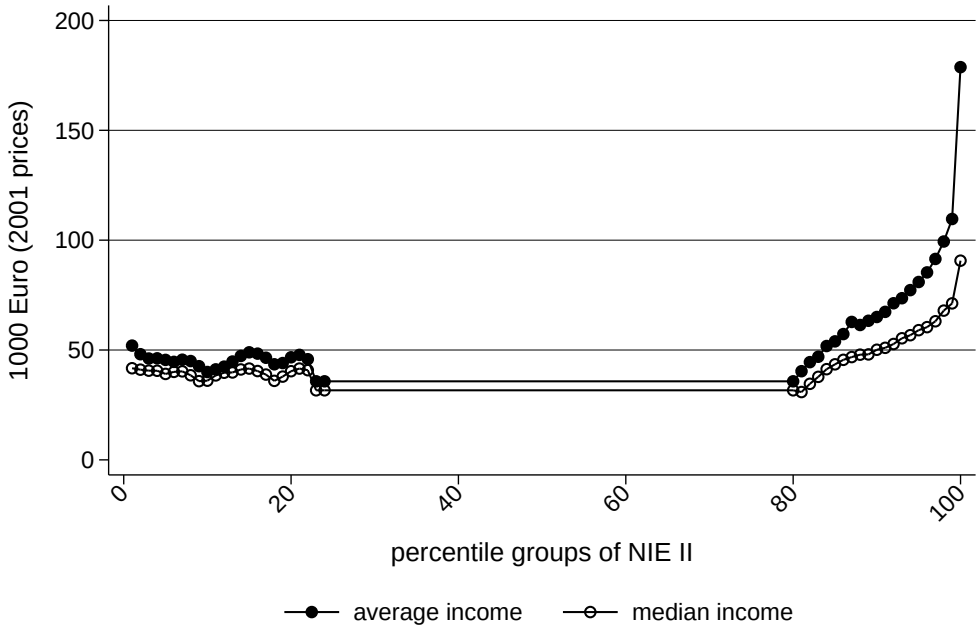


Figure 3.C.1.: Distribution of six-year average net income effect 1 and 2 by NIE percentile and corresponding size of income (mean and median for NIE2)

Notes: Unadjusted panel weights.
Source: own calculation based on TPP 2001-2006.

Appendix 3.D Capital Gains Type (ii)

The reform component of broadening the tax base by including capital gains of type (ii) into the withholding tax base cannot be comprehensively simulated, first because the income information is not fully included in our pre-reform data, and second because capital gains from those years were on average negative and therefore would not provide a reliable proxy for long-term income. We can nonetheless argue in how far this tax base broadening is expected to offset the otherwise regressive reform effect. Table 3.D.1 reports the critical level of the capital gain from stock shares per observed dividend that would result in a revenue-neutral reform by fractile. Note that observed dividends in the data comprise dividends from stocks (by whose capital gains the tax base was broadened) and dividends from closely held corporations (whose capital gains have always been taxable in the German PIT). In both NIE concepts, the critical level generally decreases towards the top, indicating that the offsetting effect of the tax base broadening is higher for the top fractiles, provided that the dividend composition (stocks / closely held companies) does not vary across the distribution. Within the top 0.1, the reform is (on average) neutral if the capital gains from stock shares amount to about 45% of dividends from both stocks and closely held corporations.

In the following, I aim at deriving a reasonable interval for the expected long-run capital gain of type (ii) per observed dividend. I proceed in three steps: First, using National Accounts, survey data, and PIT micro data, we can guess on how much of the dividend income in our data actually stems from stock shares, and how the composition of dividend income varies across the income distribution. Second, we can look at the composition of the return on stock shares: the portions of dividends and capital gains of type (ii) in the total return can be assessed using stock market indices (see Dimson et al., 2002). Last, in order to gauge the size of the additional tax base since 2009, we can compare the tax base of the withholding tax on interest income (which has been including capital gains of type (ii) since 2009) with interest income of the household sector reported in national accounts (which has not).

The most basic question is what portion of dividends in the PIT records actually stems from stock shares. In order to access the relative levels of dividend income from stocks and from closely held corporations, I use national balance sheets, survey data from the panel of household finances (PHF, Deutsche Bundesbank, 2013, documented by Kalckreuth et al., 2012), and PIT micro data.

The aggregate size of corporate shares held by the German household sector as reported by national balance sheets is shown in table 3.D.2. The quota of listed stocks in total corporate firm wealth varied roughly between 31% and 46% between 1999 and 2013. Stock shares amounted to less than half of the corporate firm wealth held by the household sector. As the stock market crashed in 2001 and 2002, the relative value of stock shares was well below 40% throughout

our data period (2001–06). If we assume comparable levels of dividend returns, the share in corporate wealth should translate into a similar share of stocks in the aggregated household dividend income.

We now turn to the composition of dividend income across the distribution. We first look at PHF survey data and then turn to PIT micro data. PHF data was designed to capture private wealth and income and oversamples high-income households. Table 3.D.3 shows PHF households by income fractile (fractiles are defined in the same way as on the tax record data using the 2010 population total). The first two columns report average and minimum gross income by fractile. The next four columns report average capital income from financial assets, closely held corporations, stocks, and stocks including funds that consist mainly of stocks.

Neither dividend income from closely held firms nor dividend income from stock shares is directly reported in PHF data. Both are imputed as follows: Dividend income from closely held corporations can be computed using income from private firms (which comprises income from both incorporated and unincorporated firms). If the household holds a share in a closely held corporation, dividends correspond to the reported firm income. If the household owns several enterprises including partnerships (i.e. unincorporated firms), firm income is divided between these firms according to reported firm value.

Dividend income from stocks and funds is imputed using the expected 2009 dividend income given 2010 portfolio value: the data report stock portfolio values for 2010, while the dividend income should relate to 2009 (in order to match the closely held corporation dividend). I thus divide the 2009 dividend aggregate in the German stock market (derived using CDAX, see below) by the 2010 market capitalization. I then apply this counter-factual return (3.5%) on portfolio values as reported in the data (for 2010). Note that the imputed dividend income including stock funds almost reaches the level of total income from financial assets (which includes interest income) in the top percentile. As it is possible that funds do not distribute the dividends, dividends from stocks may be seen as a lower bound of financial dividends, while dividends from both stocks and stock funds may be seen as an upper bound.

The seventh and eights column report the resulting quotas of dividends that stem from stocks (or from stocks and stock funds combined) in total dividend income. This quota is 40.1% over all households if financial dividends stem from stocks only and 53.8% if stock funds are expected to distribute their dividends. Compared to national balance sheets, the lower-bound quota over all households roughly equals the corresponding quota of the portfolio value of listed stocks in the value of total shares in 2009. The quota decreases towards the top (but not monotonously) in both definitions of financial dividends, suggesting a dividend quota from stock shares roughly between 29% and 30% for the top percentile, while dividends in the bottom 90% almost entirely stem from stocks. These results indicate that capital gains of type (ii) and therefore the tax base broadening may play a more important role below the top percentile, given the dividend level.

Yet, results are not necessarily conclusive, as survey data does not include the very top of the distribution.

PIT micro data provides a second glance on differences in the share of stock dividends in total dividends. Even though most capital gains from stock shares had not been taxable before 2009, those from short-term investments had. At the same time, capital losses could be credited against other taxable income if they were realized within a year from the stock purchase. If we assume that income fractiles do not differ in their portfolio strategies within stock market investment, reported capital gains from stocks can inform us about the relative composition of dividends across fractiles. Figure 3.D.1 shows the taxable (i.e. short-term investment) capital gain from stocks per dividend by income fractile, for annual cross-sectional data from 2001 to 2008. The realized capital gain per observed dividend decreases towards the top, supporting the above result that more dividends at the top stem from closely held companies. Note, however, that after 2001, dividends are not necessarily reported in the data if capital income undercut the savers' allowance (which was considerable up to 2006), while capital gains are always reported, as far as taxable. This biases the share of capital gains upwards for the lower fractiles. Yet, we also see a decrease in stock capital gains towards the top within the top percentile. Also note that the top has a larger incentive to chose risky investments and to report capital losses than the bottom of the distribution, as the degression effect is larger. For the same reason, the top has a stronger incentive not to realize short-term gains. A decrease in gains per dividend towards the top is therefore what we would expect even if initial portfolio compositions coincided, but a decrease in losses per dividend in the bear market years strongly indicates relatively fewer stock market dividends at the top.

Let us now turn to the relative size of dividend return and capital gain return in the German Stock market. I analyze the composition of the return on stock shares using the most comprehensive German stock market index (CDAX), which includes all German stocks that are traded on the Frankfurt stock exchange. There are two CDAX time series: the performance index describes the returns of the market portfolio with reinvested dividends.[57] The course index describes the returns of the market portfolio without reinvested dividends. Both index time series are corrected for events that have no impact on portfolio values, such as the issuing of new stocks. The annual total return corresponds to the performance index's annual growth rate. The annual capital gain return corresponds to the course index's annual growth rate. The dividend return corresponds to the difference between total return and capital gain return.

Figure 3.D.3 shows the development of the real annual dividend and capital gains returns in the German stock market since 1995. While the annual dividend return follows a comparatively sta-

[57]Both indices are published as a monthly time series since 06/1994 by the German Central Bank (*Bundesbank*). Time series nos. are BBK01.WU001A (CDAX course index) and BBK01.WU018A (CDAX performance index). For details on index computation see Deutsche Börse AG (2014).

ble path with a positive time trend, annual capital gains are highly volatile, even if assessed over long periods. The indicator we are interested in is the capital gain per stock market dividend. It is shown in figure 3.D.4 for different period lengths between five and fifteen years. Even long-term averages of the indicator are highly volatile. In five-year periods, capital gains amounted to both close to ten times and about minus seven times the dividend return. The fifteen-year averages rather suggest a long-term return between zero and one time the dividend return. Clearly, what we expect as average future return depends on our expectations on the stock market development. If we believe in a regularity in crashes similar to the years 2000–10, the apparent tax-base broadening does not increase taxes, as capital gains are not necessarily positive. If we believe in a rather growing path, say, equality between dividend and capital gains returns,[58] the tax-base broadening effect is potentially large. At the back of an envelope, we can thus conclude with a rough calculation: let us assume that 30% of dividends at the top stem from stocks, and that each stock dividend corresponds in the long run to an equally-sized capital gain. In the day-after scenario (NIE I), the tax-base broadening would then on average more than offset the gains for the top 0.01%, and about offset the gains for the next 0.09% (P99.99–99.999), while the rest of the top percentile would still gain on average. In the adjusted-reporting scenario (NIE II), the gain would on average not be offset in any percentile, but it would be reduced to one-third for the top 0.01%. Note, however, that capital gains are only taxable as far as realized, so that the accumulation of the portfolio value occurs untaxed as long as assets are not sold.

A last way of gauging the impact of capital gains of type (ii) on the personal income tax base is comparing the withholding tax base with interest income in national accounts: the tax base broadening should be reflected in the aggregate tax base of the withholding tax on interest income. This tax had been withheld by financial institutions since 1993 as pre-tax to the income and corporation tax, before it was turned into the final withholding tax in 2009. Since 2009, the tax base has included capital gains of type (ii), with generous transitional rules. Figure 3.D.5 shows the aggregate tax base as well as its share in total interest income of the household sector as reported in national accounts. The share of the tax base in national accounts shows a positive time trend in general, as the tax base was broadened before (e.g. by a gradual decrease in the saver's allowance until 2007). The general portion of the tax base as compared to national accounts cannot be compared to years before 2007 in a meaningful way. Interest income in 2009 is expected to be strongly driven by income timing. The possibilities of gauging the impact of capital gains of type (ii) in the tax base are therefore limited. One could, however, ask whether the annual pattern of capital gains as shown in Figure 3.D.3 is repeated in the tax flow: Capital gains were comparatively high in 2010, 2011, 2013, and 2014, but negative in 2012. Apparently, this pattern is not repeated in the withholding tax base. Yet, if capital gains are realized more

[58] Which is about what Dimson et al., 2011 (updating a series from Dimson et al., 2002) find for about the last century of the US stock market: they find a capital gain return of 5% and a total return of 9.4% from 1900 to 2010.

smoothly, the increasing portion of the tax base in national accounts might reflect the gradual tax base broadening as the impact of transitional rules decreases over time.

In sum, our knowledge about the importance of the additional tax base for the distributional result of the withholding tax reform remains fairly limited. It depends on the portion of dividends that actually stem from stock shares, and particularly on differences in this portion across the distribution. Yet, the available data suggests a smaller portion of stock dividends in total corporate dividends at the top. The long-time return in terms of capital gains has been highly volatile in the German stock market over the last two decades. It can be argued that a reasonable size for the expected long-term capital gain return per dividend might be up to 100%. These results suggest that the impact of the additional tax base might be sizable in the long run, but does most likely not reverse the progression results.

Last, the tax base seems to have actually increased over the past few years, yet it does not reflect the annual pattern of capital gains of type (ii). Taken together, the tax base broadening effect on effective progression seems unlikely to completely offset the regressive tax rate effect.

Table 3.D.1.: Critical values for capital gain per dividend

fractile	NIE	NIE2	critical values (%) excess tax on div.		capital gain per div.	
	(%)		$NIE = 0$	$NIE2 = 0$	$NIE = 0$	$NIE2 = 0$
P90–95	0,1	0,1	14,2	23,4	56,8	93,5
P95–99	0,2	0,3	16,9	24,0	67,8	96,1
P99–99,9	0,6	0,9	11,0	15,7	44,1	62,7
P99,9–99,99	1,6	2,1	9,4	12,2	37,5	48,7
P99,99–99,999	1,5	2,3	7,1	10,8	28,3	43,2
Top 0,01%	1,1	2,6	4,6	11,2	18,5	44,7

Notes: Critical values denote: (i) the excess tax on dividends that would leave the fractile's average net income unchanged by the withholding tax reform; (ii) the level of capital gains per reported dividend for the reform to be net-income neutral.
Source: Own computation based on TPP 2001–06

Table 3.D.2.: Value of shares owned by the household sector

	listed stocks	non-listed stocks	other shares	quota of listed stocks
1999	267.6	203.0	112.1	45.9
2000	250.8	190.0	132.4	43.8
2001	202.3	154.6	175.1	38.0
2002	111.4	86.2	164.0	30.8
2003	143.2	110.7	165.4	34.2
2004	153.5	118.5	166.8	35.0
2005	182.6	137.4	193.0	35.6
2006	192.8	125.4	229.8	35.2
2007	192.9	166.8	228.0	32.8
2008	121.7	54.0	215.1	31.1
2009	158.4	38.5	202.1	39.7
2010	190.8	46.4	184.4	45.3
2011	166.4	48.9	188.5	41.2
2012	191.1	57.2	198.4	42.8
2013	223.1	66.1	198.3	45.8

Notes: Values refer to the month of October. Without shares of investment funds.
Source: National balance sheets for the household sector, Deutsche Bundesbank time series BBK01.CEFI0J, BBK01.CEFJ0J, and BBK01.CEFK0J.

Table 3.D.3.: Dividends from stock shares and closely held companies (2009)

	gross income[a] (€)		avg. capital income (€)				quota[f] (%)		observations	
	avg.	min.	FA[b]	Ltd[c]	St[d]	St&F[e]	St	St&F	weighted[g]	obs.[h]
Top 1%	266,991	173,740	4,641	10,133	2,319	4,463	18.6	30.6	487,140	128
P95–99	131,135	104,100	2,189	315	482	752	60.4	70.5	1,949,597	344
P90–95	88,147	77,900	1,140	318	261	419	45.0	56.9	2,434,010	362
<P90	32,376	0	404	2	45	81	94.9	97.1	34,802,252	2,731
all	43,531	0	589	162	108	188	40.1	53.8	39,673,000	3,565

Notes: Fractiles are based on PHF weights and 2009 population total. [a]gross income: household and personal income. [b]FA: income from financial assets as reported in data [c]Ltd: dividends from closely held corporations (dividend income from private firms as far as household owns closely held corporation) [d]St: dividends from stocks (imputed based on 2009 dividend sum and 2010 market capitalization in German stock market (CDAX) and 2010 stock portfolio value as reported in data) [e]St&F: dividends from stocks and funds that consist mainly of stock shares (imputed as described above)[f]quota: portion of total dividends that stems from stocks (St) or from stocks and stock funds (St&F), based on imputed dividend returns for stocks and stock funds. [g]number of frequency weighted observations. [h]number of observations.
Source: German Panel on Household Finances (Deutsche Bundesbank, 2013), German stock market indices (CDAX).

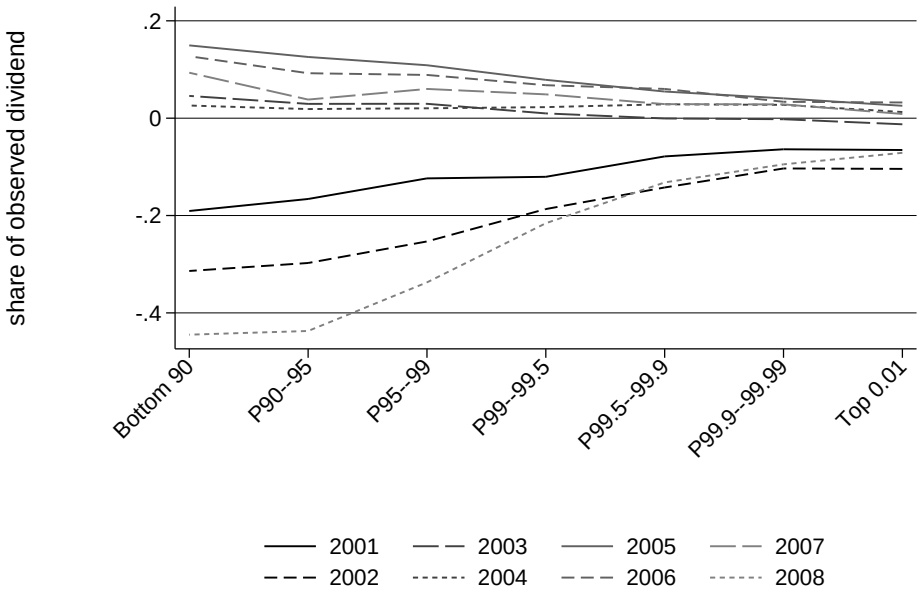


Figure 3.D.1.: Capital gains from stock shares, fraction of gross dividend 2001–2008

Notes: Taxable capital gains from stock shares (stock shares have been held for less than one year)
Source: own computation based on annual PIT micro data.

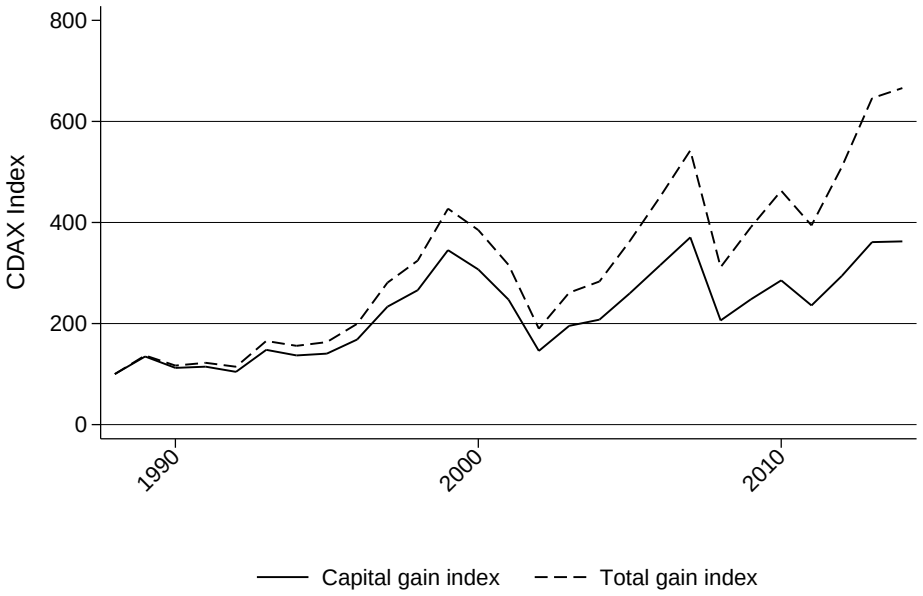


Figure 3.D.2.: CDAX Index, 1988–2014

Notes: Real index development.
Source: own computation based on CDAX time series.

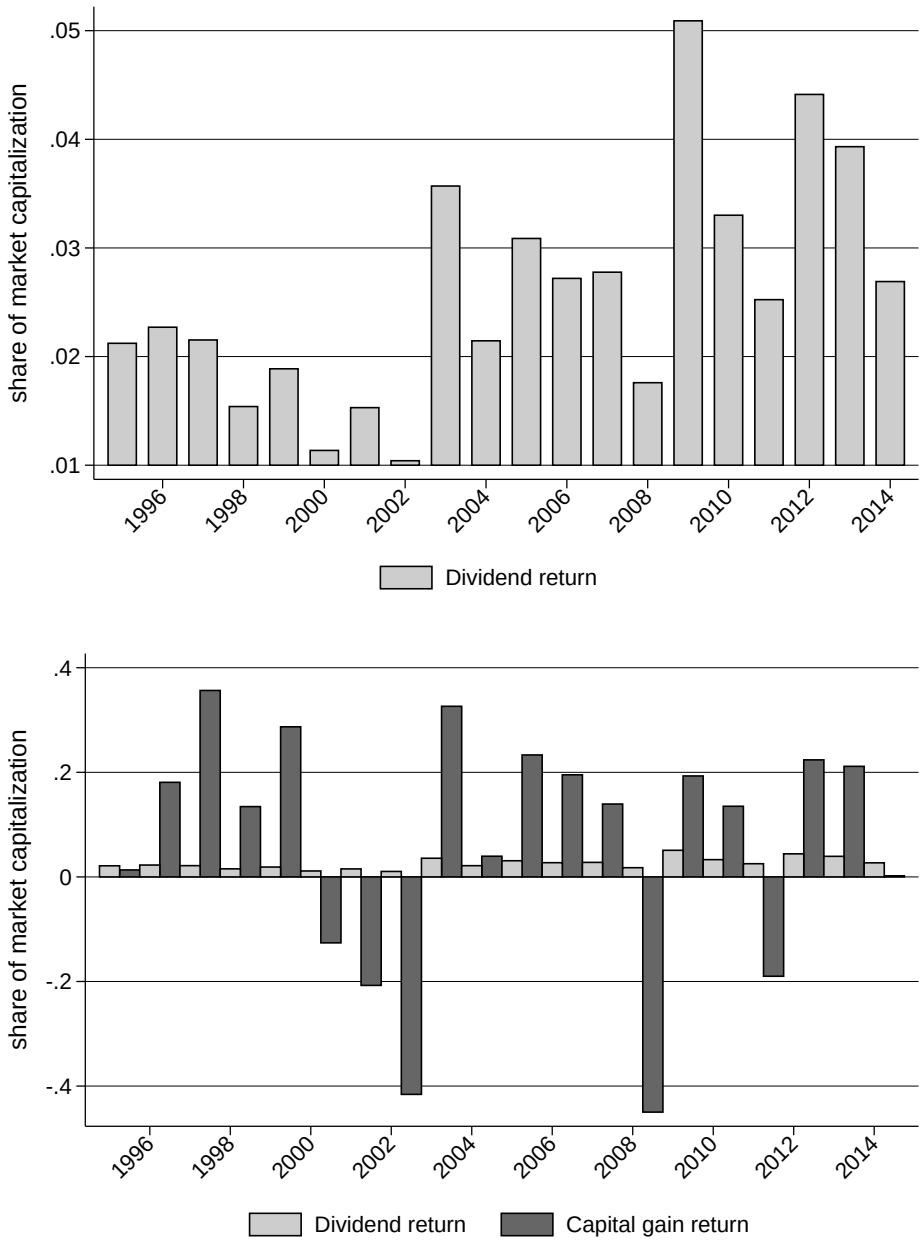


Figure 3.D.3.: Returns on German stock equity: dividends and capital gains (CDAX), 1995–2014

Notes: Real values. Dividend returns are grossed up to correspond to the gross dividend before corporation tax.
Source: own computation based on CDAX time series.

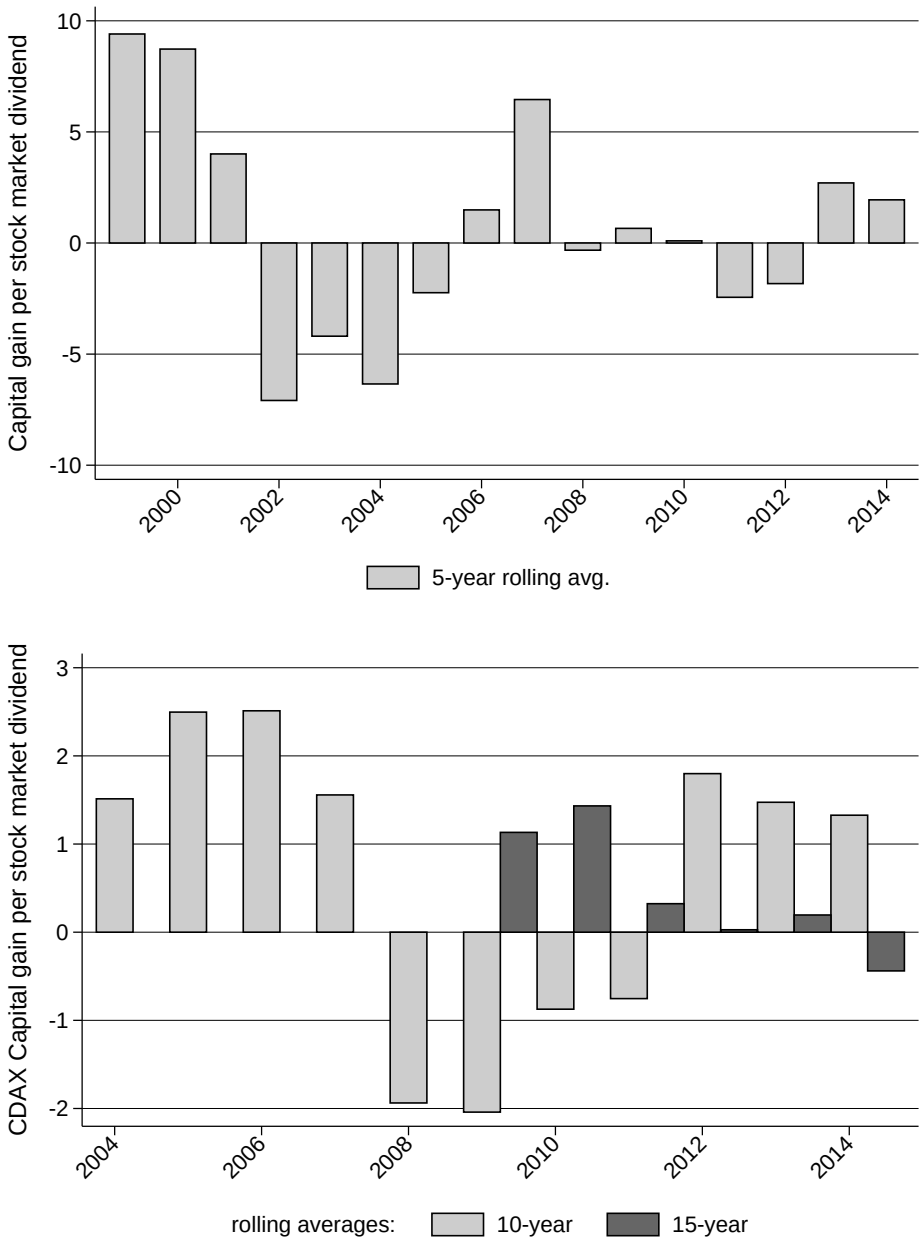


Figure 3.D.4.: Long-term returns on German stock equity: capital gain per dividend (CDAX), 1999–2014.

Notes: Real values. Averages are computed so as to correspond to a constant annual rate of return with reinvestment: $r_t = (\Delta CDAX_0^t / CDAX_0 + 1)^{1/t}) - 1$. Returns refer to the period preceding the reported year.
Source: own computation based on CDAX time series.

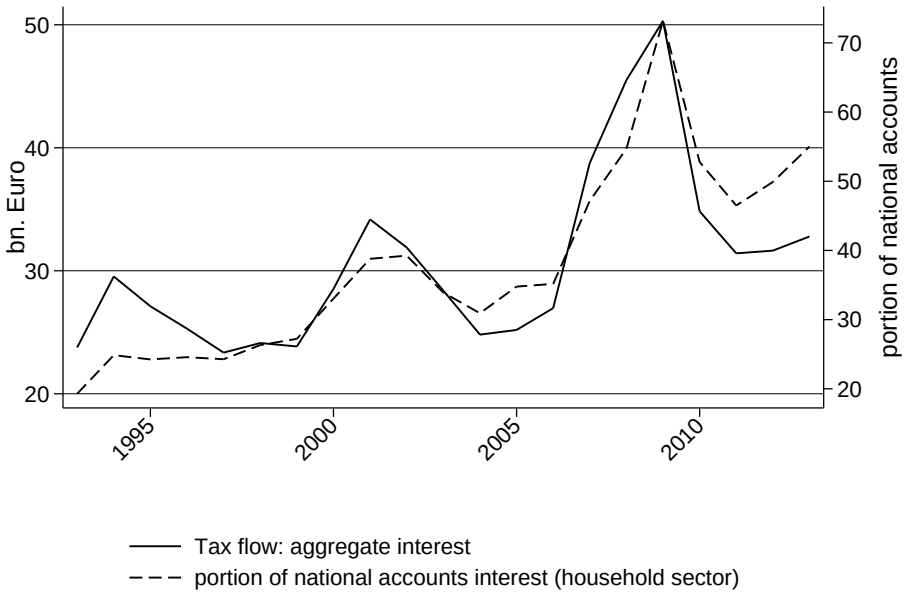


Figure 3.D.5.: Interest tax base of withholding tax flow, 1993–2013

Notes: Real values. Since 2009, tax base includes capital gains of type (ii), with generous transitional rules.
Source: own computation based on tax flow statistics and national accounts (household sector).

Appendix 3.E Effective Tax Rates

Table 3.E.1.: Simulated effective tax rates[a] by EGI fractile

	pre-reform										
	annual						permanent				
	2001	2002	2003	2004	2005	2006	01–03	02–04	03–05	04–06	01–06
<P90	10.5	10.5	10.4	10.6	10.7	10.7	10.7	10.7	10.7	10.8	10.9
P90–95	16.9	16.2	16.1	16.8	17.4	17.4	16.5	16.4	16.8	17.3	16.8
P95–99	21.2	20.3	20.3	20.8	21.1	21.4	20.7	20.5	20.8	21.2	20.9
P99–99.9	30.3	29.5	29.3	30.2	30.8	31.3	29.7	29.7	30.2	30.9	30.3
P99.9–99.99	38.0	36.4	36.3	37.3	37.7	38.6	37.1	36.8	36.9	37.8	37.5
P99.99–99.999	41.1	40.0	39.3	40.4	40.5	40.6	40.1	39.7	39.9	39.8	39.6
Top 0.001%	40.9	38.8	38.8	39.4	36.1	38.8	39.6	39.1	37.9	37.8	39.0
	post-reform I										
	annual						permanent				
	2001	2002	2003	2004	2005	2006	01–03	02–04	03–05	04–06	01–06
<P90	10.5	10.5	10.4	10.6	10.7	10.7	10.6	10.7	10.7	10.8	10.9
P90–95	16.8	16.1	16.1	16.8	17.4	17.4	16.4	16.4	16.8	17.2	16.8
P95–99	21.0	20.1	20.1	20.6	20.9	21.2	20.5	20.3	20.6	21.0	20.8
P99–99.9	29.7	29.2	28.9	29.8	30.4	30.9	29.2	29.3	29.7	30.5	29.8
P99.9–99.99	36.5	35.5	35.3	36.4	36.8	37.7	35.9	35.9	36.1	36.9	36.5
P99.99–99.999	39.3	38.5	38.3	39.4	39.4	40.2	38.7	38.6	38.9	39.3	38.6
Top 0.001%	39.6	37.5	37.3	38.4	36.3	38.2	38.2	37.9	37.3	37.5	38.3
	post-reform II										
	annual						permanent				
	2001	2002	2003	2004	2005	2006	01–03	02–04	03–05	04–06	01–06
<P90	10.5	10.5	10.4	10.6	10.7	10.6	10.6	10.6	10.7	10.8	10.9
P90–95	16.8	16.1	16.1	16.7	17.4	17.3	16.4	16.4	16.7	17.2	16.7
P95–99	21.0	20.1	20.1	20.6	20.9	21.2	20.4	20.3	20.6	21.0	20.7
P99–99.9	29.4	28.9	28.8	29.7	30.3	30.8	29.0	29.1	29.6	30.3	29.7
P99.9–99.99	36.1	35.1	35.0	36.1	36.6	37.4	35.6	35.5	35.8	36.6	36.2
P99.99–99.999	38.8	38.1	37.5	39.0	38.9	39.1	38.0	38.1	38.4	38.6	38.1
Top 0.001%	38.6	37.0	36.9	38.2	35.9	36.9	37.6	37.4	36.9	36.8	37.3

Notes: Bottom 90 group excludes cases with negative incomes. EGI including capital gains, after loss deductions
Source: own computation based on TPP 2001-2006.

Chapter 4

The Role of Capital Income for Top Income Shares in Germany

4.1 Introduction

Personal income tax data have proven to be an invaluable data source for gauging the long-run development of income concentration. Many countries introduced a modern income tax more than 100 years ago, whose records allow the construction of long-run series on top income shares. These series 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 Incomes 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, see Roine and Waldenström, 2015 for a recent review). However, income tax data suffer from the drawback that tax reforms change the definition of taxable income and, hence, the share of income documented in tax data. Much effort has been made to harmonize top income shares over time (see, e. g., Atkinson, 2007a).

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.[59] Capital income such as interest income, dividends or returns on pension funds is now often taxed separately from the personal income tax (PIT) by flat rates or is fully tax-exempt. In Germany, capital income had been gradually excluded from the PIT tax base since 2001. Since 2009, it has not been recorded in PIT data at all, due to the introduction of a final withholding tax on capital income.[60] Since capital income is largely concentrated among top income taxpayers, German top income shares assessed on PIT statistics most likely underestimate income concentration at the top after 2001 and even more after 2009.

In Germany, the 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 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.[61] The German series also display a drop, but it is unclear whether this is

[59] Nordic countries introduced dual income taxation in the 1990s, other European countries such as Austria, Switzerland and the Netherlands followed.

[60] The schedule dualization does not necessarily reduce the data quality on top incomes: e.g., in the Nordic countries and the Netherlands, the gross income information is still available in tax statistics or in the microdata (Aaberge and Atkinson, 2010, Atkinson and Søgaard, 2013, Roine and Waldenström, 2010, Salverda, 2013). In Austria, however, capital income is also not reported in PIT data (Altzinger et al., 2011, 2012), being one reason for Austria not to be included in the WTID.

[61] However, these drops do not necessarily change the evolution of income concentration in the long run: Piketty

due to the crisis or due to the exclusion of capital income from the PIT tax base.

Our main goal is to provide a harmonized series of top income shares between 2001 and 2010 that includes full capital incomes. We first estimate German top income series from 2001 to 2010 using the most recently available income tax data.[62] We then harmonize the PIT tax base definition so as to comprehensively include capital incomes exploiting a rich dataset that includes individual tax returns of all taxpayers. Until 2008, this harmonized series can be directly simulated using income tax microdata, which allows us to vary the fraction of capital income included in the overall taxable income. We simulate three top income share series, each applying one of the three taxable income definitions prevailing between 2001 and 2010. We thereby document the sensitivity of German top income shares to the gradual disappearance of capital incomes from the income tax base. From 2009 onwards, we need to extrapolate capital income. In order to extend our harmonized series including full capital incomes to the years after 2008, 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. The harmonized series updates and extends the existing series with capital gains provided by Dell (2007, 2011) from 2001 to 2010 and the series without capital gains provided by Dell (2007) from 2001 up to 2008. Furthermore, the updated series allows us to disentangle the impact of the recession from the impact of the tax reform that excluded capital income from the PIT in Germany.

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 decile of the German income distribution, but a substantial impact on the very top, i.e., the top 0.1% and top 0.01%. 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 8% for the top decile and almost 28% for the top 0.01% in 2009.

The paper is organized as follows: Section 4.2 provides an overview over the data used and the methodology employed to arrive at top income share estimates. Section 4.3 presents the trends in

and Saez (2013b) discuss the recession's impact on top income shares and conclude that long-run inequality is determined rather by regulatory changes such as tax reforms than by economic downturns. 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 (Piketty, 2003, 2007, Piketty and Saez, 2003, 2007).

[62] In Germany, annual income tax statistics are available with a four year lag. Statistics from 2011 will most likely be available in fall 2015.

top income shares with and without capital gains when using the raw income tax data. In section 4.4, we then turn to check the sensitivity of the top income series to legislative changes in the definition of capital income by simulating three homogeneous series. In section 4.5, we briefly describe data sources for potential proxies for missing capital income and present top income series including capital income up to 2010. Section 4.6 concludes.

4.2 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 4.C. For the estimation of top income shares we use both tabulated income tax statistics available annually since 2001 for the years 2001–10 (PIT statistics) and a rich data set that includes the tax returns of all income taxpayers available for the years 2001–08 (PIT microdata). Both data sources are provided by the German federal statistical office (Destatis).

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.[63] 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. An alternative approach suggested by Atkinson (2005) places upper and lower bounds for the estimated shares and refrains from assuming a form of distribution. Since the true density function of income is not known, we can assign tax units arbitrarily to particular incomes subject to the two constraints that the number of people in the interval and their mean income remain constant. We display shares, thresholds and average incomes based on this so-called mean-split histogram in the Appendix Tables 4.B.2 and 4.B.5.

As there are numerous tax exemptions, a presumably high level of tax avoidance and tax units who do not file an income tax return, tax statistics neither comprise the whole population, nor do they include total income. In the German PIT, tax units are either married couples or bachelors.

[63] 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 all income taxpayers do not file a return paying only payroll tax in 2007, this share drops to 3.7% in the top decile.

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. This population total is reported in Table 4.A.1 from 1998 to 2010. 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. Thereby, we ensure the comparability of Dell's and our series over time. Dell (2007) argues that the bottom 30% not recorded in the tax statistics earns less than 5% of gross income such that the 10%-20% missing in the tax records from the total primary household income is more likely to be non-taxable or hidden income of the tax filers.[64] The income total construction is described in Appendix 4.A and reported in Table 4.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. This is of particular importance for the estimation of top income shares with respect to capital income: the share of capital income reported in German PIT statistics declined to zero as a result of two tax reforms in 2002 and 2009. We provide a detailed description of the reforms in Appendix 4.D.

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 total dividends and interest income before source-specific deductions. We can thus derive homogeneous top income series based on varying definitions of capital income and, thereby, check the sensitivity of top income shares to the gradual disappearance of capital income from the PIT tax base. Furthermore, we can compute shares including and excluding capital gains. In PIT microdata, we can directly sort taxpayers by fractiles, so we do not need an interpolation method and can chose the sorting in accordance with the income definition applied. Top income shares are derived using the same population and income totals as the interpolated shares from PIT statistics described above. For top income shares excluding capital gains, we substract the sum of taxable capital gains observed in PIT microdata from the income control described above.[65]

Since 2009 we completely lack information on the capital income total and its distribution among top income individuals.[66] We therefore have to impute capital income by fractile based

[64]Results from a more comprehensive database seem to support this assumption: Using an integrated dataset containing tax microdata and SOEP surveydata (ITR-SOEP), Bach et al. (2009, 2013) find that gross income less transfers and capital gains does not account for more than 85% of national accounts' total household income.

[65]The income total, however, does not include capital gains as there does not exist an aggregate statistics on them. Substracting capital gains from the income total is hence a pragmatic approach that aims at preventing shares excluding capital gains to be mechanically lower than shares including capital gains.

[66]One should note that income from renting and leasing is not part of the German tax law definition of capital income and, consequently, is still observed in the data.

on external proxies for household capital income. Any suitable proxy would have to correlate strongly with capital income reported in PIT microdata. For the years 2001 to 2008, we can test the correlation of external data sources with capital income in the PIT. Five 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, GDP, and capital income observed in German survey data. We compute correlations between the dividend and interest income totals in PIT microdata by fractile with these external sources. Each of these sources bears particular advantages and disadvantages on which we elaborate in section 4.5. Appendix 4.C provides additional information on the employed data sources.

4.3 Top Income Shares, 2001–2010

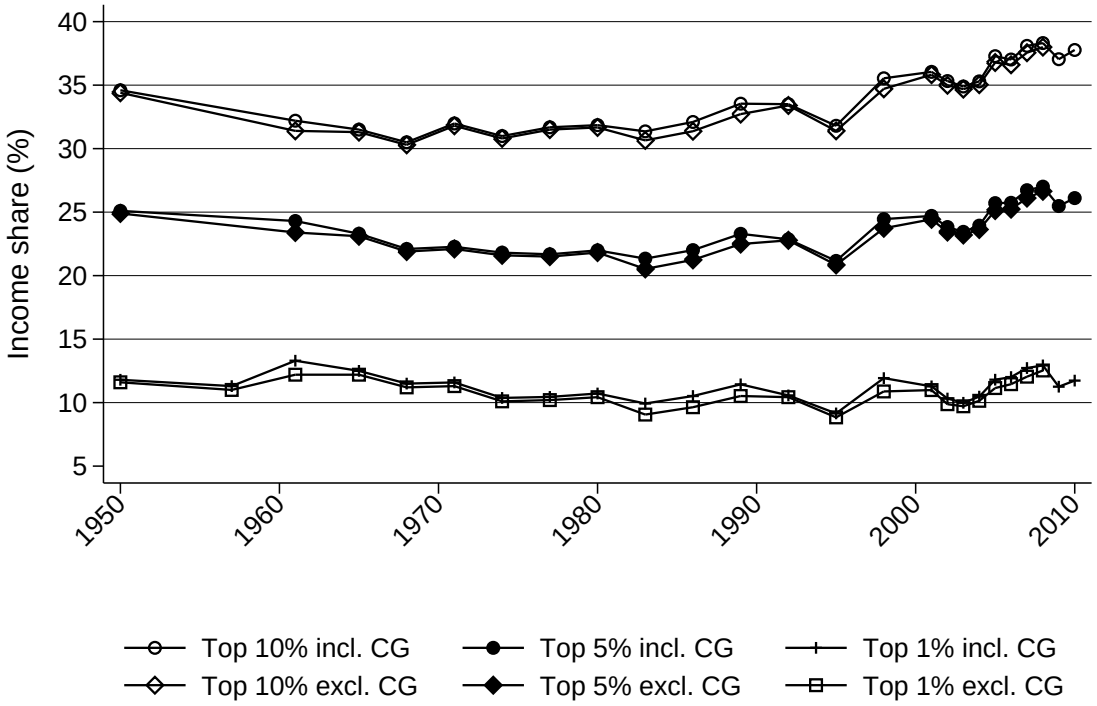
Over the last two decades income concentration at the top increased substantially in Germany. Figure 4.1 reports series both including and excluding capital gains since World War II for the top 10%, 5%, and 1%. After a quite stable development since the 1960s, the year 1995 seems to mark a turning point.[67] The share of the richest decile increased from 32% in 1995 to 38% in 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 of the top 10% and top 5% never returned to the low levels of the preceding three decades. Contrasting the series with and without capital gains reveals that realized taxable capital gains are of minor importance up to the richest percentile. One should keep in mind, however, that most realized capital gains have never been documented in German PIT data: they were largely not taxable in Germany before 2009 and thus not part of the underlying income concept of the top income share series.[68] Since 2009 capital gains from stock shares have been subject to the withholding tax and can thus not be observed in income tax data, either.

Figure 4.2 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 3.6% to 5.3% by more than 40%. The exclusion of capital gains has a larger effect for the very

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

[68] E.g., capital gains from stock shares and real estate were tax-exempt to a large part. See Appendix 4.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 and not just a transitory component.

Figure 4.1.: Top income shares in Germany (with and without capital gains), 1950-2010



Notes: Ranking including and excluding capital gains, respectively. Fractile thresholds are obtained using the Pareto interpolation method.
Source: PIT statistics and PIT microdata, WTID for 1950-1998 and own calculations since 2001.

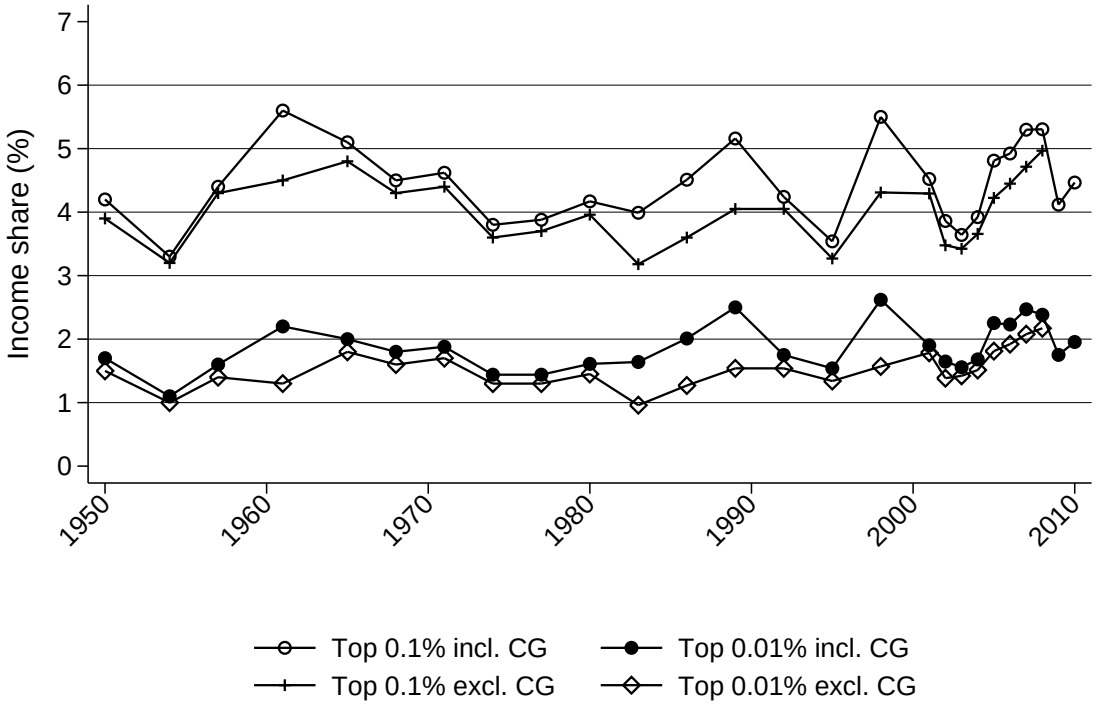
top in both stabilizing the series over time and reducing their income share. However, excluding capital gains enforces the trend of increasing income concentration.

There are two developments one should be aware of when interpreting the observed recent trends from 2001 to 2010 in Figures 4.1 and 4.2. 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 had an impact on capital income realization in 2001, 2008 and 2009: 2001 was the last year where corporation tax could be fully credited against 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.[69] In turn, interest income may have been postponed to 2009, as the marginal top tax rate

[69]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, some corporations was preponed dividend distribution. See Appendix 4.D.3 for details on the withholding tax reform.

Figure 4.2.: Top income shares in Germany (with and without capital gains), 1950-2010



Notes: Ranking including and excluding capital gains, respectively. Fractile thresholds are obtained using the Pareto interpolation method.
Source: PIT statistics and PIT microdata, WTID for 1950-1998 and own calculations since 2001.

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 marginal tax rate was raised to 45% again, suggesting that income timing is not the driving force behind the increase in top income shares.[70]

[70]The increase in the top tax rate only applied to incomes above 250,000 €. One could argue that income shifting to 2007 and 2008 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

Apart from changes in reporting behavior, two reforms changed the definition of capital income, thereby mechanically reducing the observed income share accruing to the top where capital income is concentrated: In 2002, the share of dividends that was reported in PIT taxable income 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 12% and the share of the top 0.1% even by 22%. In the wake of economic recovery in 2010, top income shares slightly increased.

In the following sections, we will focus on the mechanical effect of the gradual exclusion of capital income from the PIT tax base. Estimating the magnitude of income timing is beyond the scope of this paper. While section 4.4 concentrates on the impact of changes in taxable capital income until 2008, section 4.5 turns to the reform of 2009 and the development thereafter to disentangle crisis and tax reform effect.

4.4 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 2002 and 2008. Scenario 3 corresponds to the legislation since 2009.

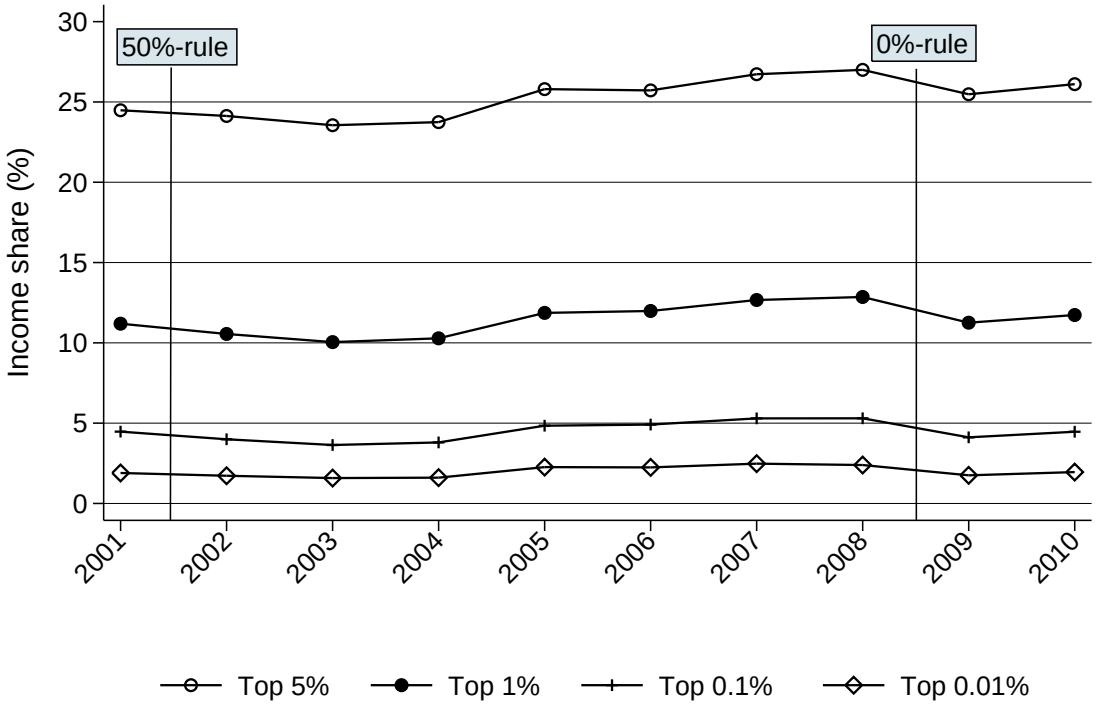
Figure 4.3 indicates the timing of the two reforms within the picture of the raw data top income shares basically zooming in into the development between 2001 and 2010 already presented in Figures 4.1 and 4.2.

Until 2001, capital income defined as the sum of dividends and interest income was fully taxable in the PIT.[71] Dividends were defined as gross dividends before corporation tax. We refer

rate. (See footnote 69 above and Appendix 4.D.3 for details.) However, our harmonized series show that top income shares excluding capital income only slightly decrease in 2008 (see scenario 3 in section 4.4 and Appendix Table 4.B.8), indicating that the increase is unlikely to be driven by taxable income responses to tax reforms.

[71] When we speak of capital income in the following, we essentially refer to dividends from incorporated firms and

Figure 4.3.: Top Income Shares in Germany, 2001-2010



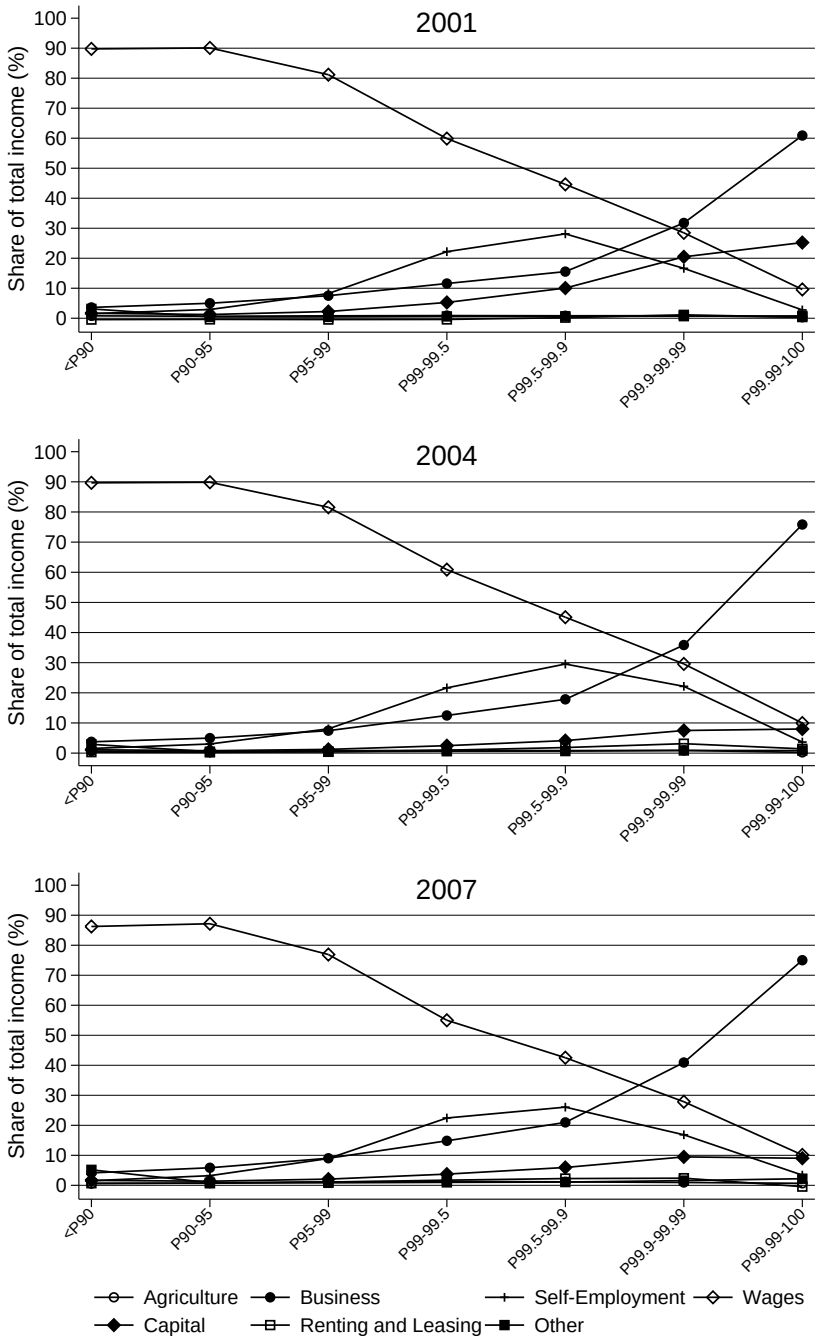
Notes: Shares are including capital gains. Fractile thresholds are obtained using the Pareto interpolation method.
Source: PIT statistics, own calculations.

to this legislation as the 100% rule, which corresponds to the income definition of our updated series. The first reform in 2002 changed the definition of taxable dividends from the full gross dividend (before corporation tax) to half the 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 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 4.D.

Both reforms are expected to affect primarily the top of the income distribution where capital income is concentrated. Figure 4.4 gives the composition of taxable income within top fractiles.

to interest income. All other income that also stems from capital in a systematic view, such as rents, is not included in this concept.

Figure 4.4.: Income composition within top fractiles in Germany, 2001, 2004 and 2007



Source: FAST, own calculations.

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%. According to Bach et al. (2009) the German affluent rely much less on wages than their counterparts in France and the U.S. The role of self-employed[72] 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 2007. The magnitude of this decline is reinforced by exceptionally high dividend payments in 2001.

Three top income series under simulated tax regimes each based on a homogeneous capital income definition are presented in Figure 4.5. Simulations do not account for behavioral responses. 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.[73] 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).[74]

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 4.3 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.

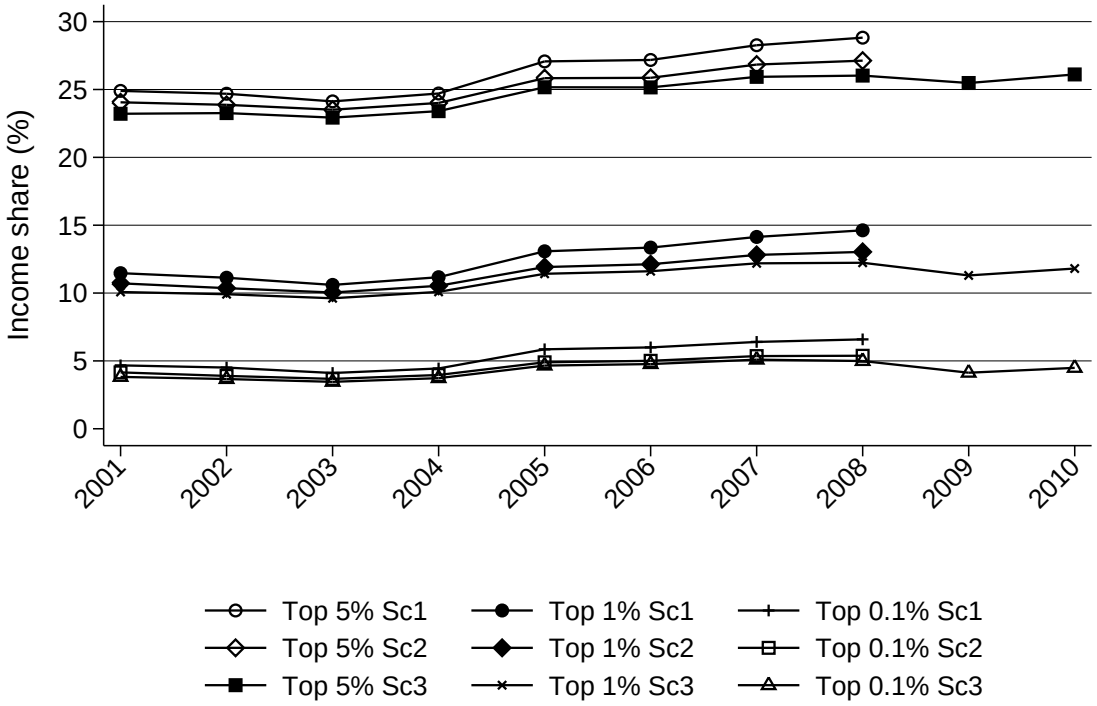
The first conclusion is illustrated by scenario 3. Top income shares would have decreased only slightly from 2008 to 2009, if capital income was excluded from the tax base already. The drop in scenario 3 decreases towards the top: while the drop is 2% for the top 5%, it exceeds 7% for the top 1%, 16% for the top 0.01% and reaches 22% for the top 0.01%. From this, we can draw the conclusion that the output drop in 2009 disproportionately hit the very top of the non-capital income distribution, albeit to a smaller degree than raw data shares presented in Section 4.3 would suggest. To quantify the portion of the 2009 drop that can be explained by the reform we compare the drop in scenario 3 with the raw data series presented in Figures 4.1 and 4.2. The

[72] 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.

[73] Differences are due to a transitional period that began already in 2001, and was relevant for fewer and fewer incomes in later periods. Scenario 2 simulates GTI according to post-2001 legislation without these transitional exceptions, which makes quite a difference in 2001 and 2002, but only little difference after 2002.

[74] See Appendix Tables 4.B.7 and 4.B.8 for harmonized shares of scenarios 1–3 including and excluding capital gains.

Figure 4.5.: Top income shares under simulated tax regimes



Notes: Scenario 1 refers to pre 2001 rules (100%-rule), Scenario 2 to 2001/02-2008 rules (50%-rule) and Scenario 3 to post 2008 rules (0%-rule). Tax units are sorted according to the scenario-specific taxable income definition. See Appendix Tables 4.B.7 and 4.B.8 for harmonized shares of scenarios 1–3 including and excluding capital gains.
Source: PIT microdata until 2008, PIT statistics thereafter, own calculations.

top 1% share drops by 1.6 %-points in raw data shares, and by 0.87 in scenario 3. I.e., the drop is only about half of the size if capital income had been excluded in 2008 already. The top 0.1% share drops by 0.64 %-points using raw PIT statistics, and still by 0.5 %-points in scenario 3.

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 have increased at a higher rate between 2001 and 2008. Simulating the 100%-rule instead of the 50%-rule raises the top percentiles' share by more than 1.5 %-points in 2008, 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 50%-rule 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 previous series by Dell (2005, 2007, 2011) suggest. Much of the decrease in raw-data top income shares between

2001 and 2003 is driven by the introduction of the 50% rule. Consequently, scenario 1 including full capital incomes is our preferred series for the extension of the WTID given in Appendix Table 4.B.7. 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. In order to extend our preferred series including capital income to 2010, we cannot rely on micro data but have to extrapolate capital income by suitable proxies, which are introduced in section 4.5.

4.5 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. In this section, we discuss several proxies for capital income to extrapolate personal capital income at the top to 2009 and later years. Our goal is to obtain top income shares including capital income for 2009 and 2010 extending the series of scenario 1.

We use the following external sources for capital income: household sector capital income from national accounts, tax flow statistics on dividends and interest income, stock market indices, GDP, and capital income observed in German household survey SOEP. In order to derive the best proxy for capital income, we test for each top income fractile the correlation between both external dividend and interest income information and the corresponding capital income reported in PIT microdata, which until 2008 displays individual interest and dividend income separately. Each of the external sources has specific advantages and disadvantages regarding their potential correlation with personal capital income at the top, on which we will elaborate below.

In order to extrapolate top fractiles' capital incomes using any of these external sources, we assume that the fractiles' shares in the corresponding source observed between 2001 and 2008 remains constant after the withholding tax reform. In the following, we describe the data sources and discuss to what extent the above assumption seems reasonable.

- National accounts of dividends and interest income comprise the most comprehensive concept of capital income in the household sector.[75] The definitions of both the household sector itself as well as dividend and interest income are more comprehensive than the corresponding PIT definitions.[76] The fact that the capital income definition is not linked to tax law makes national accounts a promising proxy at the first glance. But at the second glance, the broad

[75] It does, however, not include capital gains.

[76] In addition to private households, the national accounts' household sector includes unincorporated businesses if they are owned by a single person (as opposed to partnerships) as well as private non-profit organizations.

definition of both the household sector and its capital income presents the major drawback for national accounts dividends as a proxy for household sector dividends as defined in the PIT. In particular, dividends in national accounts comprise distributed profits of both incorporated and unincorporated firms (Schwarz, 2008).[77] By contrast, the PIT definition of dividends (which is what we need to proxy) includes only profits from incorporated firms (profits from unincorporated firms are classified as business income, self-employed income or agricultural income). This difference in the dividend definition is of particular relevance for the quality of national accounts as a proxy for dividends in the PIT definition if the tax reform has induced income shifting: If, for example, profits from unincorporated firms (which are still subject to the personal PIT tax rate) are shifted towards interest income via changes in the leverage of firms, national accounts report more interest, less dividends, and unchanged total capital income. However, dividends according to the PIT definition would remain unchanged, therefore our proxy would be too low: we would double-count the reduction in unincorporated firm profits, as it would already show up in top incomes as reported in PIT statistics. Using national accounts would thus underestimate dividend income and suggest too low top income shares. For interest income, the national accounts aggregate seems less problematic.

- Tax flow statistics report withheld revenues from taxes on dividends from corporations and on interest income. Tax flows are reported separately for dividends and interest income. The withholding pre-tax on dividends and interest income existing until 2008 could be counted against both PIT and corporation tax liability by the end of the year. The tax base generating these tax flows can be calculated by dividing the tax flows by the respective tax rates. Dividends can then be grossed up using the pre-year corporate tax rate in order to match our gross dividend definition. However, tax flow statistics suffer from several drawbacks: First, their aggregate level depends on the level of the saver's allowance which varied greatly between 2000 and 2007 (see Appendix Figure 4.E.3). Since 2007, the allowance is lower than in previous years, which might induce a mechanical increase of the proxy, yielding too low extrapolated capital income. Second, the interest tax base does not include private loans. Third, aggregates include interest and dividends received by corporations and unincorporated businesses. This difference in the definition of interest income compared to the PIT could have an impact on the quality of the proxy in the case of shifting: Shifting capital income from the firm level to the private level thus leaves the proxy unchanged, while private capital income in the PIT definition would increase. Extrapolated private capital income would thus be too low.[78] Last, the

[77] Moreover, capital income of the household sector includes interest income and dividends that is not distributed but reinvested by private insurances and pension funds.

[78] It is, however unclear in which direction of shifting would dominate: business to private shifting is more plausible in the case of unincorporated business income (which is subject to the high PIT tax rate). Private to business shifting might be favorable in the case of corporations, as the corporate tax rate (15%) is even lower than the private capital

tax base definition for interest income was broadened in 2009 and includes capital gains from stock shares since then. Although the effect of this additional tax base is expected to be small in 2009 as transitional rules are quite generous, the broader tax base will become apparent in the long-term, inducing comparatively high extrapolated values for interest income. Consequently, extrapolated capital income using tax flow statistics might lose quality as a proxy for the PIT definition of capital income. Both level and direction of the error depends on the extent and direction of income shifting and on the size of capital gains from stock shares.

- 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 go 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 might be a good indicator for the dividend development of private stock market portfolios and consequently display a similar trend as private dividend income.

- GDP might also serve as a proxy for capital income, as it reflects economic activity in general. We use lagged GDP, as dividends are usually distributed profits of the preceding year. Interest income also turns out to correlate stronger with lagged GDP than with GDP in the same year. As in the case of national accounts dividends, the share of personal dividend and interest income in GDP will change after the reform if income is shifted towards these income sources. Then, the extrapolated capital income will be too low.

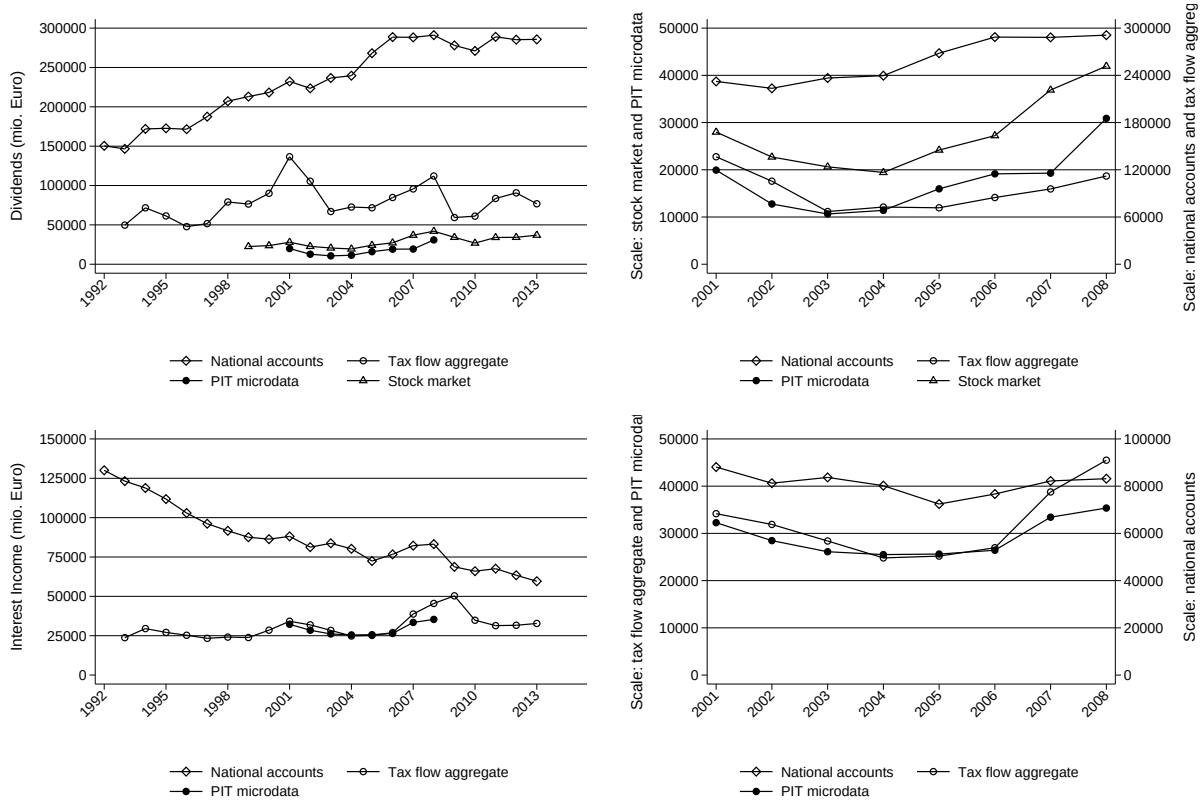
- The SOEP is a representative panel study containing individual and household data in Germany from 1984 onwards and was expanded to the New German Laender after reunification in 1990. All household members are interviewed individually once they reach the age of 16. SOEP reports gross household income 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.[79] We use capital income from the top 10% without the top 1% of households (P90–99).[80]

income tax rate (25%) which yields an accumulation effect in the long run. Furthermore, deductions can only be claimed at the firm level. See Jenderny (2015) for a detailed discussion of plausible shifting directions.

[79] Appendix Figure 4.E.4 shows that top income shares of the top decile based on SOEP using thresholds from PIT statistics are of similar magnitude as shares based on PIT statistics. The gap increases moving further to the top indicating that SOEP underestimates income concentration at the top.

[80] From 2009 onwards, it is also possible to use the German data of the Euro Area Household Finance and Consumption Survey (HFCS). The drawback of this survey is its recent availability. So far, we can only check capital income in 2009 reported in the first wave in 2010. The advantage of the survey lies in its focus on wealth. Like SOEP it reports income from financial assets, but provides additional wealth information such as the stock market portfolio.

Figure 4.6.: External proxies for capital income, 1992–2013



Notes: Values are in 2010 prices. Aggregated income from PIT microdata corresponds to comprehensive incomes before deductions as defined by scenario 1 in section 4.4.
Source: Tax flow statistics, PIT microdata, stock market indices (CDAX), and German national accounts (household sector).

The external aggregates for dividend and interest incomes described above are shown in Figure 4.6. Aggregated dividends from national accounts, tax flow statistics and the German stock market (CDAX) are reported in the upper graphs. Aggregated interest income from national accounts and tax flow statistics is given in the lower graphs. Additionally, all graphs show the corresponding income aggregates from PIT microdata between 2001 and 2008. The graphs on the left-hand side give an idea of the levels and the evolution of the time series from 1992 to 2013. The graphs on the right-hand side show the years where we can compare the external information to the PIT capital income aggregates (2001–2008). They also use a different scale for the national accounts aggregates and for the dividend tax flow aggregate in order to give a better comparison of the relative changes between the series.

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 might be boosted

by preponed dividend distribution in 2008 as discussed in section 4.3. 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 as stock market dividends. In sum, the time trend of aggregated PIT dividends seems to correspond closest with stock market dividends.[81] 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 dividend preponement in 2008 as in the tax flow aggregate.

Aggregates for interest income converged over the past two decades. The higher level of national accounts interest income as compared to the tax flow aggregate in the 1990s might be due to the high savers' allowance (see Appendix Figure 4.E.3) and the inclusion of reinvested interest income from private pension insurances. The convergence could be explained by the gradual broadening of the tax base, e.g., 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.[82] 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 that PIT microdata aggregates follow similar trends as external capital income aggregates. In particular, PIT dividends seem to correspond closest to CDAX dividends. For PIT interest incomes the tax flow aggregate seems to display a more similar development. For both income sources, trends differ from the tax flow aggregates' trends in 2007 and 2008, which can most likely be explained by taxable income reactions to tax law changes (pre-ponement of dividends to 2008 and post-ponement of interest income towards 2009).

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. Table 4.1 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 4.1 refers to dividends, while the lower part refers to interest income. The first column gives the correlation of the fractiles' aggregate with the PIT microdata total. Columns 2 to 6 give the fractiles' correlation with external aggregates.

[81] Stock market dividends and dividends in PIT microdata also nearly coincide in levels. But one should keep in mind that German stocks are not entirely owned by German private households.

[82] 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 flow since the introduction of the withholding tax in 2009. However, as there were generous transitional rules, we expect this effect to be small in 2009.

Table 4.1.: Correlation between fractile capital income and proxies 2001–08

0.85

Dividends						
$DIV_{FRACTILE}$	DIV_{PIT}	DIV_{NA}	DIV_{CDAX}	GDP_{LAG}	CAP_{SOEP}	DIV_{TF}
<P90	96.1	80.4	92.6	90.0	5.5	68.2
P90–95	93.1	90.6	95.5	84.7	16.7	64.0
P95–99	97.1	93.3	95.9	83.4	13.6	58.3
P99–99.5	98.1	87.5	97.4	89.4	15.2	65.9
P99.5–99.9	99.0	81.6	97.4	93.5	15.0	69.3
P99.9–99.99	99.8	78.1	95.6	94.2	12.1	70.2
Top 0.01%	97.2	79.0	92.4	90.2	8.2	69.3
Interest						
$INT_{FRACTILE}$	INT_{PIT}	INT_{NA}	–	GDP_{LAG}	CAP_{SOEP}	INT_{TF}
<P90	99.5	52.6		94.3	44.0	98.7
P90-95	98.6	59.2		93.8	44.7	99.3
P95-99	99.2	44.9		96.8	31.6	97.3
P99-99.5	99.5	47.9		95.9	35.7	98.1
P99.5-99.9	98.9	54.2		94.4	39.3	99.1
P99.9-99.99	95.6	55.9		90.8	45.0	97.9
Top 0.01%	56.9	54.3		84.6	47.5	94.4

Notes: Correlations between aggregated dividends / aggregated interest income by disjoint fractile. Sorting sc1: fractiles defined including capital income (100% rule) $DIV_{FRACTILE}$/$INT_{FRACTILE}$: 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_{SOEP}: Capital income of P90-99 from SOEP survey data. DIV_{TF}/INT_{TF}: Aggregated dividend/ interest income calculated from tax flow statistics
Source: Own calculations using PIT microdata, stock market indices (CDAX), SOEP, national accounts, and tax flow statistics.

All fractiles' dividend or interest incomes show a high correlation with the corresponding PIT total which indicates stable fractile shares in total capital income.[83] For the extrapolation, we therefore assume the distribution of total capital income to remain constant over the fractiles.

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 90% for each of the top fractile groups. Lagged GDP and national accounts dividends exhibit a smaller correlation. For interest income, the tax flow aggregate shows the highest correlation, closely followed by lagged GDP. Correlation with SOEP capital income is comparatively low for both dividends and interest income, which might reflect the fact that we cannot distinguish dividends from interest income in SOEP data.

The correlations with external totals confirm for both capital income sources that the findings of Figure 4.6 hold over different top income fractiles. Based on these results, we choose stock

[83] Table 4.D.4 shows that the distribution of capital income over top fractiles is quite stable over time.

market dividends and the tax flow aggregate as proxies for dividend income and interest income, respectively, and use the average proportion observed between 2001 and 2008 to extrapolate capital income by fractile for 2009 and 2010. Adding this extrapolated capital income to the non-capital income reported in tax statistics in 2009 and 2010 yields our harmonized series shares of Scenario 1.

Note, however, that the shares we observe from 2009 onwards correspond to the 0% rule (Scenario 3) and tax units are ranked accordingly. By contrast, our extrapolation requires the non-capital income of the top fractiles sorted by total income (i.e. by 100% rule income, Scenario 1), which would be slightly lower than what we observe. We take a pragmatic approach and correct for the sorting effect by applying the average sorting effect from 2001 to 2008, which is reported in Appendix Table 4.B.10. To check the robustness of the external information used, we also use the dividend tax flow and national accounts aggregates as well as the national accounts interest aggregate for extrapolation of the respective income type and derive capital income extrapolations for all combinations of sources for dividends and interest income. Furthermore, we use SOEP P90–99 average capital income and lagged GDP to extrapolate the sum of interest and dividend income.[84]

Figure 4.7 and 4.8 display our extended series including capital income. As scenario 3 is constructed to match the taxable income definition since 2009, this series can be extended by the years 2009 and 2010. Scenario 3 corresponds to the simulated scenario 3 in Figure 4.5 applying the 0%-rule. Scenario 1 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 1 is extended by the years 2009 and 2010 including imputed capital income using the capital income proxy discussed above.

Up to the top percentile, neither the concentration of capital nor of non-capital income was substantially reduced by the crisis as can be taken from Figure 4.7. Even though we find higher drops between 2008 and 2009 moving to the top, both the extended scenario 1 and scenario 3 – including and excluding capital income consistently – are smoother than the series based on the original data suggest. For the top decile, raw data presented in Figure 4.1 suggest a decrease of 3%. But the series including full capital income (Scenario 1) shows a decline by 0.4% and by 0.03% excluding capital income (Scenario 3). A large portion of the drop observed with the raw data seems attributable to the tax reform.

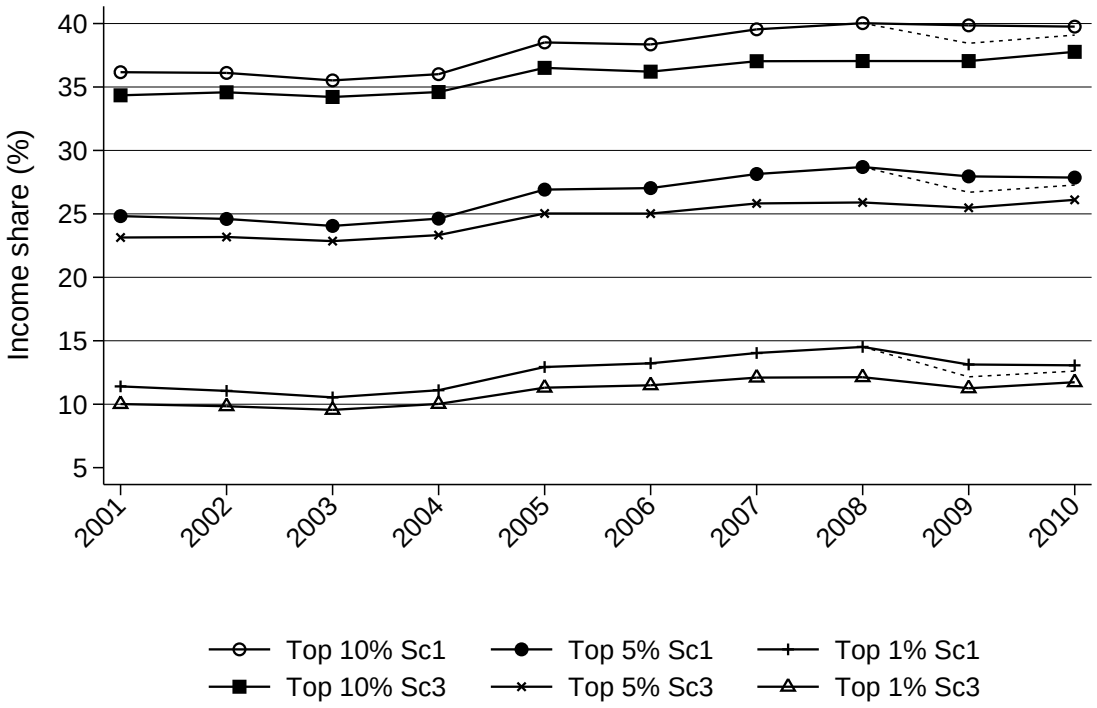
Larger changes in the homogeneous series are observed for the very top of the distribution displayed in Figure 4.8. Both series including and excluding capital income indicate a sharp drop for the top 0.1% and 0.01%. For the top 0.1%, raw data presented in Figure 4.2 reveal a

[84] Appendix Figure 4.E.1 shows the development of potential capital income proxies for selected fractile groups between 2001 and 2013 in comparison to capital income recorded in microdata between 2001 and 2008. The range of all alternative capital income extrapolations is shown in Appendix Figure 4.E.2.

decrease of 22%. In contrast, the series including capital income (Scenario 1) show a decline by 20% and by 16% excluding capital income (Scenario 3). Hence, the raw data drop for the very top is only partly attributable to the reform and more likely associated with the economic crisis. A possible explanation is the high portion of unincorporated business income at very top: as Appendix Table 4.D.1 shows, total business income documented in the tax statistics declined from 116 to 101 billion Euro between 2008 and 2009.

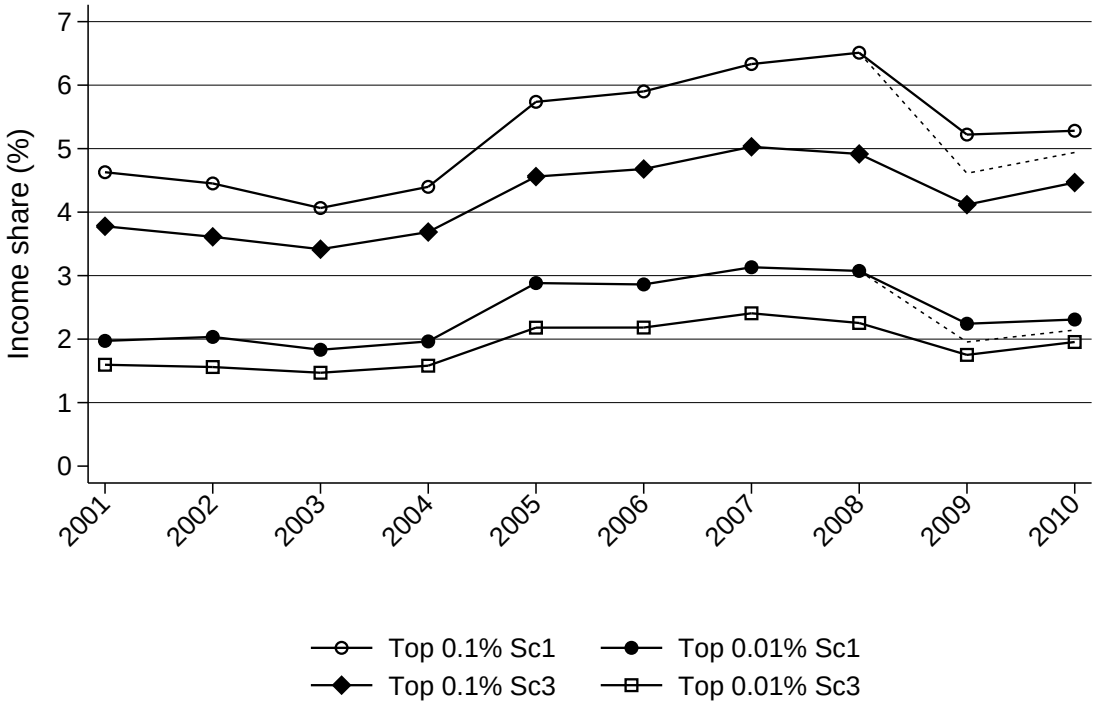
In contrast to the series assessed on raw PIT statistics, our extended harmonized series hence shows an even steeper increase in income concentration between 2001 and 2010. The income share accruing to the top decile including capital income is 8% higher than the shares assessed on the original tax data in 2009. The share of the top 0.01% is 28% higher.

Figure 4.7.: Top income shares with imputed capital income



Notes: Scenario 1 applies the 100%-rule. Scenario 3 applies the 0%-rule. Extrapolated capital income is based CDAX dividends for dividend income and the interest tax flow aggregate for interest income – the external sources with the highest correlation. This combination marks an upper bound of our extrapolations. Dotted lines indicate the lower bound based on SOEP capital income.
Source: PIT microdata for 2001-2008, PIT statistics for 2009-2010, own calculations.

Figure 4.8.: Top income shares with imputed capital income



Notes: Scenario 1 applies the 100%-rule. Scenario 3 applies the 0%-rule. Extrapolated capital income is based CDAX dividends for dividend income and the interest tax flow aggregate for interest income – the external sources with the highest correlation. This combination marks an upper bound of our extrapolations. Dotted lines indicate the lower bound based on SOEP capital income.
Source: PIT microdata for 2001-2008, PIT statistics for 2009-2010, own calculations.

4.6 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 including capital gains to 2010, and the series excluding capital gains to 2008. Second, we used PIT microdata to explore the impact of the gradual exclusion of capital income from the PIT base on top income shares. We derived homogeneous series of top income shares corresponding to varying income tax legislations and capital income definitions. 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.

Our results show that excluding taxable capital gains reduces top income shares only by little, as capital gains are largely not subject to income tax in Germany. Raw data, i.e., unharmonized, series of top income shares understate the increase in income concentration that took place in Germany between 2001 and 2010. E.g., accounting for missing capital income increases top income shares by 8% for the top decile and by 28% for the top 0.01% in 2009. Furthermore, the recession in 2009 seems to have had a minor impact on the top decile of the German income distribution, but a substantial impact on the very top, i.e., the top 0.1% and top 0.01%.

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. Correcting non-capital income shares with our capital income proxy provides a better picture of ongoing increasing income concentration in Germany. Yet, its quality is prone to shifting behavior and determined to decrease for future extrapolations. We expect that the tax reduction on capital income will provoke even higher income accumulation at the top of the distribution in the years to come which will not be documented by income tax data.

Appendix 4.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 4.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

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

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 4.A.2. Control total is 90% of total household income following Dell (2007). We deduct the sum of capital gains observed in the microdata from the control total for the estimation of shares excluding capital income.[85]

Table 4.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

Notes: 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.
Source: National accounts (*Volkswirtschaftliche Gesamtrechnungen*), various years, own calculations.

[85] This strategy enables us to easily interpret the difference between the series including and excluding capital gains. However, one should note that the income total in the national accounts does not include capital gains.

Appendix 4.B Tables of Key Results

The key results on top income shares based on both PIT statistics and PIT microdata are given in Tables 4.B.1, 4.B.2 and 4.B.3, respectively. Thresholds and average income for various fractiles based on PIT statistics and PIT microdata are given in Tables 4.B.4, 4.B.5 and 4.B.6, respectively.

Table 4.B.1.: Top income shares based on PIT statistics and Pareto interpolation

Year	Top 10%	Top 5%	Top 1%	Top 0.5%	Top 0.1%	Top 0.01%
			including capital gains			
2001	35.91	24.48	11.19	8.34	4.47	1.90
2002	35.70	24.13	10.56	7.62	4.00	1.73
2003	34.97	23.55	10.05	7.17	3.64	1.58
2004	35.03	23.74	10.28	7.47	3.80	1.61
2005	37.41	25.80	11.87	8.87	4.84	2.26
2006	37.03	25.72	11.99	8.98	4.91	2.25
2007	38.11	26.73	12.67	9.55	5.30	2.48
2008	38.34	27.00	12.86	9.69	5.30	2.39
2009	37.04	25.48	11.26	8.17	4.12	1.75
2010	37.77	26.11	11.73	8.62	4.47	1.95

Notes: Tax statistics include only income taxpayers. Fractile thresholds are obtained using the Pareto interpolation method.
Source: PIT statistics, own calculations.

Table 4.B.2.: Top income shares based on PIT statistics and mean-split histogram

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

Notes: Tax statistics include only income taxpayers. Fractile thresholds are obtained using the mean-split histogram method.
Source: PIT statistics, own calculations.

Table 4.B.3.: Top income shares based on PIT microdata

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

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

Table 4.B.4.: Thresholds and average incomes based on PIT statistics and Pareto interpolation

Year	Top 10%	Top 5%	Top 1%	Top 0.5%	Top 0.1%	Top 0.01%
			including capital gains			
			thresholds			
2001	59,364	80,947	148,050	205,601	499,944	2,134,204
2002	58,674	79,314	144,231	208,280	446,100	1,810,919
2003	57,777	77,821	141,447	201,989	443,093	1,637,040
2004	58,623	79,468	148,116	200,929	450,476	1,759,486
2005	57,232	78,946	151,594	209,290	494,414	2,105,873
2006	57,451	79,815	157,831	219,754	524,485	2,246,380
2007	57,880	79,782	165,782	233,049	545,368	2,399,781
2008	57,637	80,441	169,936	240,399	572,489	2,450,380
2009	56,440	78,706	159,042	218,853	491,008	1,833,023
2010	57,046	80,206	163,848	226,290	517,426	2,014,588
			average incomes			
2001	107,425	146,483	334,844	499,122	1,338,381	5,678,063
2002	103,822	140,345	306,966	443,279	1,162,465	5,017,030
2003	101,304	136,449	291,050	415,624	1,054,842	4,585,641
2004	104,481	141,632	306,673	445,480	1,133,084	4,792,915
2005	106,785	147,300	338,742	506,291	1,382,262	6,462,495
2006	109,291	151,835	353,777	530,277	1,449,885	6,630,997
2007	112,999	158,498	375,630	566,494	1,570,799	7,353,360
2008	114,353	161,058	383,484	577,892	1,581,693	7,140,917
2009	106,663	146,734	324,088	470,754	1,185,629	5,045,014
2010	109,677	151,631	340,714	500,508	1,296,807	5,676,499

Notes: Tax statistics include only income taxpayers. All figures in 2010 prices. Fractile thresholds are obtained using the Pareto interpolation method.
Source: PIT statistics, own calculations.

Table 4.B.5.: Thresholds and average incomes based on PIT statistics and mean-split histogram

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

Notes: Tax statistics include only income taxpayers. All figures in 2010 prices. Fractile thresholds are obtained using the mean-split histogram method.
Source: PIT statistics, own calculations.

Table 4.B.6.: 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

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

Table 4.B.7.: Top income shares under simulated tax regimes including capital gains

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
100% rule (Scenario 1), PIT statistics & capital income extrapolation						
2009	39.86	27.96	13.13	9.81	5.22	2.24
2010	39.76	27.86	13.07	9.78	5.23	2.28
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	37.04	25.48	11.26	8.17	4.12	1.75
2010	37.77	26.11	11.73	8.62	4.47	1.95

Notes: 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 excludes capital income (interest & gross dividends) completely and corresponds to post-2008 PIT legislation.
Source: PIT microdata and PIT statistics, own calculations.

Table 4.B.8.: Top income shares under simulated tax regimes excluding capital gains

Year	Top 10%	Top 5%	Top 1%	Top 0.5%	Top 0.1%	Top 0.01%
100% rule (Scenario 1), PIT microdata simulation						
2001	35.90	24.52	11.06	8.20	4.35	1.81
2002	35.56	23.98	10.38	7.54	3.84	1.59
2003	35.18	23.67	10.13	7.33	3.73	1.60
2004	35.59	24.16	10.61	7.75	3.99	1.68
2005	37.58	25.89	11.85	8.82	4.74	2.09
2006	37.58	26.19	12.32	9.27	5.11	2.30
2007	38.57	27.09	12.93	9.74	5.35	2.41
2008	39.52	28.13	13.89	10.61	5.94	2.68
50% rule (Scenario 2), PIT microdata simulation						
2001	35.07	23.72	10.36	7.56	3.87	1.59
2002	34.95	23.39	9.85	7.05	3.46	1.38
2003	34.68	23.19	9.71	6.93	3.42	1.42
2004	35.04	23.63	10.14	7.31	3.66	1.51
2005	36.78	25.12	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
0% rule (Scenario 3), PIT microdata simulation						
2001	34.05	22.81	9.67	6.96	3.50	1.45
2002	34.15	22.69	9.31	6.59	3.16	1.25
2003	33.98	22.59	9.26	6.55	3.18	1.32
2004	34.32	23.01	9.67	6.91	3.40	1.40
2005	35.94	24.38	10.57	7.66	3.90	1.67
2006	35.74	24.48	10.88	7.96	4.15	1.82
2007	36.41	25.12	11.34	8.33	4.37	1.95
2008	36.53	25.36	11.58	8.53	4.47	1.97

Notes: 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 excludes capital income (interest & gross dividends) completely and corresponds to post-2008 PIT legislation.
Source: PIT microdata and PIT statistics, own calculations.

Table 4.B.9.: Thresholds and average incomes scenario 1

Year	Top 10%	Top 5%	Top 1%	Top 0.5%	Top 0.1%	Top 0.01%
			including capital gains			
			thresholds			
2001	59,215	78,521	147,221	205,538	501,464	2,298,459
2002	58,352	77,497	142,781	196,034	454,624	2,009,571
2003	57,714	76,960	141,473	192,484	432,387	1,787,112
2004	58,983	78,867	147,957	204,238	475,373	2,065,177
2005	57,434	77,559	149,160	208,914	510,157	2,434,955
2006	57,917	78,647	155,309	219,561	549,753	2,777,135
2007	58,341	79,768	161,655	231,265	587,771	2,916,596
2008	58,213	80,053	165,672	239,832	630,374	3,106,838
			average incomes			
2001	107,748	147,922	339,748	508,594	1,378,991	5,876,776
2002	104,582	142,493	320,050	475,596	1,289,406	5,894,521
2003	102,379	138,652	303,752	445,188	1,171,779	5,281,754
2004	106,971	146,311	329,840	488,704	1,306,607	5,835,209
2005	109,841	153,516	368,875	564,293	1,636,373	8,223,341
2006	113,318	159,752	390,745	599,990	1,743,527	8,454,153
2007	117,181	166,791	415,910	641,772	1,876,316	9,282,352
2008	119,350	171,099	432,828	669,869	1,941,362	9,166,987
2009	114,736	160,948	378,022	564,843	1,503,082	6,455,928
2010	115,450	161,819	379,398	567,732	1,519,272	6,627,866
			excluding capital gains			
			thresholds			
2001	59,164	78,421	146,373	203,248	485,087	2,128,161
2002	58,291	77,374	141,786	193,524	436,678	1,746,086
2003	57,644	76,826	140,536	190,191	418,179	1,644,789
2004	58,912	78,725	146,835	201,577	458,316	1,873,993
2005	57,335	77,361	147,665	205,259	486,820	2,128,257
2006	57,809	78,429	153,641	215,448	522,324	2,402,005
2007	58,238	79,555	159,819	226,823	556,263	2,488,084
2008	58,246	80,089	165,158	237,909	612,523	2,827,034
			average incomes			
2001	106,420	145,333	327,802	486,089	1,288,976	5,378,064
2002	102,260	137,932	298,427	433,914	1,105,802	4,568,026
2003	100,908	135,807	290,752	420,617	1,069,730	4,584,455
2004	105,168	142,801	313,646	458,034	1,178,308	4,972,773
2005	106,174	146,319	334,769	498,363	1,340,656	5,908,803
2006	110,031	153,325	360,718	542,498	1,495,050	6,732,631
2007	113,255	159,082	379,572	571,946	1,570,159	7,088,053
2008	117,307	166,979	412,356	629,916	1,764,378	7,945,091

Notes: Tax statistics include only income taxpayers. All figures in 2010 prices. All figures are based on PIT microdata, with exception of the average incomes for 2009 and 2010 which stem from PIT statistics with added capital income extrapolation. 2009 and 2010 figures are only available including capital gains. Threshold incomes are not available for 2009 and 2010 as they would require distributional assumptions for the capital income.
Source: PIT microdata, PIT statistics, own calculations.

Table 4.B.10.: Sorting effect of capital income (including capital gains)

Year	Top 10%	Top 5%	Top 1%	Top 0.5%	Top 0.1%	Top 0.01%
non-capital income shares by sorting scheme						
Scenario 3: 0% rule income, sorted by 0% rule income						
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
Scenario 3b: 0% rule income, sorted by 100% rule income						
2001	34.12	22.92	9.80	7.08	3.57	1.46
2002	34.42	23.03	9.70	6.97	3.48	1.47
2003	34.08	22.73	9.44	6.72	3.31	1.40
2004	34.48	23.21	9.91	7.13	3.57	1.51
2005	36.39	24.92	11.19	8.26	4.42	2.07
2006	36.07	24.89	11.36	8.42	4.52	2.06
2007	36.86	25.66	11.94	8.90	4.85	2.29
2008	36.84	25.70	11.92	8.82	4.66	2.08
Sorting effect (Scenario 3b share as % of Scenario 3 share)						
annual						
2001	0.99	0.99	0.98	0.97	0.94	0.91
2002	1.00	0.99	0.99	0.98	0.96	0.94
2003	1.00	0.99	0.99	0.98	0.97	0.95
2004	1.00	0.99	0.99	0.98	0.97	0.95
2005	1.00	1.00	0.99	0.99	0.97	0.95
2006	1.00	0.99	0.99	0.98	0.97	0.94
2007	1.00	0.99	0.99	0.98	0.96	0.95
2008	0.99	0.99	0.98	0.97	0.95	0.92
Average sorting effect 2001–08 $\widehat{=}$ correction factor applied after 2009						
–	1.00	0.99	0.99	0.98	0.96	0.94

Notes: The sorting effect indicates the difference between the shares we observe in PIT statistics from 2009 onwards (0% rule income shares, tax units sorted by 0% rule income) and the shares that we need for extrapolation from 2009 onwards (0% rule income shares, tax units sorted by 100% rule income). We use the average difference between these two Scenarios to correct non-capital top income shares from PIT statistics before capital income extrapolation.
Source: PIT microdata, own calculations.

Appendix 4.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). For the general method of deriving dividend yields and capital gain yields from stock market indices, see Dimson et al. (2002).

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 section 4.2. 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 via remote execution access.

Appendix 4.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.

Appendix 4.D Composition of Taxable Income

The composition of aggregate taxable income and its development over the period 1992-2010 is illustrated in Figure 4.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 4.D.3.

Table 4.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). [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, 2005–2011).

Figure 4.D.1.: Composition of taxable income in Germany, 1992-2010

Source: Own calculations since 2001.

Appendix 4.D 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).[86] 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[87] 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.[88]

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.[89] 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 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.

[86] 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.

[87] 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.

[88] 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.

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

Appendix 4.D 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 4.D.3.

Table 4.D.2.: Changes in the Definition of Taxable Capital Income

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

Notes: $Y_{non\text{-}cap}$: personal income other than capital income (not affected by reforms) 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[90] could be fully deducted and therefore reduced GTI.

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

Table 4.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

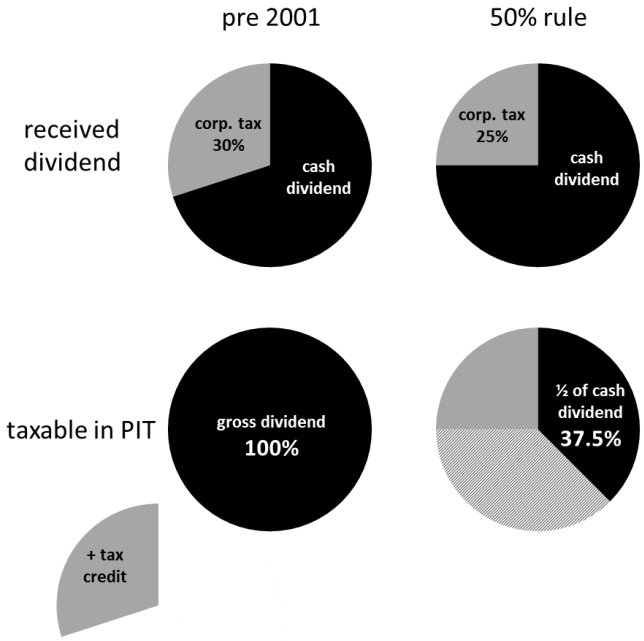
- The definition of taxable dividend income in the PIT changed in 2001/2002.[91] Instead of gross dividends, the new taxable income definition was half the cash dividend (50% rule; 35 € in the example above). At the same time, the corporate level taxes could not be credited against the PIT any more. The resulting effective tax rate on the gross dividend was comparable to the tax rate before 2001/2002, but GTI observed in the income tax data was considerably reduced.

[91]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.

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 4.D.2.: Changes in definition of taxable dividends



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% instead (see Jenderny, 2015 for a detailed description of the reform components).[92] At the same time, negative capital income and capital income

[92]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.

related expenses cannot 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.[93]

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.

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

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

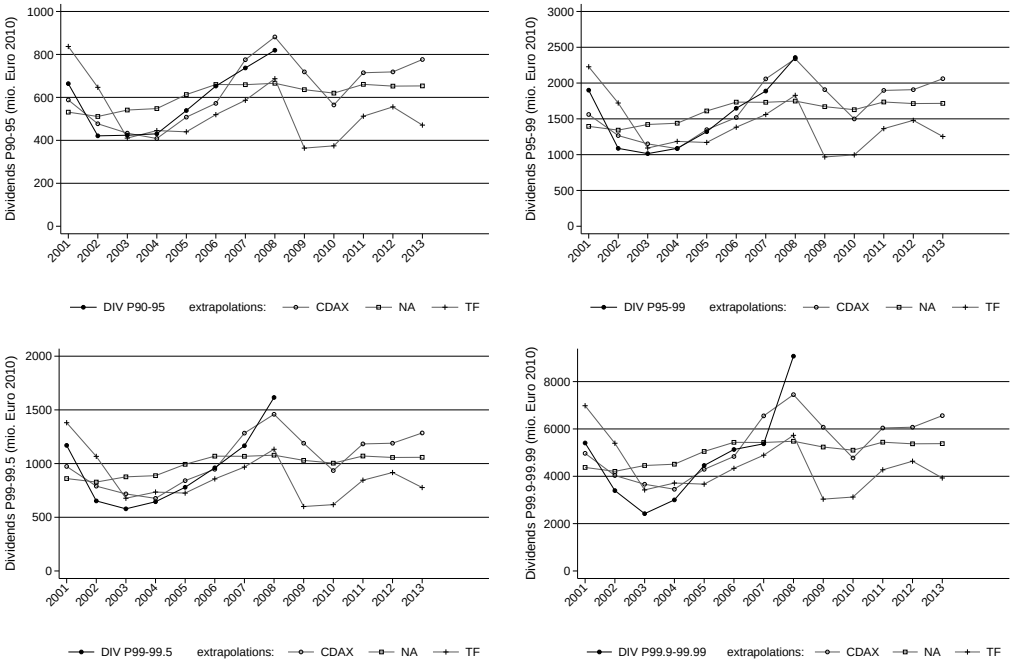
Fractile	GTI (€)	Composition of GTI (% of GTI)								CG (% of GTI)	
		GTI	a&f	bus	self	wage	cap	r&l	other	business	private
						2001					
0.01	5,740,096	100.00	0.30	60.67	2.38	9.22	23.81	0.37	0.75	11.96	-0.17
P99.9–99.99	873,837	100.00	0.83	32.22	15.92	27.15	19.84	1.22	0.70	6.19	-0.50
P99.5–99.9	291,011	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.

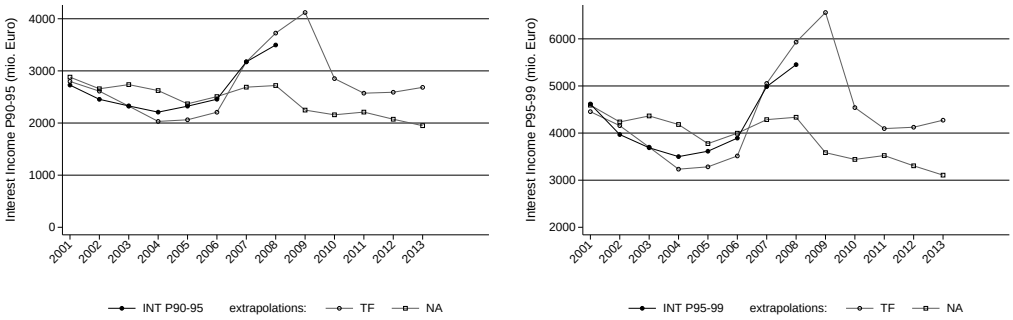
Appendix 4.E Imputing Missing Capital Income, 2009–2010

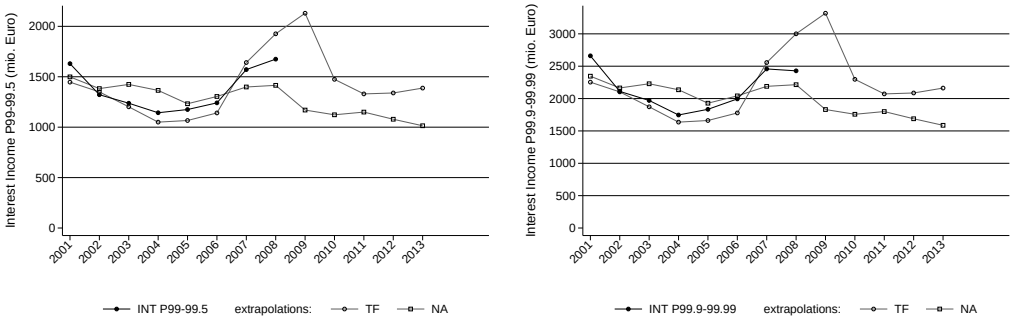
Figure 4.E.1.: PIT Fractile Totals and Extrapolations

Dividends



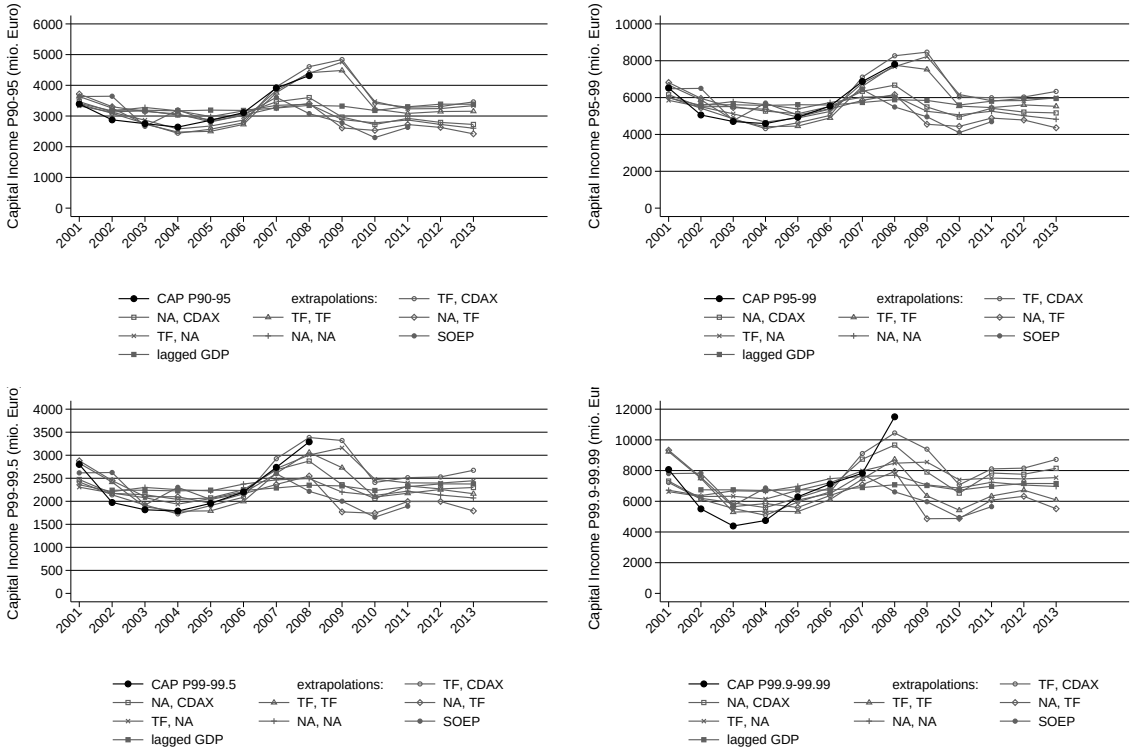
Interest income





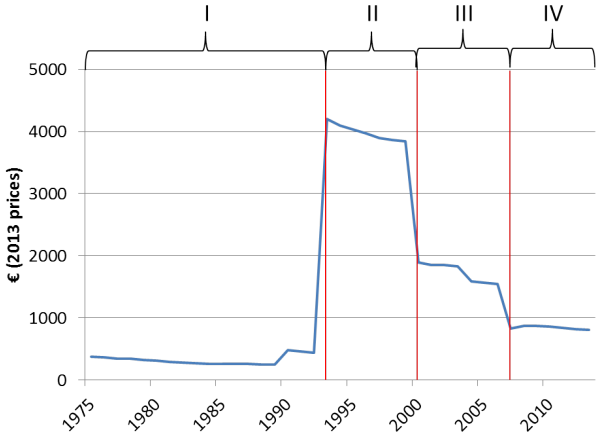
Notes: Real values in 2010 prices.
Source: Own calculations using PIT Microdata, tax flow statistics, PIT Statistics, stock market indices (CDAX), and German national accounts.

Figure 4.E.2.: PIT Fractile Totals and Extrapolations
Total capital income



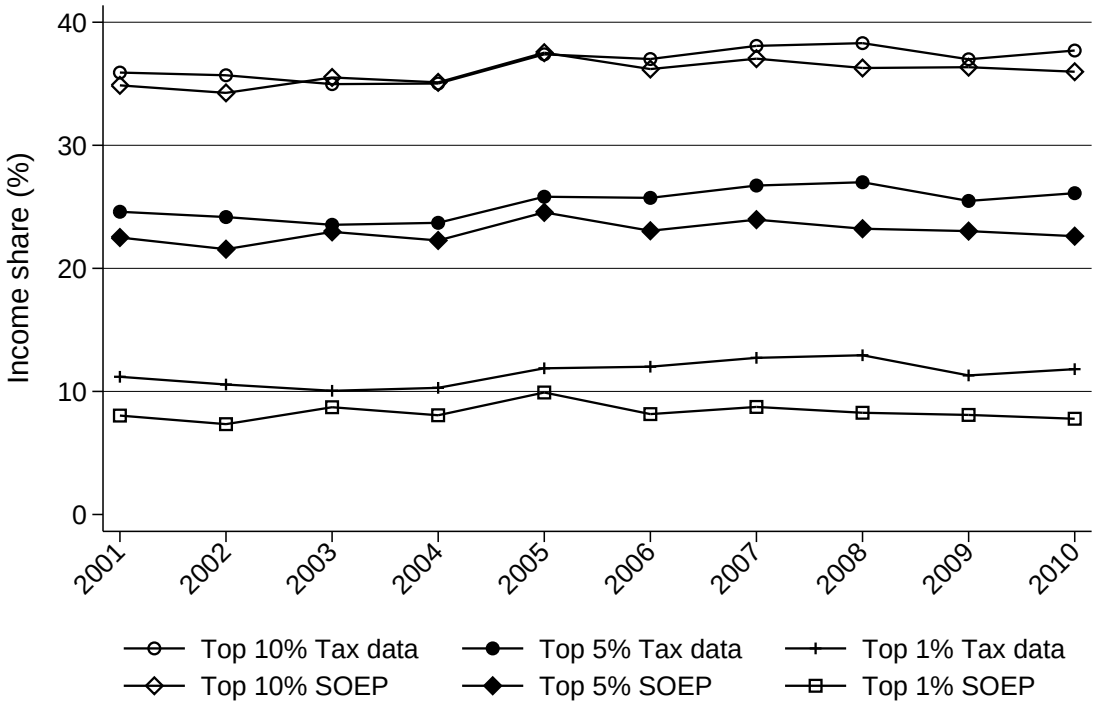
Notes: Real values in 2010 prices. Extrapolations combine the sources given in Figure 4.E.1. Sources give interest income source first and dividends source second. In addition, total capital income is extrapolated using SOEP survey data (capital income of P90–99 fractile) and lagged GDP.
Source: Own calculations using PIT Microdata, tax flow statistics, PIT Statistics, stock market indices (CDAX), and German national accounts.

Figure 4.E.3.: 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 4.E.4.: Top income shares using SOEP data, 2001-2011



Notes: Fractile thresholds are obtained from PIT statistics using mean-split histogram method.
Source: PIT statistics, SOEP data, own calculations.

Bibliography

Aaberge, R. and A. B. Atkinson, "Top Incomes in Norway", in: Atkinson, A. B. and T. Piketty eds., *Top incomes: a global perspective*, Oxford University Press, 2010, 448–482.

Aaberge, R. and M. Mogstad, *Income Mobility as an Equalizer of Permanent Income*, Discussion Paper 769, Research Department of Statistics Norway, 2014.

Aaberge, R., A. B. Atkinson, and J. Modalski, *The Ins and Outs of Top Income Mobility*, Discussion Paper 7729, IZA, 2013.

Adam, S. et al., *Dimensions of Tax Design*, Oxford University Press, 2010.

Alesina, A. F. and P. Giuliano, *Preferences for Redistribution*, Working Paper Series 14825, NBER, 2009.

Alstadsæter, A. and E. Fjærli, "Neutral taxation of shareholder income? Corporate responses to an announced dividend tax", *International Tax and Public Finance*, 16, 571–604, 2009.

Altzinger, W. et al., "Die langfristige Entwicklung der Einkommenskonzentration in Österreich, 1957-2009", *Wirtschaft und Gesellschaft - WuG*, 37, 513–529, 2011.

— "Die langfristige Entwicklung der Einkommenskonzentration in Österreich, 1957-2009", *Wirtschaft und Gesellschaft - WuG*, 38, 77–102, 2012.

Alvaredo, F. et al., "The Top 1 Percent in International and Historical Perspective", *Journal of Economic Perspectives*, 27, 3–20, 2013.

— *The World Top Incomes Database*, (last accessed on 16/12/2014), 2014, URL: http://g-mond.parisschoolofeconomics.eu/topincomes.

Atkinson, A. B., "Top Incomes in the UK over the 20th Century", *Journal of the Royal Statistical Society. Series A (Statistics in Society)*, 2, 325–343, 2005.

— "Measuring Top Incomes: Methodological Issues", in: Atkinson, A. B. and T. Piketty eds., *Top Incomes Over the Twentieth Century: A Contrast Between Continental European and English-Speaking Countries*, Oxford University Press, 2007, 82–140.

— "The Distribution of Top Incomes in the United Kingdom 1908-2000", in: Atkinson, A. B. and T. Piketty eds., *Top Incomes Over the Twentieth Century: A Contrast Between Continental European and English-Speaking Countries*, 82–140, Oxford University Press, 2007.

Atkinson, A. B., *UK estimates of top income shares 2009-2010*, Methodological Note, The World Top Incomes Database, 2012.

— *UK estimates of top income shares 2011-2012: Note on Methods*, Methodological Note, The World Top Incomes Database, 2014.

Atkinson, A. B. and T. Piketty, eds., *Top Incomes Over the Twentieth Century: A Contrast Between Continental European and English-Speaking Countries*, Oxford University Press, 2007.

— eds., *Top incomes: a global perspective*, Oxford University Press, 2010.

Atkinson, A. B. and W. Salverda, "Top Incomes in the Netherlands and the United Kingdom over the 20th Century", *Journal of the European Economic Association*, 3, 883–913, 2005.

Atkinson, A. B. and J. E. Søgaard, *The long-run history of income inequality in Denmark: Top incomes from 1870 to 2010*, EPRU Working Paper Series 2013/01, Economic Policy Research Unit (EPRU), University of Copenhagen. Department of Economics, 2013.

Atkinson, A. B. and S. Voitchovsky, "The Distribution of Top Earnings in the UK since the Second World War", *Economica*, 78, 440–459, 2011.

Atkinson, A. B., T. Piketty, and E. Saez, "Top Incomes in the Long Run of History", *Journal of Economic Literature*, 49, 3–71, 2011.

Auten, G. and G. Gee, "Income Mobility in the United States: New Evidence from Income Tax Data", *National Tax Journal*, 62, 301–328, 2009.

Auten, G., G. Gee, and N. Turner, "Perspectives on Inequality and Mobility in the US: Income Inequality, Mobility, and Turnover at the Top in the US, 1987-2010", *American Economic Review: Papers and Proceedings*, 103, 168–172, 2013.

Bach, S., G. Corneo, and V. Steiner, "From Bottom to Top: The Entire Income Distribution in Germany, 1992-2003", *Review of Income and Wealth*, 55, 303–330, 2009.

— "Effective Taxation of Top Incomes in Germany", *German Economic Review*, 14, 115–137, 2013.

Bartels, C. and K. Jenderny, *The Role of Capital Income for Top Income Shares in Germany*, FU Berlin, School of Business and Economics, DP 2014/32, 2014.

Bartels, C. and K. Jenderny, *The Role of Capital Income for Top Income Shares in Germany*, The World Top Incomes Database, WP 2015/1, 2015.

Besley, T. and A. Prat, "Handcuffs for the Grabbing Hand? Media Capture and Government Accountability", *American Economic Review*, 96, 720–736, 2006.

Biewen, M. and A. Juhasz, "Understanding Rising Income Inequality in Germany, 1999/2000-2005/2006", *Review of Income and Wealth*, 58, 622–647, 2012.

Burkhauser, R. V. and K. A. Couch, "Intragenerational Inequality and Intertemporal Mobility", in: Salverda, W., B. Nolan, and T. M. Smeeding eds., *The Oxford Handbook of Economic Inequality*, 522–545, Oxford University Press, 2011.

Chetty, R. et al., "Adjustment Costs, Firm Responses, and Micro vs. Macro Labor Supply Elasticities: Evidence from Danish Tax Records", *The Quarterly Journal of Economics*, 126, 749–804, 2011.

Corneo, G., "The Rise and Likely Fall of the German Income Tax, 1958–2005", *CESifo Economic Studies*, 51, 159–186, 2005.

— "Media Capture in a Democracy: The Role of Wealth Concentration", *Journal of Public Economics*, 90, 37–58, 2006.

Corneo, G., S. Zmerli, and R. Pollak, "Rising Inequality and the Transformation of Rhine Capitalism", in: Nolan, B. et al. eds., *Changing Inequalities and Societal Impacts in Rich Countries. Thirty Countries' Experiences*, 271–298, Oxford University Press, 2014.

D'Agostino, M. and V. Dardanoni, "The Measurement of Rank Mobility", *Journal of Economic Theory*, 144, 1783–1803, 2009.

Dardanoni, V. and P. J. Lambert, "Progressivity Comparisons", *Journal of Public Economics*, 86, 99–122, 2002.

Dell, F., "Top Incomes in Germany and Switzerland Over the Twentieth Century", *Journal of the European Economic Association*, 3, 412–421, 2005.

— "Top Incomes in Germany Throughout the Twentieth Century 1891-1998", in: Atkinson, A. B. and T. Piketty eds., *Top Incomes Over the Twentieth Century: A Contrast Between Continental European and English-Speaking Countries*, 365–425, Oxford University Press, 2007.

Dell, F., *Update and Extension of Germany Series*, Methodological Note, The World Top Incomes Database, 2011.

Destatis, *Statistisches Jahrbuch*, Destatis, Wiesbaden, 1996.

— *Lohn-und Einkommensteuerstatistik*, Finanzen und Steuern - Fachserie 14 Reihe 7.1.1, Destatis, Wiesbaden, 1998-2007.

— *Statistisches Jahrbuch*, Destatis, Wiesbaden, 2000.

— *Jährliche Einkommensteuerstatistik*, Finanzen und Steuern, Fachserie 14, Reihe 7.1.1 2001–2006, 2005–2011.

— *Bevölkerungsfortschreibung*, – Fachserie 1 Reihe 1.3 – 2001, Destatis, Wiesbaden, 2005.

— *Preise. Verbraucherpreisindizes für Deutschland. Lange Reihen ab 1948*, 2014.

— *Volkswirtschaftliche Gesamtrechnungen. Inlandsproduktsberechnung. Lange Reihen ab 1970*, Volkswirtschaftliche Gesamtrechnungen, Fachserie 18, Reihe 1.5 2013, 2014.

— *Volkswirtschaftliche Gesamtrechnungen. Sektorkonten. Jahresergebnisse ab 1991*, 2014.

Deutsche Börse AG, *Leitfaden zu den Aktienindizes der Deutschen Börse*, Version 6.28, August, 2014.

Deutsche Bundesbank, *Panel on Household Finances*, 2013, DOI: 10.12757/PHF.01.01.01.STATA.

Dimson, E., P. Marsh, and M. Staunton, *Triumph of the Optimists: 101 Years of Global Investment Returns*, Princeton University Press, 2002.

— "The Quest for Yield", in: *Credit Suisse Global Investment Returns Yearbook*, Credit Suisse Research Institute, 2011.

Doerrenberg, P., A. Peichl, and S. Siegloch, *Sufficient Statistic or Not? The Elasticity of Taxable Income in the Presence of Deduction Possibilities*, IZA Discussion Papers 8554, Institute for the Study of Labor (IZA), 2014.

Finanzministerium des Landes Nordrhein-Westfalen, *572 Selbstanzeigen in Nordrhein-Westfalen*, press release on 18/02/2010, last accessed on 07/12/2014, 2010, URL: http://www.fm.nrw.de/allgemein_fa/presse/pressearchiv/archiv_2010/2010_02_18_selbstanzeigen.php.

Finanzministerium des Landes Nordrhein-Westfalen, *Informationen zum Schweizer Steuerabkommen und dem Ankauf von Steuer-CDs sowie zu Selbstanzeigen*, Treasury's website, version as of 05/12/2014, last accessed on 07/12/2014, 2014, URL: http://www.fm.nrw.de/presse/anlagen/Selbstanzeigen_Feb2010-Dez2014_tab.pdf.

Foellmi, R. and I. Martínez, *Volatile Top Income Shares in Switzerland? Reassessing the Evolution Between 1981 and 2008*, Discussion Paper no. 2012-27, University of St. Gallen, School of Economics and Political Science, 2013.

Fossen, F. M. and M. Simmler, "Personal taxation of capital income and the financial leverage of firms", *International Tax and Public Finance*, 1–34, 2015.

Jakobsson, U., "On the Measurement of the Degree of Progression", *Journal of Public Economics*, 5, 161–168, 1976.

Jäntti, M. and S. P. Jenkins, "Income Mobility", in: Atkinson, A. B. and F. Bourguignon eds., *Handbook of Income Distribution, vol. 2*, 807–935, North-Holland, 2015.

Jenderny, K., *Top Tax Progression and the German Dual Income Tax*, FU Berlin, School of Business and Economics, mimeo, 2015.

— "Mobility of Top Incomes in Germany", *Review of Income and Wealth*, forthcoming.

Kalckreuth, U. von et al., *The PHF: A comprehensive panel survey on household finances and wealth in Germany*, Discussion Papers 13/2012, Deutsche Bundesbank, Research Centre, 2012.

Kleven, H. J. and E. A. Schultz, "Estimating Taxable Income Responses Using Danish Tax Reforms", *American Economic Journal: Economic Policy*, 6, 271–301, 2014.

Kristjánsson, A. S. and P. J. Lambert, *Structural Progression Measures for Dual Income Tax Systems*, Working Papers 269, ECINEQ, Society for the Study of Economic Inequality, 2012.

Kuznets, S., *Shares of Upper Income Groups in Income and Savings*, NBER, 1953.

Kuznets, S., "Economic Growth and Income Inequality", *The American Economic Review*, 45, pp. 1–28, 1955.

Lambert, P. J. and T. O. Thoresen, "The Inequality Effects of a Dual Income Tax System", *The B.E. Journal of Economic Analysis & Policy*, 12, 1–17, 2012.

Landais, C., *Les Hauts Revenus en France 1998-2006: Une Explosion des Inégalités?*, mimeo, PSE, 2007.

— *Top Incomes in France: Booming Inequalities?*, mimeo, PSE, 2008.

Maier, P. and T. Wengenroth, "Künftige Besteuerung privater Kapitalerträge - Auswirkungen der Abgeltungssteuer im Unternehmensteuerreformgesetz", *Der Erbschaft-Steuer-Berater*, 3, 89–90, 2007.

Merz, J. and M. Zwick, *Einkommens- und Verteilungsanalysen mit dem Taxpayer-Panel - Neue Möglichkeiten und erste Ergebnisse für Selbständige als Freiberufler und Unternehmer und abhängige Beschäftigte sowie hohe Einkommen*, FBB-Diskussionspapier 74, Forschungsinstitut Freie Berufe, Lüneburg, 2008.

Mirrlees, J. et al., *Tax by Design*, Oxford University Press, 2011.

Nielsen, S. B. and P. B. Sørensen, "On the Optimality of the Nordic System of Dual Income Taxation", *Journal of Public Economics*, 63, 311–329, 1997.

Piketty, T., *Les Hauts Revenus en France au XX^{e} Siècle: Inégalités et Redistributions, 1901-1998*, Grasset, 2001.

— "Income Inequality in France, 1901-1998", *Journal of Political Economy*, 111, 1004–1042, 2003.

— "Income, Wage, and Wealth Inequality in France, 1901-1998", in: Atkinson, A. B. and T. Piketty eds., *Top Incomes Over the Twentieth Century: A Contrast Between Continental European and English-Speaking Countries*, 43–81, Oxford University Press, 2007.

— *Capital in th Twenty-First Century*, Harvard University Press, 2014.

Piketty, T. and E. Saez, "Income Inequality in the United States, 1913-1998", *The Quarterly Journal of Economics*, 118, 1–39, 2003.

— "Income and Wage Inequality in the United States, 1913-2002", in: Atkinson, A. B. and T. Piketty eds., *Top Incomes Over the Twentieth Century: A Contrast Between Continental European and English-Speaking Countries*, 141–225, Oxford University Press, 2007.

— *A Theory of Optimal Capital Taxation*, NBER Working Paper Series 17989, 2012.

— "A Theory of Optimal Capital Taxation", *Econometrica*, 81, 1851–1886, 2013.

Piketty, T. and E. Saez, "Top incomes and the great recession: Recent evolutions and policy implications", *IMF Economic Review*, 61, 456–478, 2013.

Piketty, T. and G. Zucman, *Capital is Back: Wealth-Income Ratios in Rich Countries 1700-2010*, PSE working paper, 2013.

— *Wealth and Inheritance in the Long Run*, PSE working paper, 2014.

Piketty, T., E. Saez, and S. Stantcheva, "Optimal Taxation of Top Labor Incomes: A Tale of Three Elasticities", *American Economic Journal: Economic Policy*, 6, 230–71, 2014.

Pirttilä, J. and H. Selin, "Income Shifting within a Dual Income Tax System: Evidence from the Finnish Tax Reform of 1993", *Scandinavian Journal of Economics*, 113, 120–144, 2011.

Roine, J. and D. Waldenström, "The Evolution of Top Incomes in an Egalitarian Society: Sweden, 1903-2004", *Journal of Public Economics*, 92, 366–387, 2008.

— "Top Incomes in Sweden over the Twentieth Century", in: Atkinson, A. B. and T. Piketty eds., *Top incomes: a global perspective*, 299–370, Oxford University Press, 2010.

— "On the Role of Capital Gains in Swedish Income Inequality", *Review of Income and Wealth*, 58, 569–587, 2012.

— "Long Run Trends in the Distribution of Income and Wealth", in: Atkinson, A. B. and F. Bourguignon eds., *Handbook of Income Distribution, vol. 2*, 469–592, North-Holland, 2015.

Rosen, S., "The Economics of Superstars", *American Economic Review*, 71, 845–858, 1981.

Saez, E., *Striking it Richer: The Evolution of Top Incomes in the United States (Updated with 2012 preliminary estimates)*, Methodological Note, The World Top Incomes Database, 2013.

Saez, E. and M. R. Veall, "The Evolution of High Incomes in Northern America: Lessons from Canadian Evidence", *American Economic Review*, 95, 831–849, 2005.

— "The Evolution of High Incomes in Canada, 1920-2000", in: Atkinson, A. B. and T. Piketty eds., *Top Incomes Over the Twentieth Century: A Contrast Between Continental European and English-Speaking Countries*, 226–308, Oxford University Press, 2007.

Saez, E., J. Slemrod, and S. H. Giertz, "The Elasticity of Taxable Income with Respect to Marginal Tax Rates: A Critical Review", *Journal of Economic Literature*, 50, 3–50, 2012.

Salverda, W., *Extending the top-income shares for the Netherlands from 1999 to 2012: An explanatory note*, Methodological Note, The World Top Incomes Database, 2013.

Salverda, W. and A. B. Atkinson, "Top Incomes in the Netherlands over the 20th Century", in: Atkinson, A. B. and T. Piketty eds., *Top Incomes Over the Twentieth Century: A Contrast Between Continental European and English-Speaking Countries*, 426–471, Oxford University Press, 2007.

Schwarz, N., "Einkommensentwicklung in Deutschland. Konzepte und Ergebnisse der Volkswirtschaftlichen Gesamtrechnungen", *Wirtschaft und Statistik*, 3, 197–206, 2008.

Shorrocks, A., "Income Inequality and Income Mobility", *Journal of Economic Theory*, 19, 376–393, 1978.

Sørensen, P. B., "Dual Income Taxation: Why and How?", *FinanzArchiv: Public Finance Analysis*, 4, 559–586, 2005.

Worgulla, N. and M. Söffing, "Gestaltungsmöglichkeiten und -pflichten bis zur bzw. nach der Einführung der Abgeltungsteuer auf Kapitalerträge", *Finanz-Rundschau*, 21, 1005–1011, 2007.

Deutsche Kurzzusammenfassung

Einkommenskonzentration ist von gesellschaftlicher Bedeutung: je mehr Ressoucen eine kleine Gruppe an der Spitze der Einkommensverteilung kontrolliert, desto eher wird sie politische Entscheidungen stärker beeinflussen können, als ihr durch demokratische Rechte zustünde. Darüber hinaus generieren hohe Vermögen hohe Erbschaften, was den Stellenwert eigener Leistung für die soziale Stellung reduziert. Die langfristigen Determinanten der Einkommenskonzentration sind daher von zentraler Bedeutung. Die langfristige Entwicklung der Einkommenskonzentration ist in verschiedenen Ländern und zu verchiedenen Zeiten unterschiedlich. Da ökonomisch vergleichbare Länder zum Teil sehr unterschiedliche Verläufe der Einkommenskonzentration aufweisen, spielen institutionelle Rahmenbedingungen, z.B. der maximale Grenzsteuersatz, mit großer Wahrscheinlichkeit eine Rolle.

In Deutschland war die Einkommenskonzentration in der Nachkriegszeit vergleichsweise stabil. In den letzten Jahren ist sie jedoch angestiegen. Der erste Beitrag der vorliegenden Dissertation analysiert, inwieweit sowohl die Höhe der jährlichen Einkommenskonzentration als auch deren Veränderung durch Einkommensmobilität verringert werden. Da Einkommenskonzentration auf jährlichen Daten gemessen wird, kann eine Erhöhung der Einkommensmobilität theoretisch eine Erhöhung der jährlich beobachteten Konzentration erklären, ohne dass sich die Konzentration in langfristigen Einkommen ändert. Der Beitrag untersucht, inwieweit Mitglieder der Top-Fraktile ihre jährlichen Einkommensränge ändern, und wie stark die Konzentration in langfristigen Einkommen von der Konzentration in jährlichen Einkommen abweicht. Einkommensmobilität an der Spitze der deutschen Einkommensverteilung ist gering, und kann den Anstieg der Konzentration der in der bisherigen Literatur dokumentiert wurde nicht erklären. Darüber hinaus eignet sich die jährliche Konzentration als Proxy für langfristige Konzentration.

Steuersätze an der Spitze sind eine plausible Determinante der Einkommenskonzentration: wenn hohe Einkommen weniger besteuert werden, wächst das Nettoeinkommen und Kapitalvermögen wächst somit schneller, was wiederum höhere Kapitaleinkommen generiert. In Deutschland wurde der Steuersatz auf Kapitaleinkünfte in 2009 stark reduziert, und damit höchstwahrscheinlich der Grad der Steuerprogression der persönlichen Einkommensbesteuerung. Der zweite Beitrag analysiert, inwieweit die Reform die Nettoeinkommen in verschiedenen Fraktilen und innerhalb dieser Fraktile verändert hat. Die detaillierte Simulation aller Reformkomponenten zeigt, dass die Reform sowohl regressiv also auch horizontal ungleich gewirkt hat. Dies hat mit hoher Wahrscheinlichkeit die Nettoeinkommen einiger weniger Steuerfälle am oberen Rand erhöht, während die meisten Steuerfälle unterhalb des Top-Perzentils kaum von der Reform betroffen waren.

Für die Analyse der Top Income Shares sind Einkommensteuerdaten unerlässlich, da sie sie einzige verlässliche Datenquelle über Einkommen am oberen Rand sind. Seit 2001 haben ver-

schiedene Reformen der Kapitaleinkommensbesteuerung die Eignung der Steuerdaten immer weiter reduziert. 2009 wurde die Qualität nochmals deutlich durch die Exklusion der Kapitaleinkommen aus der persönlichen Einkommensteuer reduziert. Seitdem fehlt ein Teil der höchsten Einkommen sowohl in der Einkommensteuerstatistik als auch in Mikrodaten. Im dritten Beitrag werden in Bezug auf die Kapitaleinkommensbesteuerung harmonisierte Zeitreihen der Top Income Shares für Deutschland konstruiert, um den Einfluss zu messen, den die Reformen bis 2008 und die Exklusion der Kapitaleinkommen aus dem persönlichen Steuertarif in 2009 auf die unkorrigierte Zeitreihe der Top Income Shares hatten. Bis 2008 kann die Harmonisierung auf Grundlage von Mikrodaten erfolgen, während für die Jahre 2009 und 2010 die Kapitaleinkommen an der Spitze extrapoliert werden müssen. Die harmonisierten Zeitreihen zeigen, dass die Einkommenskonzentration stärker gestiegen ist als die unkorrigierte Zeitreihe vermuten lässt. Darüber hinaus scheint die Rezession im Jahr 2009 die Top-Einkommen bis zum höchsten Perzentil nicht stark beeinflusst zu haben, während sie Anteile der höchsten Fraktile, also der Top 0,1% und der Top 0,01%, im Rezessionsjahr gesunken sind.

English Summary

Income concentration is a social issue: the more resources are controlled by a small group of persons at the top of the distribution, the more this group may influence collective decisions to a larger extent than their democratic rights would grant them. Furthermore, large fortunes translate into large inheritances, reducing the role of one's own effort in the determination of social position. The driving forces of income concentration are therefore of paramount importance. Long-run time series on income concentration show a heterogeneous pattern across countries and throughout history. As countries with similar economies show very different trends in income concentration, institutional settings such as the top marginal tax rate are likely to play a role.

While German income concentration was comparatively stable since WWII, it increased in recent years. The first contribution of this thesis analyzes to what extent annual concentration and the increase therein are offset by income mobility. As annual concentration is assessed on cross sectional data, an increase in income mobility can in theory account for an increase in annual concentration, without any increase of concentration in permanent income. The chapter analyzes the extent to which top income fractile members are mobile in terms of ranks, and to what extent concentration of permanent incomes differs from annual concentration. It finds that income mobility at the top of the German income distribution is particularly low, and cannot account for the previously documented increase in income concentration. In addition, annual concentration is a suitable proxy for permanent concentration.

Top income taxation is a plausible driving force for income concentration: if high incomes are taxed less, net income increases and accelerates capital accumulation, which in turn generates capital income. In Germany, the tax rate on capital income was drastically reduced in 2009, most likely reducing the degree of progressivity of personal income taxation. The second contribution analyzes the extent to which the reform changed net incomes across the distribution and within fractiles. A detailed simulation of all tax reform components reveals that the reform effect is regressive and horizontally unequal. The reform most likely induced a high increase in net incomes for few high-income tax units, while the bulk of tax units below the top percentile was hardly affected.

The analysis of top income shares crucially depends on the availability of data on income tax records, as these are the only reliable source of the income level at the very top. Since 2001, several reforms of capital income taxation rendered tax statistics less and less suitable for deriving top income shares. In 2009, the data quality for Germany was further reduced by the exclusion of capital income from the personal income tax schedule. Since then, both tax statistics and microdata are missing a significant portion of gross income at the top. The third contribution derives harmonized series on top income shares with respect to capital income taxation, gauging

the impact of the reforms up to 2008 and the total exclusion of capital income from the personal income tax schedule in 2009 on top income shares as assessed on tax statistics. While the analysis can rely on microdata until 2008, capital income of the top fractiles needs to be extrapolated in order to derive homogeneous series including capital income for the years 2009 and 2010. Harmonized series indicate that income concentration increased more than uncorrected series suggest. Furthermore, the 2009 recession does not seem to have had a substantial impact on top income shares up to the top percentile, while the share of higher fractiles, i.e. the top 0.1% and the top 0.01% decreased.

Vorveröffentlichungen

Die folgende Liste enthält alle Vorveröffentlichungen. Darunter sind auch Versionen der Kapitel, die zum Teil stark überarbeitet wurden, bevor sie Eingang in die vorliegende Dissertation fanden.

Kapitel 2: Mobility of Top Incomes in Germany

- Diskussionspapiere des Fachbereichs Wirtschaftswissenschaft der Freien Universität Berlin, 2013/7
- Review of Income and Wealth (early view DOI: 10.1111/roiw.12184)

Kapitel 3: Top Tax Progression and the German Dual Income Tax

- Annual Conference 2013 (Duesseldorf): Competition Policy and Regulation in a Global Economic Order 80039, Verein für Socialpolitik / German Economic Association. (Titel: Declining Tax Progression and the German Dual Income Tax)

Kapitel 4: The Role of Capital Income for Top Income Shares in Germany

- Diskussionspapiere des Fachbereichs Wirtschaftswissenschaft der Freien Universität Berlin, 2014/32 (mit C. Bartels)
- The World Top Incomes Database (WTID) Working Paper, 2015/1 (mit C. Bartels)