# Optional (Non-)Filing and Effective Taxation[*]

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## Abstract

Tax non-filing is legal in more than thirty countries worldwide. Using German administrative tax data, we examine the effect of such optional (non-)filing systems: Low-income taxpayers are both more likely not to file and to over-remit taxes, aggregating to total over-remittances of 950 million € in 2014. Because low-income non-filers face higher effective average tax rates, this reduces the effective tax progressivity. Non-filing also increases effective marginal tax rates which imposes distortionary effects for non-filers with no mechanical tax revenue gain from other taxpayers, leading to unexploited tax revenue potential. We suggest two reform proposals to quantify this potential.

**Keywords:** Tax Filing, Optional Filing, Effective Taxation, Tax Over-Remittance, Tax Progressivity
**JEL Codes:** H24, H29, H31

# 1  Introduction

The study of progressive income taxes - a common feature of tax systems around the world - has a long tradition in public economics (e.g., Mirrlees 1971; Saez 2001). Yet, when observing actual outcomes, statutory and effective taxation often diverge. The reasons for this divergence are manifold. Some taxpayers, often those with higher income, engage in active behavior to decrease their tax burden, for example via tax evasion (Alstadsæter et al. 2019). Other taxpayers, often those with lower income, passively stick to implicit defaults increasing their effective tax burden. Examples for this include incomplete take-up of benefits, such as the EITC, or non-filing (Goldin et al. 2021). Although more than 30 countries use optional (non-)filing systems,[1] including the US where low-income taxpayers can be exempt from filing duties,[2] there is currently only a small and emerging literature on filing behavior (e.g. Benzarti 2020b; Goldin et al. 2021; Zwick 2021). Consequently, the effects of tax filing decisions on effective taxation are not well understood, yet.

In this paper, we provide empirical evidence that optional tax filing systems with a legal non-filing option have large implications for effective taxation, affecting both equity and efficiency. We study effective taxation in Germany, a country where about half of the taxpayer population has the legal option of tax non-filing. Despite automatic withholding, many employees over-remit taxes which are only refunded after the tax year when taxpayers actively decide to file an income tax return. We show that optional non-filing leads to substantial tax over-remittances which increases effective average tax rates. Since non-filing and over-remittances are concentrated at the lower end of the income distribution, this weakens the effective tax progressivity as compared to the statutory tax schedule. Non-filing also increases effective marginal tax rates which imposes distortionary effects for non-filers. In contrast to an increase in

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[1]See Table A.1 for more information on countries with optional tax filing systems.

[2]Different thresholds apply depending on individual characteristics such as marital status or age. The Internal Revenue Service (IRS) provides an interactive tax assistant that determines filing requirements (`https://www.irs.gov/help/ita/do-i-need-to-file-a-tax-return`, last accessed: 2020-12-01).

statutory marginal tax rates, there is no mechanical gain in tax revenue from other taxpayers, leading to unexploited tax revenue potential.

Building on German administrative tax data with precise information on both filers' and non-filers' income and effective tax liabilities, our empirical analysis leads to three major insights on tax non-filing and its (distributional) impacts on the effective taxation of income.[3] First, we document the prevalence of non-filing over the income distribution. The share of non-filers relative to all optional filers falls over income. While the non-filing share is as high as 90% in the lowest income bins, the share drops to about 30% for taxpayers with higher income.

Second, we quantify tax over-remittances that result from non-filing. We do so by computing the statutory tax liabilities as defined in the tax schedule and comparing those to the effective tax remittances observed in the data. Over-remittances, i.e. divergences between effective and statutory taxation, occur due to incorrect extrapolations of annual taxable income by employers and may, for example, arise for taxpayers with fluctuating monthly income. We show that non-filing leads to over-remittances at all income levels and that these over-remittances are sizable, summing up to at least 949 million €. On average, over-remitting non-filers pay 360 € more than intended, the average for all non-filers is as high as 116 €. Tax over-remittances are more likely to occur for lower income taxpayers, including those who, following the statutory tax schedule, should pay zero taxes.

Third, we derive the effective average tax rates (ATRs) for non-filers and compare it to the statutory tax schedule. Non-filing increases effective ATRs, especially at the lower end of the income distribution. Over-remitting non-filers with income within the basic allowance pay an effective ATR of about 4.5%, despite a statutory rate of zero. The effective ATR for all non-filers in this income range, including those without over-remittances, is 2%. As a result, the effective progressivity of the income taxation is dampened compared

[3]Our results are based on the most recent cross-sectional administrative data set on taxpayers in Germany from 2014, but we can replicate all findings with the second most recent data from 2010, as provided by the Research Data Centre of the Federal Statistical Office and the statistical offices of the Länder (RDC) (2018, 2020).

to the statutory tax schedule.

Since non-filing has tangible effects on the effective progressivity of income taxation and arguably makes the optional (non-)filing system inequitable, this entails clear policy implications. If policymakers are concerned about equity, the straightforward policy implication is to realign effective and statutory taxation and to refund non-filers' over-remittances automatically. This would lift effective progressivity back to the level defined in the tax schedule. Tax authorities have employer provided information on non-filers' effective taxation and would simply need to compare this to the statutory taxation to determine the refund due – basically performing the same calculation as we do in this paper. Since refunds are not cost free, we provide a back-of-the-envelop proposal for a budget neutral tax reform that could finance refunds via an increase in top income marginal tax rates.

Besides changing the effective degree of redistribution, as measured by the average tax rates (ATRs), the optional filing system also effectively changes marginal tax rates (MTRs). Over-remitting non-filers, typically with low income, thus face higher effective distortions than foreseen by the tax schedule. However, these distortions do not generate any additional tax revenue from other, typically higher-income, taxpayers, as is the case if MTRs are increased in the tax schedule (Saez 2001): An increase in statutory MTR for a given income level leads to a mechanical tax revenue gain from higher-income taxpayers by increasing their ATRs without changing their MTRs. We argue that the effective distortions under non-filing are not efficient, yielding unexploited potential to increase tax revenue. Even if policymakers are not concerned about equity, we show that effective taxation under optional (non-)filing cannot be optimal because of these efficiency losses.

To quantify the unexploited potential for tax revenue, we propose two tax reforms that increase tax revenue without increasing average effective distortions. First, we design a tax schedule that incorporates the current effective marginal tax rate in the first bracket, i.e. below the basic allowance. Lowest income taxpayers face, on average, the same effective distortions as in the status quo, but now reached via an increase in statutory MTR rather than via

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over-remittances from non-filing. This generates a mechanical increase in tax revenue from taxpayers with higher income, whose ATRs now increase while their MTRs remain unchanged. Exploiting this mechanical effect generates about 13 billion € in additional tax revenue without imposing higher effective distortions.

For the second approach, we quantify missed out gains in tax revenue from behavioral responses. We design a best-fit tax schedule that matches the average effective tax liabilities currently observed under optional (non-)filing. The degree of effective redistribution in terms of effective ATRs remains unchanged, but we are able to implement lower MTRs. Intuitively, implementing the increased effective MTRs for low-income taxpayers in the status quo as statutory MTRs generates additional tax revenue from higher income taxpayers. However, as we keep the effective tax liabilities constant for a given income level, effective MTRs can fall. This reduction in marginal tax rates generates incentives to increase taxable income, ultimately leading to increases in tax revenue of at least 193 million €.

After documenting the relevance of non-filing for effective taxation, one pressing question is: Why is it that taxpayers forgo sizable refunds by not filing an income tax return? In a related study, Benzarti (2020b) shows that patterns on the intensive tax filing margin – whether or not to itemize deductions when taxpayers are filing – are in line with filers trading off benefits from additional refunds against compliance time costs. In our setting, taxpayers face the decision whether to file a tax return, i.e. are at the extensive margin of tax filing. In contrast to most filing settings, we know that correcting for over-withholding in the German context only requires copying a total of six numbers from an employer provided form into a two page filing form (we refer to this as *minimal filing*). When we compare non-filers' average over-remittances and conventional tax filing time estimates from the literature, we find that the implied net hourly wages need to be implausibly high to make non-filing the optimal choice. We thus suggest that informational frictions with respect to refund potential, tax filing time estimates, or both are likely to be important.

Our work relates to three broad strands of the literature. First, we contribute to an evolving literature on optional tax filing.[4] Investigating optional filing at the intensive margin, Benzarti (2020b) shows that filing taxpayers in the US restrain from filing itemized deductions to avoid additional filing costs by documenting a missing mass in the distribution of itemized deductions just above the standard deduction level. We contribute to the literature here by showing that taxpayers forgo sizable refunds at the extensive margin, by not filing a tax return at all. Related to our findings, filing experiments in the US document that non-filers forgo EITC refunds (Goldin et al. 2021; Guyton et al. 2017). Incomplete take-up rates, especially among low-income earners, for the EITC and other social welfare benefits have been a well established pattern (see e.g. Currie 2006). As Germany does not administer social welfare programs via the tax code, we contribute to this literature by highlighting that non-filers forgo substantial amounts of money even in the absence of potential social stigmata, suggesting that other frictions seem to matter for incomplete take-up (see also Finkelstein and Notowidigdo 2019). Zwick (2021) documents similar findings on the firm level, by showing that eligible firms fail to claim tax refunds in complex settings.

Second, we add to the literature on effective taxation. So far, this literature has been mostly examining taxpayers at the upper end of the income or wealth distribution. Saez and Zucman (2019, 2020) recently contributed to the debate about the effective taxation of the very wealthy in the US. In a similar vein, Advani and Summers (2020) document low effective average tax rates for UK's top income taxpayers. In the Swiss context, Roller and Schmidheiny (2016) show that high-income taxpayers migrate to low-tax regions in order to reduce their effective tax burden. Alstadsæter et al. (2019) highlight the role of tax evasion for effective inequality in terms of the wealth distribution. In contrast to active actions to reduce tax liabilities, often taken by high-income or very wealthy taxpayers, our work highlights the importance of passive behavior for

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[4]An additional literature focuses more on non-compliance with filing obligations and reasons for why individuals do not pay any taxes at all (e.g. Fullerton and Rao 2019; Heim et al. 2014). This is less related to our study, which focuses on legal non-filing that leads to tax over-remittances.

the effective redistribution, common mostly among low-income taxpayers. We show that the implicit non-filing default in an optional tax (non-)filing system over-proportionally increases the effective tax burden at the lower end of the income distribution.

Lastly, we add to the broader literature on how taxpayers perceive and react to taxes. Abeler and Jäger (2015) highlight that taxpayers do not always make optimal decisions when facing complex tax systems. Similarly, Aghion et al. (2017) show that taxpayers seem to be trading-off complexity with forgoing tax savings. More generally, individuals seem to use simplifying heuristics when interacting with taxes (Rees-Jones and Taubinsky 2020), and are therefore likely to misperceive (marginal) tax rates (e.g. Feldman et al. 2016). Our results suggest that taxpayers might also not be aware of basic institutional features of a tax system, namely potential over-withholding throughout the year and related benefits from tax filing. This relates to findings for the US, where many taxpayers do not adjust for over-withholding throughout the year which leads to tax refunds at the end of the year (Jones 2012).

The remainder of this paper is organized as follows. Section 2 explains the institutional background for tax filing in Germany, before Section 3 introduces the data set. Section 4 documents the prevalence of non-filing and resulting tax over-remittances, analyzes the impact on effective taxation and discusses related policy implications. In section 5, we analyze effective marginal tax rates under non-filing and the corresponding reform potential for increasing tax revenue. Further thoughts and discussion of our results are provided in section 6. Lastly, section 7 concludes.

## 2    Institutional Background

To evaluate the effects of an optional (non-)filing system, it is important to understand the institutional background for personal income taxation in Germany, as outlined below. A more extensive overview is relegated to subsection B.2 in the Online Appendix.

**Tax Schedule.** The German tax system features a progressive income tax schedule. In 2014, annual taxable income up to a threshold of 8,354 € is tax free. Above this basic allowance, marginal tax rates (MTRs) are linearly increasing from initially 14% up to 42% for a taxable income of 52,881 €. Taxable income above this cutoff is taxed at a flat MTR of 42%, before the top MTR of 45% applies for all taxable income exceeding 250,730 €. For joint filing spouses, their tax liability equals twice the amount of taxes that correspond to their mean taxable income. In the appendix, Figure A.1 graphically shows marginal and average tax rates for single and joint filing taxpayers in 2014.

**Tax Deductions.** Taxpayers can reduce their taxable income through various deductions.[5] In a given year, all taxpayers are entitled to a standard deduction for special expenses (36 €) and wage earners have an additional standard deduction for work related expenses (1,000 € in 2014). As these standard deductions are rather small and various expenses are deductible, many taxpayers exceed the standard level when itemizing. Furthermore, taxpayers can deduct social security contributions. This includes parts of the public health insurance costs and contributions towards the public pension insurance. Additional special allowances, e.g. for single parents or elderly employees, also exist.

**Optional and Compulsory Filing.** Taxpayers can be divided into two main groups: *Compulsory filers*, who have to file an income tax return, and *optional filers*, who are free to choose whether to file. When optional filers file an income tax return, we call them *voluntary filers*, whereas *non-filers* abstain from filing an income tax return.

Whether a taxpayer is an optional or a compulsory filer is determined by three broad circumstances. First, taxpayers have to file an income tax return if taxes for their income are not or only partially withheld at source. Wage income and most of capital income is taxed at source. Second, taxpayers

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[5]See Doerrenberg et al. (2017) for a detailed introduction regarding deduction possibilities in Germany.

receiving social benefits to replace income, for example unemployment benefits are required to file if those exceed an annual threshold (410 €). Third, for wage earners, alterations to the automatic withholding scheme trigger a filing duty. Most prominently, joint filing spouses can allocate both basic allowances to one spouse throughout the year. In order to assure correct taxation, these couples have to file an income tax return if both earn wages.

Thus, optional filers are either single taxpayers or married taxpayers for whom taxes are withheld as if they were singles. Overall, in 2014, optional filers account for the majority of the taxpayer population (53%), with about a third of all taxpayers not filing a tax return (32%).[6]

**Automatic Withholding.** Employers automatically withhold income taxes for their employees on a monthly basis, but the income tax schedule is a function of the annual taxable income. Each month, employers thus extrapolate the annual gross income (usually by multiplying the monthly gross income by twelve). To obtain the corresponding taxable income, they apply one twelfth of the basic allowance, one twelfth of the two standard deductions, and deductible social security contributions. Then, employers withhold income taxes at the ATR that applies to the extrapolated taxable income.

For uneven income flows throughout the year, extrapolated and true annual income do not coincide, which leads to over-withholding via two main channels. First, due to inflated annual income extrapolations, the applied ATR can be too high. This applies for taxpayers who are employed for less than twelve months as well as to those who are employed for the entire year but with fluctuating income.

For example, consider a taxpayer experiencing a pay raise in July. From then onward, the applicable ATR will be as if this taxpayer earns the post-raise income for the complete year. Thus, at the end of the year, withheld taxes are too high. As this problem has been considered by lawmakers, employers with more than ten employees have to adjust the final income tax withholding in a given year to correct these fluctuations. For employers with ten or less

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[6]See Figure 1 for the aggregate statistics.

employees, this adjustment is optional.[7]

Second, less than full consideration of the standard deductions leads to over-withholding. If the total employment period is less than a year, only a fraction of the standard deduction is considered. However, the German income tax code allows employees to fully deduct both standard deductions as soon as they worked for at least one day in the respective year. Likewise, only a fraction of the basic allowance (8,354 €) is considered.

Taxpayers who are employed less than twelve months face both adverse effects. As their employment spell with their employer is less than the full year, no annual adjustment can take place. Furthermore, while being entitled to the full standard deductions and the full basic allowance, their employer only considers a fraction of both.

Automatic withholding is thus *exact* in the sense that, each month, employers apply the correct schedule when extrapolating the annual taxable income for their employees. However, this extrapolated annual income is not necessarily correct. Deviations between extrapolated and true annual income lead to over-withholding and tax over-remittances for non-filers. Because the progressive income tax schedule is a convex function of income, fluctuations in monthly income cannot lead to under-withholding for non-filers.

**Tax Filing.** Generally, there are three ways to file an income tax return in Germany. First, taxpayers can file taxes all by themselves. This can be done either electronically, with a free online solution provided by the tax authority, or in paper. Self-filing is fairly common in Germany, as a 2013 online survey finds that about 50% of taxpayers file either on their own or with the help of friends or family.[8]

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[7]In 2014, 82% of German enterprises had 9 or less individuals employed, employing about 19% of all employees (`https://www-genesis.destatis.de/genesis/online?sequenz=tabellen&language=en&selectionname=48121-0001`; last accessed: 2021-04-30). This suggests a limited number of mandatory end-of-year adjustments. Unfortunately, there is no official data on the number or share of conducted end-of-year adjustments.

[8]This was part of a survey by the market research firm *YouGov* (`https://yougov.de/news/2013/05/28/knapp-die-halfte-der-deutschen-hatte-unterstutzung/`; last accessed: 2020-05-17).

Second, there are various electronic filing solutions. Specialized websites or applications provide fairly user-friendly interfaces and usually guide through the filing process at low fixed fees. These filing solutions regularly provide hints for deductible expenses. As mentioned before, there is also a cost-free governmental e-filing solution, which is however rather less intuitive.

Third, taxpayers can hire tax advisers or consult non-profit organizations, similar to the Volunteer Income Tax Assistance Program in the US. The applicable fee for these organizations (*Lohnsteuerhilfevereine*) depends on the annual gross income but is usually significantly smaller than the costs for certified tax advisers.

Similar to many other countries, the filing paperwork itself builds on a modular system, with a general cover form for basic demographic and social information, and additional forms for each income category.

**Minimal Tax Filing.** If taxpayers simply want to reclaim their over-withheld taxes, the filing requirements are limited. Figure A.11 shows the simplified tax return for this *minimal filing*. It consists of two pages and taxpayers only have to copy-paste six values from their employer-provided wage tax certificate (*Lohnsteuerbescheinigung*, see Figure A.10) into these forms. By law, employers are required to provide this nationwide standardized wage tax certificate to all of their employees.

Filing this simplified return thus ensures that all standard deductions and the basic allowance are taken into account and that the annual adjustment of taxes takes place. While this minimal filing scenario has rather small real compliance costs in terms of collecting information and filling out forms, it ensures that over-withholding throughout the year is corrected for.

# 3   Data Set

To analyze optional non-filing and effective taxation, we use administrative income tax data which provide precise information on individual income, taxes, and basic demographic characteristics for German taxpayers, including non-

filers. Having individual level data on non-filers is key to our analysis, since it allows us to analyze the distribution of non-filing over the wage income distribution (subsection 4.1), and calculate the amount of over-remitted taxes for non-filers (subsection 4.2).

The data set is a 10% stratified random sample of German taxpayers in 2014 (the latest year available) provided by the Research Data Centre of the Federal Statistical Office and the statistical offices of the Länder (RDC) (2020). The sample contains 4,017,600 observations overall, including 400,000 non-filers.[9] In the data set, an observation, i.e. a *taxpayer* or a *taxable unit*, refers either to married couples filing jointly or to individual taxpayers, including spouses that file individually.

Information on non-filers come from employer-provided end-of-year wage tax certificates, which include gross income earned throughout the year and withheld taxes. Furthermore, they also include socio-demographic characteristics, such as age, gender, marital status, the taxpayer's state of residence, and the number of children known to the employer for tax purposes. For filing taxpayers, additional information is available from their tax returns and final tax assessments, including multiple income measures and the corresponding tax payments - withheld taxes, final tax liabilities, and refunds or additional tax payments.

Tax-filing information is available if the tax assessment is concluded within 2 years and 9 months after the tax year, i.e. September 30, 2016 for the tax year 2014. Compulsory filers have to file a tax return within five months following the tax year, i.e. May 2015, whereas optional filers have up to four years to file.[10] If optional filers make use of this and file late, this is a potential

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[9]Basic descriptive statistics for the full sample can be found in Table A.2. The ratio of non-filers to filers is based on the sampling by the RDC which fixes the number of non-filing observations at 400,000. To ensure that our results hold for the entire population, we use the weights provided by the RDC to correct for this sampling design.

[10]There is a monetary incentive for late filing, because tax refunds accrue 4.5% p.a. in interest after fifteen months following the tax year, i.e. starting in April 2016. The level of interest payment has recently been struck down in Germany's Federal Tax Court for refunds accruing in the calendar year 2015 and later, making it less of a concern here. The data set may also lack tax assessment information if the process has not yet been completed, e.g. because taxpayers objected their tax assessment and still wait for the final decision.

confounder to our results. However, anecdotal evidence from conversations with practitioners suggests that the number of taxpayers filing this late is negligible.

Figure 1: Prevalence of Filing Status in Germany
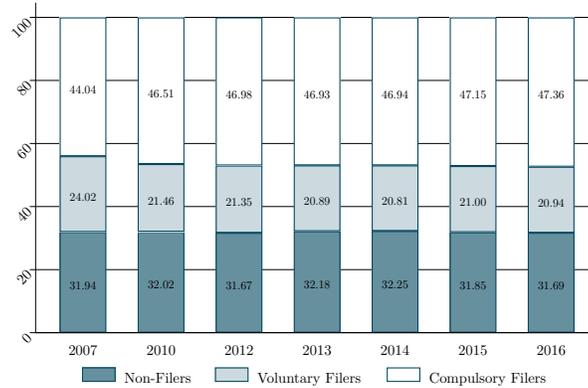
*Notes:* Same data base as for the data set we use for our empirical analysis. Since aggregated data is published earlier than micro data, the time range includes 2016 here, but the most recent data aviailable for our analysis is 2014. Prior to 2012, this statistic was published every three years. Since 2012, the statistic is published annually. Data prior to 2007 is not directly comparable, as employers were only required to electronically submit income tax returns by 2006. Therefore, not all non-filers are captured prior to 2007. Differences to 100% are due to rounding.

# 4   Non-Filing, Over-Remittances, and Effective ATR

As seen in Figure 1, slightly more than every second taxpayer in Germany can decide whether or not to file an income tax return. Within this group of optional filers, about 60% decide not to file an income tax return. Thus, about every third taxpayer in Germany does not file an income tax return. Based on the individual level administrative data described in section 3, we analyze the prevalence of non-filing along the income distribution, quantify tax over-remittances for non-filers and determine the effects on effective taxation.

To understand the impact of the optional (non-)filing system, we focus on optional filers, i.e. voluntary filers and non-filers.

## 4.1 Prevalence of Non-Filing

In total, there are 683,718 optional filers in our sample, representing about 14.9 million German taxpayers when using the weights provided by the statistical office. Overall, non-filers account for 61.15% of the weighted sample.[11] We provide descriptive statistics in Table A.3. Non-filers have, on average, significantly lower income than voluntary filers. In 2014, the average annual gross wage income for non-filers is 18,047 €, or only 52% of the average for voluntary filers (34,524 €). Furthermore, non-filers are younger and more likely to live in East German states (former German Democratic Republic). Differences in filing behavior across different demographic groups are discussed in more detail in subsection A.5.

Figure 2 visualizes the share of non-filers among all optional filers over the gross wage income distribution in 2014, documenting substantial heterogeneity across income. Throughout this chapter, we analyze non-filing over gross income instead of taxable income, since the latter is endogenous to tax filing. Overall, there is a negative correlation between gross income and tax non-filing. While 90% of optional filers with a gross wage income of around 10,000 € do not file, this share declines for higher income levels. Yet, Figure 2 also shows that the share of non-filers stabilizes at around 30% for higher income taxpayers.

## 4.2 Tax Over-Remittance through Non-Filing

In this section, we quantify tax over-remittances for non-filing taxpayers. Tax over-remittances are defined as the difference between the effective tax remittance of individual $i$ ($T_i^E$) via automatic withholding and statutory taxes that apply to their taxable income $y_i$ according to the tax schedule ($T^S(y_i)$).

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[11]Deviations from the entire population of taxpayers, as shown in Figure 1, come from the fact that we focus on optional filers only.

Figure 2: Prevalence of Non-Filing over Gross Income
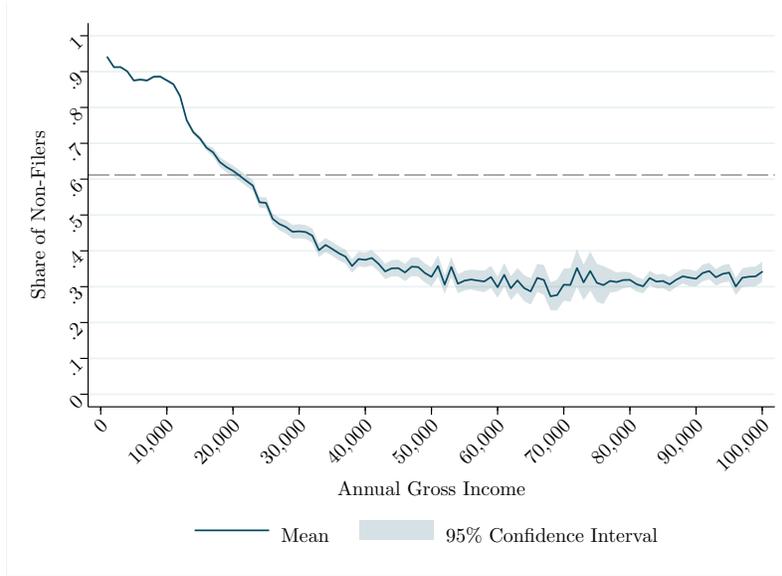
*Notes:* Share of non-filers among optional filers over annual gross wage income. Dashed grey line: Average share of non-filers (61.15%) across all gross income levels. Statistics refer to taxable units which may be either an individual or married spouses in case of joint filing. For jointly filing spouses, we consider the average gross income. See Figure A.2 for non-filing shares over income percentiles.

Under automatic withholding, effective taxes withheld are greater or equal than taxes according to the schedule, $T_i^E \geq T^S(y_i)$ – a feature common to most progressive income tax systems (see Jones 2012 for over-withholding in the US).

We observe $T_i^E$ for non-filers in the data and follow the tax code to obtain $T^S(y_i)$. Starting from the annual gross wage income, we subtract the standard deductions for all taxpayers and special allowances for single parents or elderly employees, if applicable. Based on demographics, we determine social insurance contributions which are partly tax deductible and subtract those. This yields us $y_i$, the annual individual taxable income for taxpayer $i$. Using the statutory tax schedule, we then compute $T^S(y_i)$, which is equivalent to the tax payment in the event of minimal tax filing.

This simulation corrects for over-withholding through employers by smooth-

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ing fluctuating incomes, i.e. it performs the annual adjustment of wage tax, and considers both the full standard deductions and the full basic allowance. As this measure for tax over-remittance does not take into account any additional itemized deductions, it can be interpreted as the lower bound for tax over-remittances through non-filing, or potential monetary benefits from tax filing. In subsection B.3, we provide an upper bound estimate for potential gains when considering additional deductions.

To determine the amount of over-remitted taxes, we have to restrict the sample to taxpayers for whom taxable income is imputable. Since we infer social insurance contributions based on annual gross income, we have to exclude taxpayers for whom this cannot be done. This excludes taxpayers with an annual gross income exceeding 48,600 € in 2014 (about the 90th percentile of wage earners) as well as civil servants. Both groups are free to choose whether or not to enroll in the public health insurance and there is no information on the enrollment status for non-filers. Additionally, we exclude joint filing married spouses and restrict the sample to the working age population ($16 \leq$ age $\leq 64$). The sample restrictions are explained in more detail in the appendix, subsection A.4. The descriptive statistics for this sample, which we use for the remainder of this section, are given in Table A.4.

Figure 3 shows the average (lower-bound) over-remittance for non-filing taxpayers within each income bin. Non-filers over-remit taxes at all income levels. In absolute terms, the average over-remittance for all non-filers (solid red line) is increasing with income reaching its maximum of 270 € in the gross income bin around 16,000 €. For higher income non-filers, the average-over-remittance is decreasing at first, before increasing again. This is mostly driven by a mechanical effect: Assuming that the extrapolated annual taxable income correlates with the annual gross income, absolute over-remittances increase with gross income as employers apply a higher average tax rate for a higher (extrapolated) taxable income. Furthermore, automatic withholding produces particularly high over-withholding when the overall employment period within a given tax year is very short, which is more likely for lower annual income.

For the subgroup of non-filers who are subject to over-withholding (dashed

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Figure 3: Tax Over-Remittance for Non-Filers
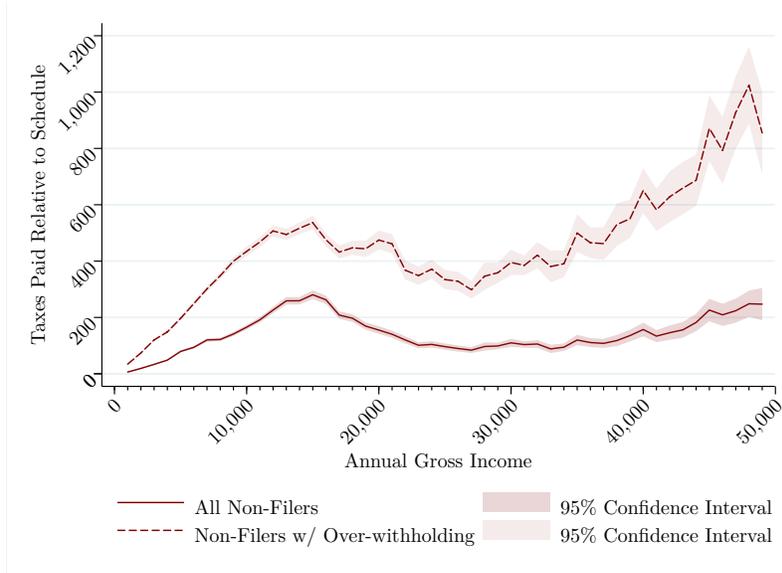
*Notes:* Individuals are grouped in 1,000-€-bins. Non-filers only. This graph shows over-remitted taxes for non-filers over annual gross income, relative to the statutory tax schedule, which is represented by the horizontal intercept at zero.

red line in Figure 3), the pattern is similar but the amount of over-remitted taxes is significantly higher. Over-remitting non-filers with an annual gross income of 16,000€ effectively pay, on average, 570€ more than they should according to the statutory tax schedule.

Table 1 shows the aggregated numbers for over-remitted taxes. On average, non-filers over-remit 118€, including those for whom withholding is correct. Conditional on over-withholding, the average over-remittance is 360€. In total, this leads to an overall sum of over-remitted taxes of at least 949 million€. Columns 2 and 4 of Table 1 show that one third of the total over-remittances originate from taxpayers at the lower end of the income distribution, below the basic allowance threshold. Taxpayers in this income range over-remit at least 317 million€ and account for 33.5% of all over-remittances in our sample,

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Table 1: Taxes Over-Remitted through Non-Filing - Lower Bound Estimates

| | | (A) All Non-Filers | | (B) With Over-Withholding | |
|---|---|---|---|---|---|
| | | All | y < threshold | All | y < threshold |
| Over-Remittance | total | 949,512,506 | 317,948,477 | 951,685,618 | 317,774,299 |
| | mean | 118.66 | 79.41 | 360.04 | 247.40 |
| | p25 | -0.40 | 0.00 | 42.00 | 45.00 |
| | p50 | 0.00 | 0.00 | 182.90 | 137.00 |
| | p75 | 40.09 | 38.00 | 518.60 | 348.00 |
| | p90 | 425.28 | 277.00 | 959.56 | 639.00 |
| | p95 | 760.16 | 498.00 | 1,265.00 | 846.00 |
| N | absolute | 205,678 | 103,761 | 68,138 | 33,350 |
| | weighted | 8,001,646 | 4,004,070 | 2,643,277 | 1,284,469 |

_Data:_ RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Lohn- und Einkommensteuerstatistik, 2014, own calculations.
_Notes:_ Over-remittances are defined as $T_i^E - T^S(y_i)$ for individual $i$ and listed in €. ($A$): All non-filers in the sample. ($B$): Only those non-filers with over-remittance, defined as a deviation of more than 5€ from the statutory tax schedule. The total over-remittance in ($B$) is smaller than for ($A$), since ($A$) includes a +/- 5€ tolerance around 0, and the (small) negative values decrease the total amount. $y < threshold$: Individuals with an annual gross wage income below the basic tax allowance threshold.

even though their statutory tax payment as is zero.[12]

The estimates presented here are a lower bound for three reasons. First, we exclude civil servants and employees with an annual wage income exceeding 48,600€ from our analysis. Since non-filing and potentially over-withholding is also present in this group (but cannot be quantified with the data at hand), this represents a lower bound for the total sum of over-remittances. Second, our estimates do not take into account the full refund potential. We do not account for over-withholding of additional surtaxes (church tax and solidarity tax) and only consider the standard deductions of 1,000€ for work related expenses and 36€ for special expenses. Given these low standard values, and ample deduction possibilities, taxpayers might realize even larger benefits when

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[12]For our main analysis, we exclude taxpayers for whom too little taxes ($\Delta \leq$ -5€) were withheld relative to the tax schedule. We hypothesize that this may be driven by either changes in tax relevant characteristics throughout the year which are not captured in yearly data or by mistakes in withholding or reporting. When including these taxpayers, our results remain fairly robust: The sum of over-remittance in 2014 is 805 million€ instead of 949 million€.

itemizing.[13] Third, for married non-filers, we calculate their filing counterfac-
tual assuming individual filing. However, given the system of joint taxation
in Germany, married spouses can typically reduce their tax liabilities further,
when filing jointly.

## 4.3 Effective ATR

Both tax non-filing and over-remittances occur over-proportionally at the
lower end of the income distribution. Now we combine these two observations
to examine the effect on the effective tax schedule, in terms of the average tax
rate (ATR).

Figure 4 displays the effective ATR for non-filers and mirrors the results
of Figure 3 in relative terms. The black line corresponds to the statutory tax
payment associated with the corresponding level of gross income. It is clearly
visible that taxpayers below the basic allowance have positive effective ATRs,
despite not being liable to pay any income tax. Overall, all non-filers whose
statutory ATR ($ATR^S$) is zero face an effective ATR ($ATR^E$) of about 2%.
This already includes non-filers for whom automatic withholding works well.
Conditional on over-withholding, $ATR^E$ is close to 4.5%.

It is important to stress that non-filers in this income range would receive
a full tax refund for all taxes remitted throughout the tax year when filing
a tax return and that only minimal filing is required for them. As described
in section 2, filing requirements for correcting for over-withholding basically
consist of copying six numbers from one form to another. When moving along
the income distribution, the absolute deviation between the $ATR^E$ and the
$ATR^S$ decreases, but remains significant.

These absolute deviations can also be interpreted as the monetary costs of
non-filing. On average, non-filers in the lowest income bins forgo nearly 2% of
their annual gross income due to non-filing. These relative monetary costs of

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[13]For example, in 2014 57% of the German population were members of the Roman
Catholic or Protestant Church, which automatically levy a state-dependent 8-9% surtax on
the income tax, known as "church tax". Even though this church tax qualifies as a special
expense, it is not taken into account by the employer when withholding income taxes. Given
the data at hand, we are not able to compute this additional benefit.

Figure 4: Effective ATR for Non-Filers
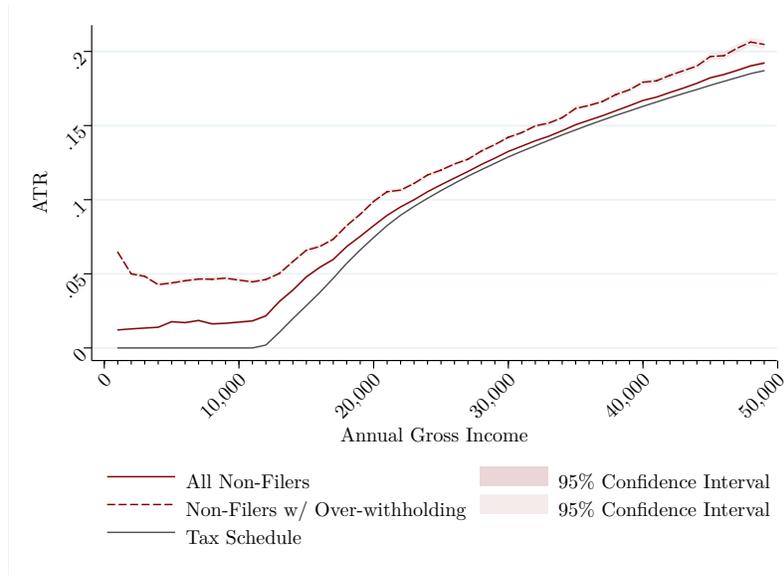
*Notes:* Individuals are grouped in 1,000- €-bins. ATR based on taxes remitted over the year through automatic withholding by the employer. *Tax schedule*: Statutory ATR that corresponds to the respective gross income in the income tax schedule. This is equivalent to the lower bound for gains from filing/minimal filing.

non-filing are much smaller for higher incomes. For example, non-filers with an annual gross income of 30,000 € or more forgo on average less than 0.5% of their gross income.

There are two factors driving the high effective ATRs at very low income levels. First, as shown in Figure 2, low-income earners are very likely to be non-filers. Second, over-withholding is particularly likely for low-income earners, as the gap between projected annual gross income and actual gross income is largest. Interestingly, the US exhibit a similar pattern, namely over-withholding being very common among all taxpayers but particularly likely for low-income earners (Jones 2012). Related to our results, Goldin et al. (2021) show that tax filing increases the disposable income for low-income earners in the US as it expands EITC take-up.

This section has highlighted three things: First, non-filing is very common, with the highest non-filing shares at the lower end of the income distribution. Second, non-filers substantially over-remit income taxes, especially low-income non-filers. Third, combining these two observations highlights that the effective taxation, in terms of ATR, deviates from the statutory tax schedule. The effective redistribution is weakened compared to the tax schedule, leading to a less progressive income taxation. Standard measures of income inequality, such as the Gini-coefficient and percentile ratios, support this observation. Table A.5 in the appendix provides the exact numbers for pre and post filing income inequality measures.

## 4.4  Policy Implications

If the statutory tax schedule maps the *intended* degree of redistribution, the regressive effects from non-filing on the effective taxation can be considered as *unintended* redistribution. In particular, the basic allowance threshold for low-income taxpayers should be enforced for all taxpayers, irrespective of their filing status. This seems rather likely as the basic allowance is included in the statutory tax code and in the light of a ruling by the German Federal Constitutional Court from 1992 stating that a minimum amount of income may not be taxed.[14]

The coherent policy implication in this case is to automatically refund over-remittances to non-filing taxpayers to realign statutory and effective taxation. Intuitively, one can think of automatic refunds for non-filers as equity gains without direct efficiency losses. On average, non-filing taxpayers currently face higher average and marginal taxes than intended by the schedule. A tax refund would reduce their effective average tax rate and the applicable marginal tax rate, increasing their net-of-tax rate and generating welfare gains for low-income taxpayers. In terms of labor supply incentives, this would, if anything, lead to efficiency gains. Formerly over-remitting non-filers would now face

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[14]The decision is based on the premise that income should only be taxed when surpassing the amount that is required to meet existential needs. The full ruling can be found here: http://www.bverfg.de/e/ls19920925_2bvl000591.html (last accessed: 2021-02-06).

lower effective MTRs and potentially adjust their labor supply. In addition to increasing tax progressivity, aligning effective and stationary taxation also strengthens horizontal equity between filers and non-filers at a given income level.

Clearly, automatically refunding over-remittances to non-filers reduces the governmental budget relative to the current situation. However, while substantial in absolute and per capita terms, the relative importance of tax revenue collected through over-remittances is limited. The sum of all over-remittances (949 million €) accounts for about 0.15% of Germany's overall tax revenue in 2014 (644 billion €).[15] For the case that automatic refunds, nevertheless, jeopardize the governmental budget, we provide two back-of-the-envelope calculations for budget neutral reforms. We approximate the required increase in the (two) top marginal tax rates that would levy sufficient funds to finance automatic refunds for non-filers. We discuss the approach and results of this computation in subsection B.4.

If automatic refunds are not feasible due to administrative or legal reasons, tax authorities could provide pre-populated forms for taxpayers exclusively earning wage income. Automatically sending out pre-populated forms is already implemented in other countries, for example in Norway.[16] Pre-filled forms address several potential drivers for non-filing: First, they may provide information about over-withholding which currently might not be salient for non-filers. Second, they reduce the (expected) compliance costs of filing. Providing pre-populated forms is considered a rather cost-effective way to reduce compliance costs of tax filing. For example, for the US, Benzarti (2020a) estimates that 70% of Schedule A could be pre-populated which would lead to a

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[15]Data from the Federal Statistical Office (`https://www-genesis.destatis.de/genesis/online?sequenz=tabellen&language=en&selectionname=71211-0001`; last accessed: 2020-11-26).

[16]Information on pre-populated tax forms in Norway is provided by the Norwegian Tax Administration (`https://www.skatteetaten.no/en/person/taxes/`, last accessed: 2020-11-30). Right now, pre-populated forms in Germany are available upon request for taxpayers that are already registered for online filing (`https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/2019/07/31/German+pre-filled+tax+return`, last accessed: 2020-11-30).

70% reduction in compliance costs.

Both automatic refunds and pre-populated forms increase the degree of effective income redistribution. In addition, currently filing taxpayers also benefit from both measures. Automatic refunds or pre-populated returns can benefit voluntary filers who currently only file to obtain their over-withheld taxes. Filing an income tax return would no longer be necessary for them.

# 5 Effective MTR and Reform Potential

In this section, we analyze the efficiency implications arising from an optional tax filing system with over-withholding. So far, we have focused on total tax remittances or effective *average* tax rates (ATRs). However, higher effective average tax rates inextricably imply higher effective *marginal* tax rates (MTRs) as well. Building on the intuition from Saez (2001), we argue that tax non-filing raises both equity concerns and efficiency concerns. These efficiency concerns arise because increased effective MTRs come at full effective distortions but generate less revenue than increased statutory MTRs.

## 5.1 Increase in Statutory MTR

To guide our investigation of increased *effective* marginal tax rates $(MTR^E)$, we revisit the baseline effects of an increase in *statutory* marginal tax rates $(MTR^S)$ as a benchmark. We closely follow Saez (2001) to sketch the effect of an increase in $MTR^S$ for a given income range in a standard setting, where taxpayers pay taxes according to the tax schedule and statutory and effective MTR coincide.

Figure 5a visualizes a local perturbation of the statutory MTR as described by Saez (2001). For income between $y^*$ and $y^* + dy^*$, $MTR^S$ is increased by $dMTR^S$. The change in $MTR^S$ is visible in the flatter slope of the after tax income $y - T(y)$ for this income range. For income above $y^* + dy^*$, the $MTR^S$ remains unchanged, but taxpayers face a higher ATR. The change in the ATR is visible in the downward shift of $y - T(y)$ above $y^* + dy^*$.

Figure 5: Tax Perturbations

(a) Change in Statutory MTR



(b) Change in Effective MTR
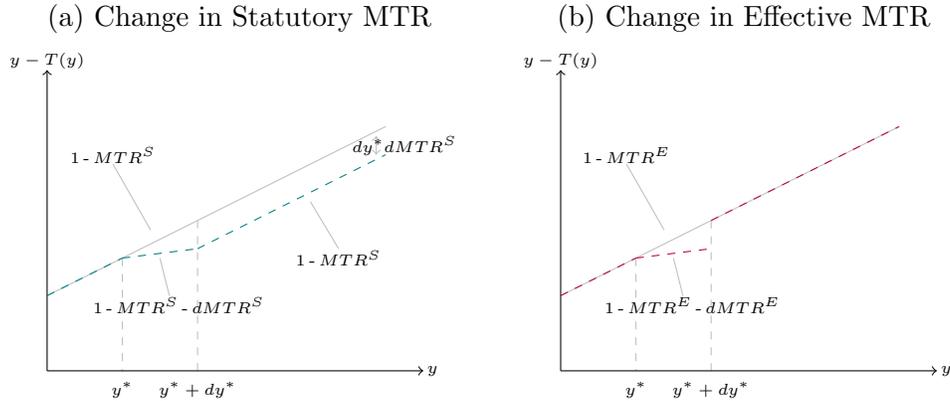


*Notes:* Simplified visualization of the effect of increasing the marginal tax rate for the income range $[y^*; y^* + dy^*]$ by $dMTR > 0$. Panel (a) refers to an increase in the statutory MTR ($MTR^S$) as defined in the tax schedule and follows closely Saez (2001). Panel (b) refers to an increase in the effective MTR ($MTR^E$), leaving the tax schedule unchanged. $y$: taxable income; $T(y)$: taxes paid on taxable income; $y - (Ty)$: net-of-tax income. Slopes are indicated in the graphs.

For taxpayers with income between $y^*$ and $y^* + dy^*$, there are two opposing effects. First, a *mechanical effect* increases tax revenue, since taxpayers face higher tax rates for a given income level $y \in (y^*$ and $y^* + dy^*)$. Second, there is a *behavioral response* to the reduced net-of-tax rate. There is a negative *elasticity effect* because taxpayers reduce their taxable income in response to higher MTR, either by reducing labor supply as described by Saez (2001) and/or by adjusting tax reporting behavior (Doerrenberg et al. 2017; Neisser 2021). With less after tax income available than before, an *income effect* increases taxable income and dampens the behavioral response. However, empirical evidence for income effects is scarce, which is why they are often abstracted from (see for example Saez, Slemrod, et al. 2012). Taxpayers with income above $y^* + dy^*$ face a mechanical effect (and potentially an income effect) but no elasticity effect since their MTR remains unchanged.

## 5.2 Increase in Effective MTR Under Non-Filing

Now, we analyze an increase in the *effective* marginal tax rate ($MTR^E$) and show how this differs from an increase in $MTR^S$. Under optional non-filing and with over-remittances, effective and statutory MTRs differ systematically. As described in section 2, over-remittances occur due to incorrect extrapolations of annual taxable income $\tilde{y}_i$. Given the progressive nature of the tax system, the effective ATR of taxpayer $i$ ($ATR_i^E$) is, at best, equal to the statutory ATR ($ATR^S$) that applies to their true taxable income $y_i$, i.e. $ATR_i^E = ATR^S(\tilde{y}_i) \geq ATR^S(y_i)$. Consequently, the same intuition applies to the effective MTR and non-filers may face higher effective distortions than intended by the tax schedule: $MTR_i^E = MTR^S(\tilde{y}_i) \geq MTR^S(y_i)$.[17]

What is the effect of a change in $MTR^E$ in comparison to a change in $MTR^S$? Figure 5b illustrates an increase in $MTR^E$ for taxpayers with income between $y^*$ and $y^* + dy^*$. In contrast to Figure 5a, there is no effect on taxpayers with income above $y^* + dy^*$, since their ATR remains unchanged. The mechanical effect accrues only partly as there is no effect on taxpayers with income above $y^* + dy^*$. Yet, under the assumption that taxpayers react to their effective MTR, there is the same distortionary behavioral response as for a change in $MTR^S$.

Figure 6a displays $MTR^E$ over taxable income for all taxpayers, i.e. averaging over non-filers and filers. At all income levels, $MTR^E > MTR^S$ for the average taxpayer within an income bin. Given the concentration of over-remitting non-filers at the bottom of the income distribution, the deviation is largest for low-income taxpayers, reaching about 5 percentage points. This is also driven by the fact that an incorrect extrapolation of taxable income has particularly strong effects around the basic allowance threshold, where $MTR^S$ jumps from 0% to 14%. Figure 5b is thus a stylized description of the increased effective MTR which we observe under non-filing. It is stylized in the sense that in reality, non-filing increases effective MTRs for non-filers in different

---

[17]This holds as long as $MTR^S(\tilde{y}_i) > MTR^S(y_i)$ which is always true when $y_i$ lies within the first three brackets of the German income tax schedule which feature linearly increasing marginal tax rates (see Figure A.1 for the tax schedule).

income ranges and there is no income range where all taxpayers are non-filers for whom $MTR^E > MTR^S$.

As described above, the increase in $MTR^E$ for non-filers has no effect for other, mainly higher income taxpayers. Put differently, optional non-filing with over-withholding imposes effective distortions for mainly low-income non-filers without generating additional tax revenue from higher income taxpayers. Going back to the terminology of Saez (2001) and in comparison to the benchmark of increased $MTR^S$, the increase in $MTR^E$ for non-filers comes at the full distortionary costs from the behavioral effect but only partially realizes an increase in tax revenue from the mechanical effect.

## 5.3  Tax Reform Potential

An increase in $MTR^S$ leads to a distortionary behavioral effect and a mechanical revenue effect. However, an increase in $MTR^E$, as observed in the non-filing status quo, leads to full distortions for the affected taxpayers while generating only limited additional revenue. We now quantify the effects of this institutional setting by comparing the status quo to two hypothetical tax reforms. First, we propose a tax schedule that increases tax revenue by exploiting the mechanical effect, without increasing effective distortions. Second, we propose a tax schedule which keeps effective tax liabilities constant for a given income level, but increases tax revenue by exploiting behavioral responses to decreased effective distortions.

Both proposals change the tax schedule and affect taxpayers over the entire income distribution. To quantify the overall tax reform potential, we thus rely on a sample that is not restricted by filing type or income, in contrast to the previous section 4. Furthermore, since the tax schedule is a function of taxable income, we now focus on taxable income rather than gross wage income. The sample includes taxpayers with positive taxable income $y > 0$, where we preferably use our self-computed taxable income from section 4 or rely on the official taxable income as provided. Lastly, we drop taxpayers for whom the imputed statutory tax liability is more than $5 \in$ smaller than the

Figure 6: $MTR^S$ and $MTR^E$ - Status Quo vs. Proposal I & II
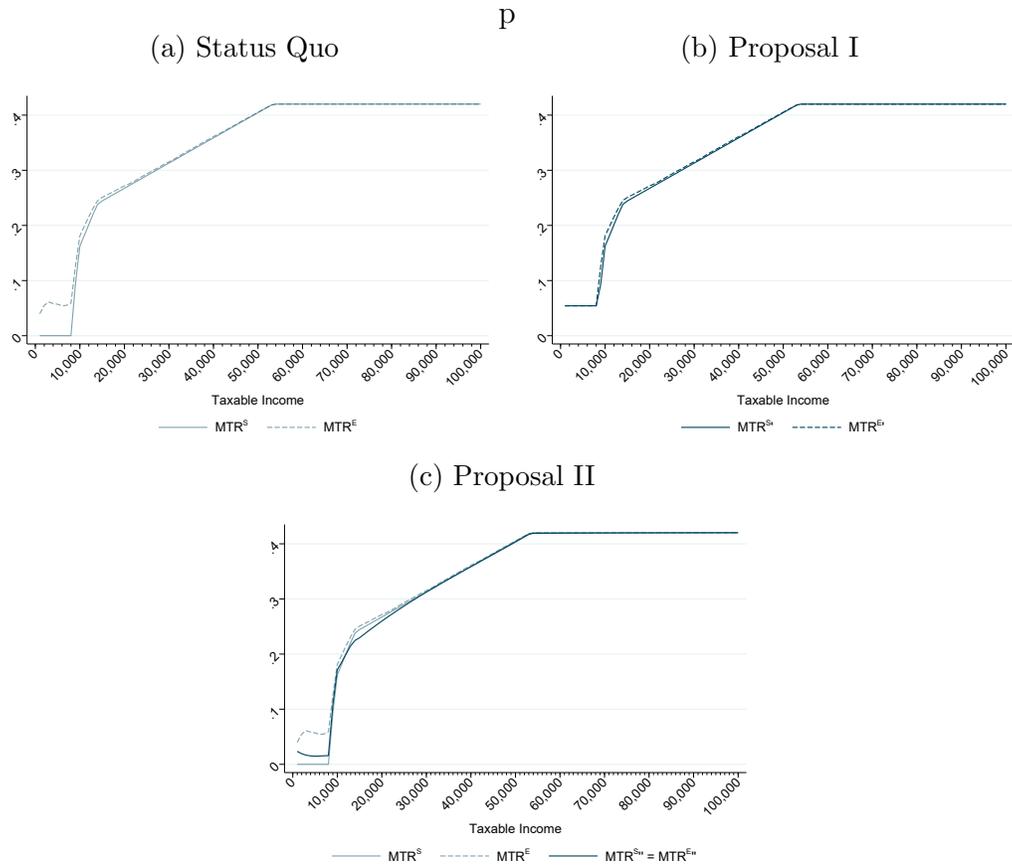
p

(a) Status Quo

(b) Proposal I



(c) Proposal II

*Notes:* Taxpayers with taxable income up to 100,000 €, mean income for joint filing spouses. Taxpayers are grouped in 1,000-€-bins. $MTR^S$: Statutory marginal tax rate as defined in the tax schedule. $MTR^E$: Effective marginal tax rate that is observed under optional non-filing. $MTR^E$ is the average for all taxpayers at income level $y$ - filers and non-filers.

observed remittances, leading to a sample of about 34 million observations.

**Proposal I: "More Tax Revenue from Mechanical Effect".** For this first proposal, we investigate the potential gain in tax revenue from an exploitation of the mechanical effect. To illustrate this, we focus on effective distortions in tax bracket 1. According to the statutory tax schedule, taxable income below the basic allowance, $y_i \leq y_1 = 8{,}354\,\text{€}$, is exempt from taxation and therefore faces a zero marginal tax rate: $MTR_1^S = 0$ for $y_i \leq y_1$ (see Figure A.1 for the tax schedule). De facto however, non-filing with over-remittances is common for $y_i \leq y_1$ (see Figure 2). For many taxpayers in bracket 1, this leads to $MTR_1^E > MTR_1^S = 0$ with an average of $\overline{MTR_1^E} = 5{,}43\%$ including filers and non-filers (see Figure 6a).[18]

To assess the mechanical tax revenue potential, we compare the status quo to a hypothetical tax reform which replaces the statutory tax rate in bracket 1, $MTR_1^S = 0$, by a positive constant $MTR_1^{S\prime} > 0$. The reform imposes the current average effective MTR $(\overline{MTR_1^E})$ as a new statutory and effective MTR such that $MTR_1^{S\prime} = MTR_1^{E\prime} = \overline{MTR_1^E} = 5{,}43\% > MTR_1^S = 0$, with no change in the average effective distortion in bracket 1. The statutory and effective tax rates for higher income earners, in brackets 2-5, remain unchanged. Note that new tax rates associated with this reform proposal are indicated by a single prime:

$$MTR^{S\prime} = \begin{cases} \overline{MTR_1^E} & \text{in tax bracket 1} \\ MTR^S & \text{in tax bracket 2 - 5} \end{cases}$$

$$MTR^{E\prime} = \begin{cases} \overline{MTR_1^E} & \text{in tax bracket 1} \\ MTR^E & \text{in tax bracket 2 - 5} \end{cases}$$

Figure 6b compares $MTR^S$ and $MTR^E$ from the status quo to the hypothetical $MTR^{S\prime}$ and $MTR^{E\prime}$. Intuitively, this reform for tax bracket 1 is

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[18]Effective MTRs are more responsive to over-withholding than ATRs, particularly in bracket 1. If over-withholding occurs, low-income taxpayers might experience relatively small differences in their ATR, while the minimum MTR is 14%.

comparable to an increase in $MTR^S$ in a defined income range as described in Figure 5a. However, when keeping the effective MTR constant, and in contrast to the benchmark case as described by Saez (2001), there is no elasticity effect and thus no behavioral response when abstracting from income effects.

Although the reform does not increase effective distortions, on average, it increases tax revenue since effective ATRs are increased. Taxpayers at income level $y$ pay $\left(ATR^{E\prime}(y) - ATR^E(y)\right) \cdot y$ more taxes than before. The resulting mechanical change in tax revenue $dT'$ can be described as:

$$
\begin{aligned}
dT' &= \sum_{y=1}^{\infty} \left(ATR^{E\prime}(y) - ATR^E(y)\right) y N_y \\
&= \underbrace{\sum_{y=1}^{y_1} \left(ATR_1^{E\prime}(y) - ATR_1^E(y)\right) y N_y}_{\text{Bracket 1}} + \underbrace{\sum_{y>y_1}^{\infty} ATR_1^{E\prime} y_1 N_y}_{\text{Brackets 2-5}} \\
&= \left(ATR_1^{E\prime} - \overline{ATR_1^E}\right) \overline{y_1} \sum_{y=1}^{y_1} N_y + ATR_1^{E\prime} y_1 \sum_{y>y_1}^{\infty} N_y \\
&= (0.0543 - 0.0187) \cdot 4,077 \cdot 8,687,419 + 0.0543 \cdot 8,354 \cdot 25,677,500 \\
&= 12.9 \text{ billion}
\end{aligned}
$$

(1)

Taxpayers in the income brackets 2 to 5 now pay $ATR_1^{E\prime} \cdot y_1$ more than before. Taxpayers in bracket 1 already face $ATR_1^E > 0$ in the status quo. The average taxpayer in bracket 1, with average income $\overline{y_1}$ and corresponding $\overline{ATR_1^E}$ in the status quo, now effectively pays $(ATR_1^{E\prime} - \overline{ATR_1^E}) \cdot \overline{y_1}$ more than in the status quo. There is a change in the average $ATR^E$, because, as described above, $ATR^E$ is much less responsive to over-withholding than $MTR^E$, leading to $ATR_1^{E\prime} - \overline{ATR_1^E} > 0$. Equation 1 also provides the parameters for our computation and highlights that the mechanical revenue potential is sizable with $dT' = 12.9$ billion €.

One potential way to use the additional tax revenue $dT'$ is to transfer it back to all 34 million taxpayers $(N)$ in our sample via a lump sum payment

defined as $P = dT'/N = 375 \, €$. While $P$ is the same for all, net benefits differ over the income distribution. Taxpayers with an income $y_i > y_1$, see an increase in their tax liability by $78 \, €$, whereas for $y_i \leq y_1$, the net benefit is $(\overline{ATR_1^E} - ATR_1')y_i > 0$ with an average refund of $230 \, €$.

The results are an approximation and require a few assumptions. First, we assume that all taxpayers with $y_i > y_1$ do not pay taxes on income below $y_1$. However, for non-filers this might not be true. Second, by including all taxpayers in this analysis, the measurement of taxable income is less precise than in section 4.[19] Furthermore, we keep $\overline{MTR_1^E}$ constant in tax bracket 1 but abstract from variations in the individual $MTR^E$. Consequently, there is no elasticity effect to a change in $MTR^E$. Lastly, we abstract from income effects.

**Proposal II: "More Tax Revenue from Behavioral Responses"**. For this second proposal, we investigate the potential gain in tax revenue from behavioral responses to a decrease in $MTR^E$. We compare the status quo to a hypothetical tax reform that introduces a new schedule $T''(y)$, which matches the observed effective tax liabilities from the status quo $(T^E(y))$ and thus keeps the effective ATR constant for a given income level $y$. Effective and statutory taxation are aligned now: $T''(y) = T^{S''}(y) = T^{E''}(y)$, with the corresponding $ATR''(y) = ATR^{S''}(y) = ATR^{E''}(y)$ and $MTR''(y) = MTR^{S''}(y) = MTR^{E''}(y)$.[20] Note that all relevant parameters of this second proposal are indicated by two primes.

This reform implements the same effective tax liabilities as in the status quo, but with less distortions in terms of effective MTR. In the status quo, effective taxation for low-income taxpayers is increased due to over-remittances from non-filing with no effect on other, higher income taxpayers. Reaching the same effective tax liabilities by implementing $T''(y)$ raises additional tax

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[19]For some non-filing taxpayers that were not included in the main analysis, we rely on information on taxable income as reported in the data. The measurement of taxable income in the data set may not be fully accurate as discussed in subsection 4.2

[20]One way to incorporate this is assuming no over-remittances due to automatic refunds or improvements in withholding.

revenue from taxpayers with higher income. Without loosing tax revenue, this allows for reducing MTRs at higher income levels. Lower MTRs yield a first order incentive to increase taxable income. As a result of this behavioral response, tax revenue increases.

We define the new tax schedule, $T''(y)$, as a smoothed function of the status quo average effective tax liabilities for taxpayers with taxable income $y$, $T^E(y)$. $T''(y)$ is obtained by regressing effective individual tax liabilities on taxable income. $MTR''(y)$ is then defined as the derivative of $T''(y)$.

Figure 6c shows the resulting $MTR''(y)$. Compared to the status quo, marginal tax rates, and hence effective distortions, visibly decrease. A higher $MTR^{S''}(y_1) > 0$ for tax bracket 1 allows for reduced marginal tax rates in higher taxable income ranges while keeping the average effective tax rate, $ATR^E$, constant. Additionally, $MTR''(y)$ is also reduced in bracket 1 relative to $MTR^E$ in the status quo. The lowest positive marginal tax rate in the German tax schedule is 14%. Any positive effective ATR in the status quo thus implies an $MTR^E$ of at least 14% which is significantly higher than the effective ATR.

In response to lower effective MTRs, taxpayers increase their taxable income. We compute these behavioral responses for each individual taxpayer leading to an aggregated increase in tax revenue of $dT''$:

$$
\begin{aligned}
dT'' &= \sum_{i=1}^{N} T''(y_i) - T_i^E + dy_i \cdot MTR''(y_i) \\
&= \sum_{i=1}^{N} T''(y_i) - T_i^E - \varepsilon_{y,1-MTR^E} \frac{dMTR_i^E}{1 - MTR''(y_i)} \cdot MTR''(y_i)
\end{aligned}
\tag{2}
$$

Equation 2 shows that the individual change in effective tax liabilities consists of two parts. First, introducing the same $T''(y_i)$ for all individuals with income $y_i$ may imply a change in the individual effective tax liability, because the individual tax remittance $T_i^E$ may differ for the same income level under non-filing in the status quo. In aggregate however, these individual differences

30

Table 2: Proposal II: Potential Gains from Behavioral Responses

| | $dy_i$ | $\sum dy_i$ | $dT_i''$ | $\sum dT_i''$ |
|---|---|---|---|---|
| (A) Same Elasticity for Filers and Non-Filers $\left(\varepsilon^F_{y,1-MTR^E} = \varepsilon^{NF}_{y,1-MTR^E} = 0.2\right)$ | | | | |
| | 43.93 | 1,509,612,466 | 8.66 | 297,432,805 |
| (B) Different Elasticities for Filers and Non-Filers $\left(\varepsilon^F_{y,1-MTR^E} = 0.2, \varepsilon^{NF}_{y,1-MTR^E} = 0.0\right)$ | | | | |
| | 22.82 | 784,289,807 | 5.62 | 193,009,407 |

*Notes:* Quantification of the tax revenue effect of proposal II as defined in Equation 2. All values in €. Panel (A) shows results for $\varepsilon_{y,1-MTR^E} = 0.2$ for all taxpayers, both filers ($F$) and non-filers ($NF$). Panel (B) shows results for $\varepsilon^F_{y,1-MTR^E} = 0.2$ for filers and $\varepsilon^F_{y,1-MTR^E} = 0.0$ for non-filers. Results for $\varepsilon_{y,1-MTR^E} = 0.3$ are shown in Table A.8. Effective tax liabilities are smoothed by fitting a forth order polynomial function (OLS) for each tax bracket $b$ to derive $T_b''(y) = \beta_0 + \beta_1 y + \beta_2 y^2 + \beta_3 y^3 + \beta_4 y^4$. $\beta_0 = 0$ for the first bracket to ensure $T_1''(0) = 0$. The corresponding $MTR''(y)$ is defined as the derivative of $T_b''(y)$ and thus a stepwise third order polynomial function of $y$ within each tax bracket. Applying different polynomial fits for smoothing does not change the magnitude of the effect, see Table A.9 for a stepwise linear and quadratic $MTR''(y)$. Smoothing $T^E$ over $y$ is necessary to obtain $T''(y)$ with meaningful $MTR''(y)$. However, it comes at the cost of not keeping the average effective tax liability 100% constant at each income level. On average, the annual $T''(y)$ is 0.14 € higher for a given income level $y$. $dy_i$: Average change in individual taxable income. $\sum dy_i$: Aggregate change in taxable income. $dT_i''$: Average individual change in tax remittance defined as $T_i'' - T_i^E$. $\sum dT_i''$: Aggregate change in tax revenue.

balance out.[21]

Second, and quantitatively much more relevant, taxpayers adjust their taxable income by $dy_i = \partial y / \partial MTR''$ which increases their tax liability by $dy_i$ times $MTR''(y_i)$.[22] The degree of this behavioral response depends on the elasticity of taxable income with respect to $MTR^E$: $\varepsilon_{y,1-MTR^E} = (1 - \tau)/y \cdot \partial y / \partial (1 - \tau)$. Plugging $\varepsilon_{y,1-MTR^E}$ into Equation 2, we can quantify the change in tax liability $dT_i''$ for each individual $i$ in the data set. Aggregating over the taxpayer population $N$ yields the overall effect on tax revenue $dT''$.

Panel A of Table 2 shows the results for $\varepsilon_{y,1-MTR^E} = 0.2$. On average, individuals increase their annual taxable income by 44 € which corresponds to an increase in effective tax liabilities of roughly 9 €. Aggregating over the universe of all taxpayers leads to a total increase in tax revenue of 297 million €.

The increase in tax revenue comes from filers and non-filers in all tax brackets, since average effective MTRs decrease over the entire income distribution

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[21]The average difference $T''(y_i) - T_i^E$ is close to zero with an annual value of 0.14 €.

[22]We take the simplifying assumption here that $MTR''(y) = MTR''(y + dy)$.

as shown in Figure 6c. One concern might be that non-filers exhibit smaller elasticities than the average population. In Panel B of Table 2, we account for this possibility and introduce heterogeneity in the elasticity of taxable income based on the filing status. We show that even under the most extreme assumption that non-filers do not react to changes in $MTR^E$ at all, i.e., $\varepsilon^{NF}_{y,1-MTR^E} = 0$ for all non-filers, the gain in tax revenue from filers is still 193 million €.

The estimated increase in tax revenue can be interpreted as an approximation for the losses in the current optional filing system since this could be realized under the same effective redistribution. In addition, horizontal equity is increased since non-filers and filers now face the same effective tax rates for a given level of taxable income.

Again, the results are an approximation and build on several assumptions. First, we only consider average tax payments at a given income level. It is important to note that this is no Pareto-improvement. Under $T''(y)$, some taxpayers in a given income range pay more taxes and others pay less, when compared to their status quo. Second, we only consider behavioral responses at the intensive margin and assume that taxpayers can adjust their taxable income without frictions. Third, interactions with the social security and transfer system are disregarded. Fourth, an implied assumption is that the financial authorities are able to automatically refund over-remitted taxes to non-filers to align effective taxation with the statutory tax schedule.

# 6   Discussion

## 6.1   Persistence of Our Findings

**Robustness over Time**.   We provide evidence for the robustness of our results over time by running the same analyses on the second most recent data set, which is available for the year 2010. The results using the 2010 data are qualitatively the same but smaller in size, relative to 2014. The corresponding figures and tables for this robustness check can be found in subsection B.1.

The average over-remittance for non-filers is 102 € in 2010, compared to

118 € in 2014. This is equivalent to a 15% increase from 2010 to 2014, which is proportional to the overall economic development over the same time period.[23] In 2010, aggregate over-remittances amount to 603 million €, 346 million € less than in 2014. This aggregate deviation is largely driven by a smaller number of non-filers in our sub-sample in 2010, as the per capita difference are only slightly smaller.

**Sample Selection**. When examining non-filing shares at the lower end of the income distribution, see Figure 2, we included optional filers, irrespective of whether they had any tax remittances withheld throughout the year or not. However, for taxpayers who had no taxes withheld, there is no immediate monetary benefit of filing an income tax return. Excluding this group decreases the non-filing share below the basic allowance threshold by roughly ten percentage points. Nonetheless, the non-filing share in these income ranges remains at about 80 percent (see Figure A.4).

**Persistence over Age**. By the nature of the withholding system, it might be that over-remittances occur only in distinct circumstances that happen very rarely or maybe only once in a taxpayer's life.[24] The prime example is a young employee entering the labor market mid-year. Since vocational training cycles and academic education programs regularly end throughout the year, these employees typically work less than twelve months in their first job post graduation which leads to over-withholding.

While the cross-sectional structure of the data does not allow for tracking individuals over time, we can compare the filing behavior of a given cohort at different points in time, 2014 and 2010. Exploiting the repeated cross-section, we provide suggestive evidence that non-filing with over-remittance is

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[23]Following data from the Federal Statistical Office (`https://www-genesis.destatis.de/genesis/online?sequenz=tabellen&language=en&selectionname=81000-0003`; last accessed: 2021-01-17), the German gross national income rose from 2,616 billion € in 2010 to 2,986 billion € in 2014 which constitutes a 14% rise.

[24]See Fullerton and Rao (2019) for a related analysis of taxpayers who do not owe federal income taxes in the United States.

likely not a once-in-a-lifetime phenomenon. The share of non-filers is indeed highest among taxpayers in their early twenties but it remains substantial at higher age ranges (Figure A.5). Furthermore, for a given cohort, non-filing shares relative to all optional filers do not vary significantly between 2010 and 2014. In addition, over-remittances are common over the entire age distribution (Figure A.6). The optional (non-)filing system thus systematically leads to over-remittances for taxpayers at various stages of their lives.

## 6.2 Filing Costs

When facing the decision to file taxes, there is a trade-off between the expected benefits and the expected costs of filing. When expected filing costs exceed the expected refunds, non-filing can be rational even if we observe sizable refunds. For US taxpayers, Benzarti (2020b) documents itemizing behavior that is in line with a rational cost-benefit analysis. By documenting a missing mass in the distribution of itemized deductions just above the standard deduction level, Benzarti (2020b) shows that individuals forgo substantial tax refunds when filing their taxes to avoid compliance costs from itemizing.

Non-filing decision with over-withholding in our setting can, on average, not be explained by an informed cost-benefit analysis regarding compliance costs. Conditional on tax over-withholding, the average forgone refund in our sample is 360 € (see Table 1). For non-filing to be individually cost rational for over-remitting taxpayers, compliance costs thus have to be higher than that. We use filing cost estimates in terms of compliance time estimates from the literature and calculate the implied net hourly wage that is required to make non-filing a rational decision. We find that the average implied net hourly wages are significantly larger than the average German hourly gross wages for all compliance time estimates (Column 1 of Table A.7).

Based on these results, taxpayers need to either overestimate costs or underestimate benefits of filing to make non-filing under over-withholding a rational choice (or both). The latter includes the possibility that non-filers may be unaware of their over-remittances. It is a well established fact that tax literacy

is often limited and that taxpayers regularly fail to understand basic concepts and mechanisms of taxation and tax policy (Rees-Jones and Taubinsky 2020; Stantcheva 2020). In a similar vein, non-filers may fail to assess whether or not they are subject to over-withholding, although assessing whether or not over-withholding occurs is relatively straightforward.[25] We show that under full uncertainty about over-withholding, non-filing can be the rational outcome of a cost-benefit analysis under reasonable wage levels only for the higher time estimates (Column 2 of Table A.7). In line with previous evidence related to benefit take-up, e.g. Chetty et al. (2013) and Bosch et al. (2019), we conclude that informational frictions, in our case regarding costs and/or benefits from filing, are likely to play an important role for non-filing.

# 7    Conclusion

In this paper, we examine the effects of optional tax (non-)filing for effective taxation. We show that non-filing is particularly prevalent at the lower end of the income distribution. Additionally, taxpayers in these income ranges are hurt most by optional filing rules. Below the basic allowance threshold, non-filers face an average tax rate of about 2%, relative to a statutory rate of zero. On average, non-filers remitted 119 € more than intended by the schedule in 2014, adding up to a total of at least 949 million €. As a result, the effective income taxation is less progressive than intended by the tax schedule.

Based on our results, we derive policy implications. If the statutory tax schedule maps the intended degree of progressivity, optional non-filing weakens tax progressivity and can thus not be considered equitable. In this case, policymakers should take measures such as automatic refunds or pre-poulated returns to realign the statutory and effective taxation to increase effective equity. At the same time, optional non-filing comes at sizable efficiency costs, making it sub-optimal from an efficiency perspective, even if the current ef-

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[25]Over-withholding happens for certain cases of income fluctuations throughout the year and whether or not this applies to an individual situation can be answered by simple heuristics. For example, a taxpayer who works less than 12 months in a given year/given job and does not receive social benefits to replace income will always be subject to over-withholding.

fective tax progressivity reflects societal preferences for redistribution. We provide two quantifications to assess the size of this efficiency loss.

Lastly, we discuss the persistence of these effects and provide suggestive evidence that this pattern cannot be rationalized by a fully informed cost-benefit analysis. Rather, information frictions regarding tax filing time and/or expected refunds, have to be sizable to explain these patterns. To fully understand which channels drive individual non-filing behavior in the presence of substantial over-withholding, further research is needed.

# References

Abeler, Johannes and Simon Jäger (2015). "Complex Tax Incentives." *American Economic Journal: Economic Policy* 7, 1–28.

Advani, Arun and Andy Summers (2020). *How much tax do the rich really pay? New evidence from tax microdata in the UK.*

Aghion, Philippe, Ufuk Akcigit, Matthieu Lequien, and Stefanie Stantcheva (2017). *Tax Simplicity and Heterogeneous Learning.* NBER Working Paper 24049.

Alstadsæter, Annette, Niels Johannesen, and Gabriel Zucman (2019). "Tax Evasion and Inequality." *American Economic Review* 109, 2073–2103.

Benzarti, Youssef (2020a). *Estimating the Costs of Filing Tax Returns and the Potential Savings from Policies Aimed at Reducing These Costs.* NBER Working Paper 27946.

– (2020b). "How Taxing Is Tax Filing? Using Revealed Preferences to Estimate Compliance Costs." *American Economic Journal: Economic Policy* 12, 38–57.

Blaufus, Kay, Sebastian Eichfelder, and Jochen Hundsdoerfer (2014). "Income Tax Compliance Costs of Working Individuals: Empirical Evidence from Germany." *Public Finance Review* 42, 800–829.

Bosch, Nicole, Egbert Jongen, Wouter Leenders, and Jan Möhlmann (2019). "Non-bunching at kinks and notches in cash transfers in the Netherlands." *International Tax and Public Finance* 26, 1329–1352.

Bucher-Koenen, Tabea, Annamaria Lusardi, Rob Alessie, and Maarten van Rooij (2017). "How Financially Literate Are Women? An Overview and New Insights." *Journal of Consumer Affairs* 51, 255–283.

Buettner, Thiess, Katharina Erbe, and Veronika Grimm (2019). "Tax planning of married couples and intra-household income inequality." *Journal of Public Economics* 179, 104048.

Chetty, Raj, John N. Friedman, and Emmanuel Saez (2013). "Using Differences in Knowledge across Neighborhoods to Uncover the Impacts of the EITC on Earnings." *American Economic Review* 103, 2683–2721.

Currie, Janet (2006). "The Take-Up of Social Benefits." *Public Policy and the Income Distribution*. Ed. by Alan J. Auerbach, David Card, and John M. Quigley. Russell Sage Foundation, 80–148.

Doerrenberg, Philipp, Andreas Peichl, and Sebastian Siegloch (2017). "The elasticity of taxable income in the presence of deduction possibilities." *Journal of Public Economics* 151, 41–55.

European Commission (2018). *Gender pay gap in EU countries based on SES (2014)*. Luxembourg: Publication Office of the European Union.

Federal Statistical Office (2012). *Erfüllungsaufwand im Zusammenhang mit Steuererklärungen, steuerlichen und zollrechtlichen Nachweispflichten*.

Feldman, Naomi E., Peter Katuščák, and Laura Kawano (2016). "Taxpayer Confusion: Evidence from the Child Tax Credit." *American Economic Review* 106, 807–835.

Finkelstein, Amy and Matthew J Notowidigdo (2019). "Take-Up and Targeting: Experimental Evidence from SNAP." *The Quarterly Journal of Economics* 134, 1505–1556.

Fullerton, Don and Nirupama L. Rao (2019). "The Lifecycle of the 47 Percent." *National Tax Journal* 72, 359–396.

Goldin, Jacob, Tatiana Homonoff, Rizwan Javaid, and Brenda Schafer (2021). *Tax Filing and Take-Up: Experimental Evidence on Tax Preparation Outreach and EITC Participation*. NBER Working Paper 28398.

Guyton, John, Pat Langetieg, Day Manoli, Mark Payne, Brenda Schafer, and Michael Sebastiani (2017). "Reminders and Recidivism: Using Administrative Data to Characterize Nonfilers and Conduct EITC Outreach." *American Economic Review: Papers & Proceedings* 107, 471–475.

Heim, Bradley T., Ithai Z. Lurie, and James Pearce (2014). "Who Pays Taxes? A Dynamic Perspective." *National Tax Journal* 67, 755–778.

International Bureau of Fiscal Documentation (2016). *Global Individual Tax Handbook 2016.* Amsterdam: IBFD.

Jones, Damon (2012). "Inertia and Overwithholding: Explaining the Prevalence of Income Tax Refunds." *American Economic Journal: Economic Policy* 4, 158–185.

Mirrlees, J. A. (1971). "An Exploration in the Theory of Optimum Income Taxation." *The Review of Economic Studies* 38, 175–208.

Neisser, Carina (2021). "The Elasticity of Taxable Income: A Meta-Regression Analysis." *The Economic Journal.*

Rees-Jones, Alex and Dmitry Taubinsky (2020). "Measuring "Schmeduling"." *The Review of Economic Studies* 87, 2399–2438.

Research Data Centre of the Federal Statistical Office and the statistical offices of the Länder (RDC) (2018). *Lohn- und Einkommenssteuerstatistik 2010, Scientific Use File.* type: dataset.

– (2020). *Lohn- und Einkommenssteuerstatistik 2014, Scientific Use File.* type: dataset.

Roller, Marcus and Kurt Schmidheiny (2016). *Effective Tax Rates and Effective Progressivity in a Fiscally Decentralized Country.* CEPR Discussion Paper 11152.

Saez, Emmanuel (2001). "Using Elasticities to Derive Optimal Income Tax Rates." *The Review of Economic Studies* 68, 205–229.

Saez, Emmanuel, Joel Slemrod, and Seth H Giertz (2012). "The Elasticity of Taxable Income with Respect to Marginal Tax Rates: A Critical Review." *Journal of Economic Literature* 50, 3–50.

Saez, Emmanuel and Gabriel Zucman (2019). *The triumph of injustice: how the rich dodge taxes and how to make them pay.* First Edition. New York.

– (2020). "Progressive Wealth Taxation." *Brookings Papers on Economic Activity* Fall 2019, 437–533.

Schächtele, Simeon (2019). "Tax Responses at Low Taxable Incomes: Evidence from Germany."

Stantcheva, Stefanie (2020). *Understanding Tax Policy: How Do People Reason?* NBER Working Paper 27699.

Zwick, Eric (2021). "The Costs of Corporate Tax Complexity." *American Economic Journal: Economic Policy* Forthcoming.

# A    Appendix

## A.1    Additional Figures

Figure A.1: Average and Marginal Tax Rates for Single and Joint Filers in Germany
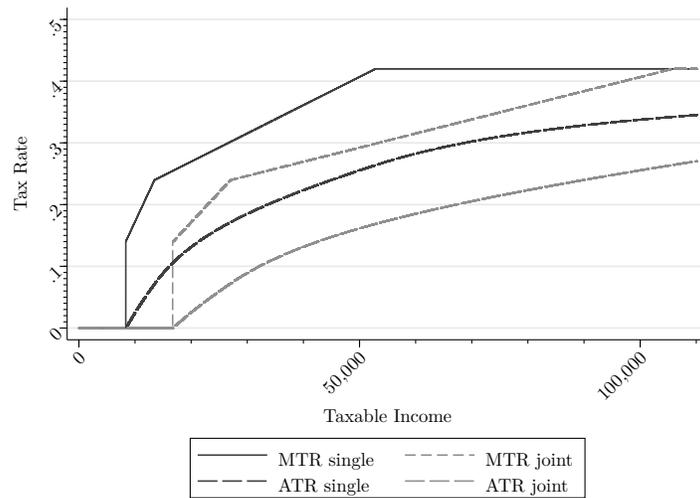
Figure A.2: Prevalence of Non-Filing over the Income Distribution
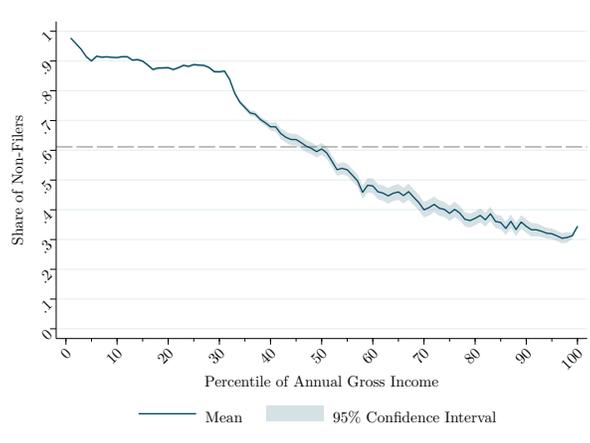
*Notes:* Share of non-filers among optional filers along the income distribution. Dashed grey line: Average share of non-filers (61.15%) across all income percentiles. Statistics refer to taxable units which may be either an individual or married spouses in case of joint filing. Percentiles are based on the annual gross wage income of optional filers. For jointly filing spouses, we consider the average gross income. Figure 2 shows the non-filing share over gross income.

Figure A.3: Non-Filing Share by Refund Potential
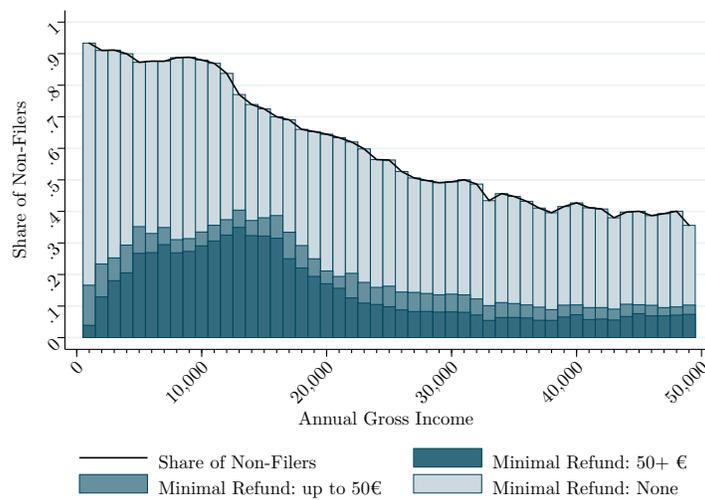
Share of Non-Filers

Annual Gross Income

— Share of Non-Filers    Minimal Refund: 50+ €
   Minimal Refund: up to 50€    Minimal Refund: None

*Notes:* Decomposition of the non-filing share (black line) over income by refund potential of the non-filers. Individuals are grouped in 1,000-€-bins. *Minimal refund*: Lower bound for taxes over-remitted through non-filing. *None*: No refund from minimal filing because taxes are withheld correctly. This is allowing for a range of 0 +/- 5€. *Up to 50€ (50+€)*: Minimal refund of up to (more than) 50€. *Reading example:* 64% of optional filers with an annual gross income of 20,000€ are non-filers. In this income bin, 17% of all optional filers have a minimal refund potential of at least 50€.

Figure A.4: Prevalence of Non-Filing over Gross Income - Only Taxpayers with Positive Tax Remittance
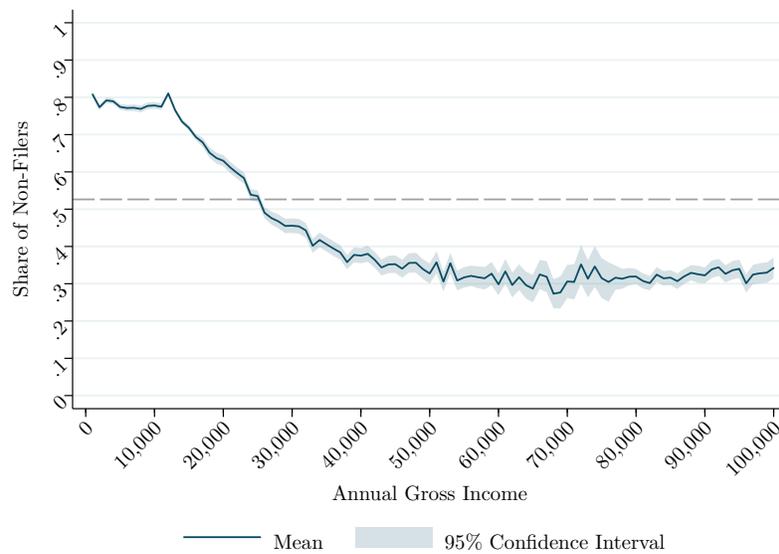
*Notes:* Sample restricted to taxpayers with a positive tax remittance. Thus excluding taxpayers below the basic allowance threshold for whom no taxes were withheld. Individuals are grouped in 1,000- €-bins. Share of non-filers among optional filers. Dashed grey line: Average share of non-filers (52.62%) across all gross income levels. Statistics refer to taxable units which may be either an individual or married spouses in case of joint filing. For jointly filing spouses, we consider the average gross income.

Figure A.5: Non-Filing Share Over Age in 2010

(a) Non-Filers relative to Optional Filers     (b) Non-Filers relative to All Taxpayers
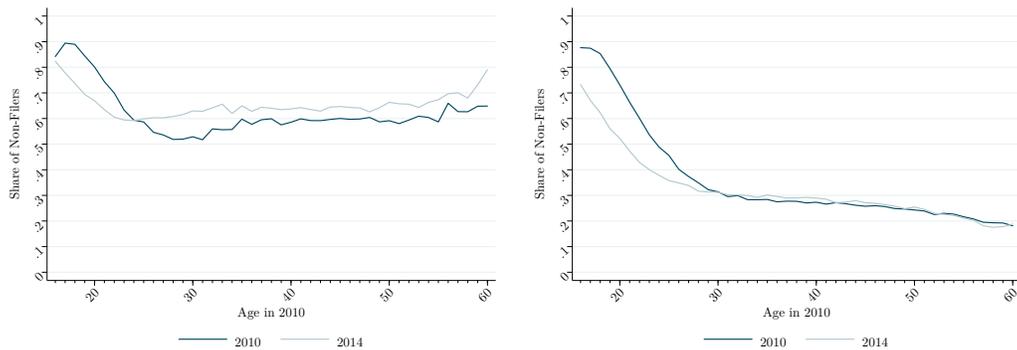
_Notes:_ Repeated cross sections. Individuals are grouped by their age in 2010. Figure A.5a shows the share of non-filers among the optional filers in the final sample. After age 30, non-filing relative to all optional filers is a persistent phenomenon. Figure A.5b shows the share of non-filers relative to all taxpayers (with mean age for married taxpayers). Within a cohort, tax filing increases up until age 30. As older taxpayers become more and more likely to be compulsory filers, due to e.g. marriage and additional income sources, the share of non-filers relative to all taxpayers decreases beyond the age of thirty.

Figure A.6: Non-Filing Share by Refund Potential over Age
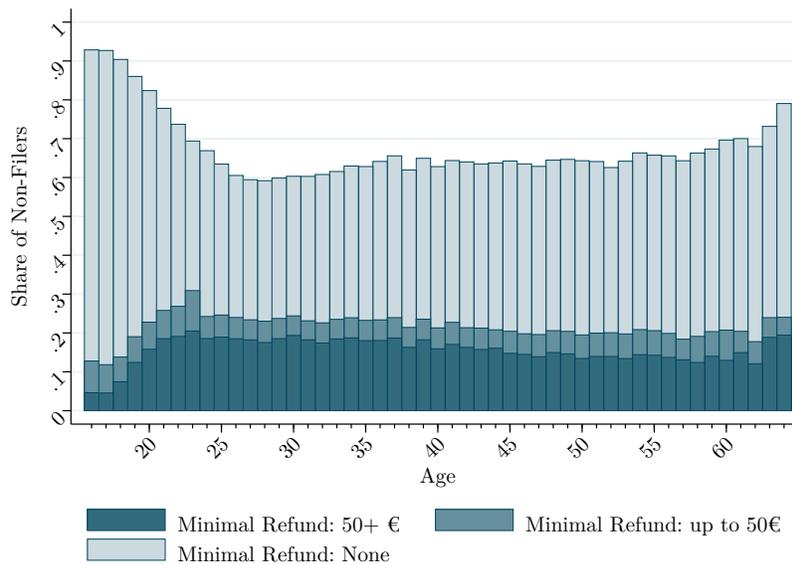
_Notes:_ Decomposition of the non-filing share over age by refund potential for non-filers. _Minimal Refund_: Lower bound for taxes over-remitted through non-filing. _None_: No refund from minimal filing because taxes are withheld correctly. This is allowing for a range of 0 +/- 5 €. _Up to 50 € (50+ €)_: Minimal refund of up to (more than) 50 €. _Reading example:_ 64% of optional filers aged 50 are non-filers. In this age cohort, 13% of all optional filers have a refund potential of at least 50 €. Lower over-remittances for teen-aged taxpayers can be explained by the fact that employees in this age span are likely apprentices whose annual income is below the basic allowance. Following data from the Federal Institute for Vocational Education and Training, the average monthly income of apprenticeships covered by social agreements in 2014 is 802 € in West German States and 737 € in East German States (`https://www.bibb.de/de/12209.php`; last accessed: 2020-11-25).

## A.2 Additional Tables

Table A.1: Countries with Income Tax Non-Filing Options

| Country | Non-Filing Option | Limitation | Country | Non-Filing Option | Limitation |
|---|---|---|---|---|---|
| Argentina | ✓ | - | Japan | (✓) | y < 20 mio. JPY |
| Austria | ✓ | - | Korea, Rep. | ✓ | - |
| Belarus | ✓ | - | Lithuania | ✓ | - |
| Bulgaria | ✓ | - | Luxembourg | (✓) | y < 100,000 EUR |
| Chile | ✓ | - | Macedonia | ✓ | - |
| China | (✓) | y < 120,000 CNY | Madagascar | ✓ | - |
| Costa Rica | ✓ | - | Moldova | ✓ | - |
| Croatia | ✓ | - | New Zealand | ✓ | - |
| Czech Republic | ✓ | - | Nicaragua | ✓ | - |
| Dominican Republic | ✓ | - | Peru | ✓ | - |
| Ecuador | ✓ | - | Philippines | ✓ | |
| El Salvador | (✓) | y < 60,000 USD | Ukraine | ✓ | - |
| Estonia | ✓ | - | Romania | ✓ | - |
| Guatemala | ✓ | - | Russia | ✓ | - |
| Iran | ✓ | - | Slovak Republic | ✓ | - |
| Israel | (✓) | y < 643,000 NIS | Turkey | (✓) | y < 30,000 TRL |

*Notes:* Filing requirements are taken from International Bureau of Fiscal Documentation (2016), section 1.10 of each country chapter. *Non-Filing Option:* In a country, is a wage earning single taxpayer with a single employer exempt from tax filing. *Limitation:* Whenever (✓) is indicated, this columns gives more information about the relevant limitation for non-filing. For example, in Japan, wage earning taxpayers with income exceeding 20 mio. JPY have to file an income tax return. Wage earners with less income do not have to file.

Table A.2: Descriptive Statistics - Full Sample

| Income | mean | 22,564.31 |
|--------|------|-----------|
|        | p25  | 4,152.00 |
|        | p50  | 18,484.00 |
|        | p75  | 33,365.00 |
|        | p90  | 48,494.00 |
|        | p99  | 99,023.00 |
| Age    | mean | 45.75 |
|        | p50  | 45 |
| Married | share | 45.35 |
| East   | share | 18.25 |
| Children | share | 27.72 |
| N      | absolute | 4,017,600 |
|        | weighted | 40,175,995 |

*Data:* RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Lohn- und Einkommensteuerstatistik, 2014, own calculations.

*Notes:* Statistics refer to taxable units which may be either an individual or married spouses in case of joint filing. Statistics are based on weighted data if not indicated differently. *Income*: Annual gross wage income in €. For jointly filing spouses, the average gross income is taken into account. *Married*: Share of married taxpayers. *East*: Share of taxpayers that live in Eastern states of Germany. *Children*: Share of taxpayers with at least one child that is relevant for the tax authority.

Table A.3: Descriptive Statistics - Optional Filers

| | | Optional Filers | Voluntary Filers | Non-Filers |
|---|---|---|---|---|
| Income | mean[+] | 24,447.75 | 34,524.08 | 18,046.71 |
| | p25 | 8,231.00 | 22,624.00 | 4,479.00 |
| | p50 | 21,951.00 | 32,559.00 | 13,023.00 |
| | p75 | 35,465.00 | 43,225.00 | 27,200.00 |
| | p90 | 48,539.00 | 56,855.00 | 40,063.00 |
| | p99 | 86,952.50 | 97,373.00 | 75,206.00 |
| Age | mean[+] | 34.92 | 37.12 | 33.62 |
| | p50 | 32.00 | 34.00 | 30.00 |
| Married | mean[+] | 9.28 | 12.79 | 7.05 |
| East | mean[+] | 21.54 | 18.99 | 23.17 |
| Children | mean[+] | 16.88 | 20.62 | 14.51 |
| N | absolute | 683,718 | 425,579 | 258,139 |
| | weighted | 14,863,136 | 5,773,958 | 9,089,178 |

*Notes:* Statistics refer to taxable units which may be either an individual or married spouses in case of joint filing. Statistics are based on weighted data if not indicated differently. *Income*: Annual gross wage income in €. For jointly filing spouses, the average gross income is taken into account. *Married*: Share of married taxpayers. *East*: Share of taxpayers that live in Eastern states of Germany. *Children*: Share of taxpayers with at least one child that is relevant for the tax authority. [+] indicates mean/share difference between voluntary filers and non-filers significant at the 0.1% - level (two-sided t-test).

## Table A.4: Descriptive Statistics - Final Sample

|          |          | Optional Filers | Voluntary Filers | Non-Filers |
|----------|----------|-----------------|------------------|------------|
| Income   | mean[+]  | 19,137.60       | 27,192.55        | 15,243.17  |
|          | p25      | 6,513.00        | 18,930.00        | 4,185.00   |
|          | p50      | 17,820.00       | 28,444.00        | 11,614.00  |
|          | p75      | 30,407.00       | 36,338.00        | 24,300.00  |
|          | p90      | 38,713.00       | 42,388.00        | 34,735.00  |
|          | p99      | 47,186.00       | 47,903.00        | 46,218.00  |
| Age      | mean[+]  | 33.72           | 35.22            | 33.00      |
|          | p50      | 30              | 32               | 29         |
| Married  | share[+] | 4.61            | 0.63             | 6.53       |
| East     | share[+] | 21.99           | 17.98            | 23.92      |
| Children | share[+] | 15.20           | 16.50            | 14.57      |
| N        | absolute | 429,069         | 220,818          | 208,251    |
|          | weighted | 12,016,340      | 3,916,260        | 8,100,080  |

*Data:* RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Lohn- und Einkommensteuerstatistik, 2014, own calculations.

*Notes:* Individual taxpayers with gross income up to 48,600 € only. No civil servants. Statistics are based on weighted data if not indicated differently. *Income*: Annual gross wage income in €. *Married*: Share of married taxpayers. This includes only individually filing spouses. *East*: Share of taxpayers that live in Eastern states of Germany. *Children*: Share of taxpayers with at least one child that is relevant for the tax authority. [+] indicates mean/share difference between voluntary filers and non-filers significant at the 0.1% - level (two-sided t-test).

## Table A.5: Different Inequality Measures for Different Income Concepts

|                              | Gini   | Percentile Ratios | | |
|------------------------------|--------|---------|---------|---------|
|                              |        | p90/p10 | p90/p50 | p50/p10 |
| Pre-Tax Gross Income         | 0.4079 | 18.0384 | 2.1793  | 8.2772  |
| After-Tax Income Pre Filing  | 0.3832 | 15.4307 | 1.9632  | 7.8599  |
| After-Tax Income Post Filing | 0.3897 | 15.6391 | 2.0403  | 7.6650  |

*Data:* RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Lohn- und Einkommensteuerstatistik, 2014, own calculations.

*Notes:* We report two different measures for inequality for three different income concepts for the final sample used in section 4. *Gini*: Indicates the Gini-coefficient. *Percentile Ratios*: Indicates the ratio between two income percentiles. For instance, *p90/p10=18.0384* indicates that the $90^{th}$ income percentile is 18 times larger than the $10^{th}$ income percentile. *Gross Income*: Gross wage income before taxes. *After-Tax Income Pre Filing*: Gross income minus taxes withheld through the employer, before potential tax filing. *After-Tax Income Post Filing*: This is the final after tax-income that optional filers realize. For voluntary filers, this is their taxable income after filing. For non-filers, this is their gross income minus taxes withheld.

Table A.6: Taxes Over-Remitted through Non-Filing - Lower Bound Estimates (2010)

|  |  | (A) All Non-Filers | | (B) With over-remittance | |
|---|---|---|---|---|---|
|  |  | All | y < threshold | All | y < threshold |
| Over-Remittance | total | 603,046,641 | 240,758,764 | 604,502,377 | 240,584,508 |
|  | mean | 102.26 | 81.12 | 318.89 | 238.33 |
|  | p25 | 0.37 | 0.00 | 41.90 | 48.00 |
|  | p50 | 0.00 | 0.00 | 164.00 | 139.00 |
|  | p75 | 34.34 | 52.00 | 441.54 | 331.00 |
| N | absolute | 168,805 | 83,296 | 55,399 | 29,741 |
|  | weighted | 5,897,323 | 2,967,949 | 1,895,650 | 1,009,474 |

*Data:* RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Lohn- und Einkommensteuerstatistik, 2010, own calculations.

*Notes:* Over-Remittance is defined as the difference between the the automatically withheld income taxes and the income tax that applies according to the tax schedule. Over-remittances are listed in €. (*A*): All non-filers in the sample. (*B*): Only those non-filers with over-remittances, defined as a deviation of more than 5 € from the statutory tax schedule. $y < threshold$: Individuals with an annual gross wage income below the basic tax allowance threshold.

## Table A.7: Compliance Costs

| | Compliance Time | Implied Net Hourly Wage | |
| --- | --- | --- | --- |
| | | (1) Over-Withholding | (2) All Non-Filers |
| (A) Federal Statistical Office (2012) | | | |
| Basic forms | 1.69 | 213.04 | 70.21 |
| All forms | 4.52 | 79.65 | 26.25 |
| (B) Blaufus et al. (2014) | | | |
| Lower bound | 3.90 | 92.32 | 30.43 |
| Upper bound | 9.76 | 36.89 | 12.16 |
| (C) Benzarti (2020b) | | | |
| Form 1040 | 9.40 | 38.30 | 12.62 |

*Notes:* On average, non-filing can be rational if the implied net hourly wage, i.e. the average over-remittance (360.04 €) divided by the compliance time, is higher than the average net wage. Time is measured in hours, wages are measured in €. *(A)*: This is our preferred time estimate because it is closest to the minimal filing requirements. Based on interviews, the German Federal Statistical Office directly measures the average compliance time for tax filing in Germany in 2009 to be 4.52 hours for a typical employee. The estimate includes time spent for filing (3.83 hours) as well as for preparation and follow-up work (0.69 hours). Out of the 3.83 hours, 1 hour results from three basic forms that require information similar to the minimal filing form which leads to a total of 1.69 hours. *(B)*: Blaufus et al. (2014) find that compliance time increases with income. They estimate the compliance time to be at least 3.9 hours for non self-employed taxpayers whose taxable income $y$ is $\leq 22{,}000$ € and at most 9.76 hours for taxpayers with $y \in (22{,}001$ €, $42{,}000$ €). *(C)*: Benzarti (2020b) in Table 1, Panel b, column (1), he mentions that filing hours for a standard 1040 as surveyed by the IRS amount to 9.40 hours. We assume this to be the closest US substitute for our minimal filing counterfactual. *Interpretation*: The implied net hourly wages are significantly larger than the average German hourly gross wages for all compliance time estimates. The Federal Statistical Office provides quarterly data for gross earnings. In 2014, those ranged from $20.54$ € to $20.99$ € (`https://www-genesis.destatis.de/genesis/online?sequenz=tabellen&language=en&selectionname=62321-0001`; last accessed: 2020-11-25).

## Table A.8: Proposal II: $\varepsilon_{y,1-\tau} = 0.3$

| $dy_i$ | $\sum dy_i$ | $dT_i''$ | $\sum dT_i''$ |
|---|---|---|---|
| (A) Same Elasticity for Filers and Non-Filers $\left(\varepsilon_{y,1-MTR^E}^{F} = \varepsilon_{y,1-MTR^E}^{NF} = 0.3\right)$ | | | |
| 65.89 | 2,264,418,698 | 12.96 | 445,405,280 |
| (B) Different Elasticities for Filers and Non-Filers $\left(\varepsilon_{y,1-MTR^E}^{F} = 0.3, \varepsilon_{y,1-MTR^E}^{NF} = 0.0\right)$ | | | |
| 34.23 | 1,176,434,711 | 8.40 | 288,770,183 |

*Notes:* Quantification of the tax revenue effect of proposal II with different assumed elasticity of taxable income. All values in €. Panel (A) shows results for $\varepsilon_{y,1-MTR^E} = 0.3$ for all taxpayers, both filers ($F$) and non-filers ($NF$). Panel (B) shows results for $\varepsilon_{y,1-MTR^E}^{F} = 0.3$ for filers and $\varepsilon_{y,1-MTR^E}^{F} = 0.0$ for non-filers. Effective tax liabilities are smoothed by fitting a forth order polynomial function (OLS) for each tax bracket $b$ to derive $T_b''(y) = \beta_0 + \beta_1 y + \beta_2 y^2 + \beta_3 y^3 + \beta_4 y^4$. $\beta_0 = 0$ for the first bracket to ensure $T_1''(0) = 0$. The corresponding $MTR''(y)$ is defined as the derivative of $T_b''(y)$ and thus a stepwise third order polynomial function of $y$ within each tax bracket. Smoothing $T^E$ over $y$ is necessary to obtain $T''(y)$ with meaningful $MTR''(y)$. However, it comes at the cost of not keeping the average effective tax liability exactly constant at each income level. On average, the annual $T''(y)$ is 0.14 € higher for a given income level $y$. $dy_i$: Average change in individual taxable income. $\sum dy_i$: Aggregate change in taxable income. $dT_i''$: Average individual change in tax remittance defined as $T_i'' - T_i^E$. $\sum dT_i''$: Aggregate change in tax revenue.

Table A.9: Proposal II: Different Polynomial Fit

| | $dy_i$ | $\sum dy_i$ | $dT_i''$ | $\sum dT_i''$ |
|---|---|---|---|---|
| | (A) Same Elasticity for Filers and Non-Filers | | | |
| | $\varepsilon_{y,1-MTR^E}^{F} = \varepsilon_{y,1-MTR^E}^{NF} = 0.2$ | | | |
| Linear | 41.22 | 1,416,525,933 | 7.62 | 261,905,054 |
| Quadratic | 43.92 | 1,509,457,767 | 8.76 | 300,878,495 |
| | (B) Different Elasticities for Filers and Non-Filers | | | |
| | $\varepsilon_{y,1-MTR^E}^{F} = 0.2,\ \varepsilon_{y,1-MTR^E}^{NF} = 0.0$ | | | |
| Linear | 20.23 | 695,093,006 | 4.59 | 157,809,423 |
| Quadratic | 22.95 | 788,510,358 | 5.74 | 197,136,862 |

*Notes:* Alternative quantification of the tax revenue effect of proposal II as shown in Table 2. All values in €. Panel (A) shows results for $\varepsilon_{y,1-MTR^E} = 0.2$ for all taxpayers, both filers ($F$) and non-filers ($NF$). Panel (B) shows results for $\varepsilon_{y,1-MTR^E}^{F} = 0.2$ for filers and $\varepsilon_{y,1-MTR^E}^{F} = 0.0$ for non-filers. *Linear*: Effective tax liabilities are smoothed by fitting a second order polynomial function (OLS) for each tax bracket $b$ to derive $T_b''(y) = \beta_0 + \beta_1 y + \beta_2 y^2$. The corresponding $MTR''(y)$ is defined as the derivative of $T_b''(y)$ and thus a stepwise linear function of $y$ within each tax bracket. *Quadratic*: Effective tax liabilities are smoothed by fitting a third order polynomial function (OLS) for each tax bracket $b$ to derive $T_b''(y) = \beta_0 + \beta_1 y + \beta_2 y^2 + \beta_3 y^3$. Here, $MTR''(y)$ is a stepwise quadratic function of $y$ within each tax bracket. For both the linear and quadratic MTR, $\beta_0 = 0$ for the first bracket to ensure $T_1''(0) = 0$. Smoothing $T^E$ over $y$ is necessary to obtain $T''(y)$ with meaningful $MTR''(y)$. However, it comes at the cost of not keeping the average effective tax liability exactly constant at each income level. On average, the annual $T''(y)$ is 0.10 € lower for a given income level $y$ for the linear MTR and 0.03 € higher for the quadratic MTR. $dy_i$: Average change in individual taxable income. $\sum dy_i$: Aggregate change in taxable income. $dT_i''$: Average individual change in tax remittance defined as $T_i'' - T_i^E$. $\sum dT_i''$: Aggregate change in tax revenue.

## A.3 Sample Restrictions - Optional Filers

Besides filing and non-filing single taxpayers, we also include married taxpayers if they fulfill one of the following three criterion. First, spouses who did not choose to reallocate allowances between them over the year, but still file jointly, are considered. Hence, for tax withholding purposes, each spouse is treated like a single taxpayer. For these couples, we consider their average refund and their average income to be able to compare them to single taxpayers. Second, married individuals that filed their taxes individually, and third, married individuals who are non-filers are considered.

## A.4 Sample Restrictions - Over-Remittance Sample

In general, contributions to the health insurance, to the nursing care insurance, and to the pension insurance are tax deductible up to a threshold for both private and public insurances. However, while contributions to the public social insurances are a function of gross income and can thus be computed with the data set at hand, this is not the case for private insurances. Unfortunately, the data set does neither include information on the contribution fees remitted for private insurances nor on the enrollment status (public or private) if not declared in the tax return. Hence, we cannot calculate the contribution payments for non-filers enrolled in private insurances and thus cannot derive their taxable income. The same is true for filers who do not claim their contributions in their tax returns. Therefore, we restrict the sample to those for whom we are certain that they are enrolled in the public insurance.

It is important to note that for employees with an annual wage income up to 48,600 € in 2014, enrollment in all public social insurances is compulsory. By restricting the sample to this group, we thus exclude all observations with an annual gross wage income above 48,600 €, which is close to the 90th percentile of gross wages. Additionally, we exclude civil servants who do not contribute to the public pension insurance and who are free to choose whether to enroll in a private health insurance even at lower income levels. Additionally, for voluntary filers, we focus on individually filing taxpayers here, including married

individuals that do not file jointly with their spouses. We do so, because for jointly filing spouses not all relevant variables are available at the individual level.

We further restrict the sample to individuals for whom the calculated statutory tax liability is less than the withheld taxes, allowing for a 5-€-inaccuracy. This means that we exclude non-filers for whom the minimal refund potential is significantly negative. There are several potential reasons why the data set includes optional filers who remitted too little taxes through automatic withholding. First, employers may make mistakes when calculating and withholding the wage taxes for their employees. Second, there may be cases in which the tax schedule we apply to a taxpayer's income is imprecise because one or several of their individual characteristics changed within the tax year. Since the data set only contains yearly information, no such changes are observable. Additionally, some of these unobservable changes trigger an obligation to file. A third potential explanation is that some information in the data is incorrect.

## A.5   Voluntary Filers

Based on the administrative data at hand, we cannot make any causal claims on why taxpayers decide to voluntarily file their taxes while others do not. However, we can characterize voluntary filers based on demographic characteristics available in the data and analyze their filing behavior in more detail. Based on these descriptive statistics, we provide some suggestive evidence for what may drive individual choices for voluntary filing.

**Demographic Characteristics**. Some basic characteristics of voluntary filers are provided in Table A.3, along with the information on non-filers. We know want to shed some more light on the filing patterns across different sub-populations of taxpayers.

Table A.3 documents that taxpayers who voluntarily file an income tax return are, on average, somewhat older than non-filers (35 vs. 33 years). Figure A.7 shows age specific filing shares. Three patterns emerge: First, the

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Figure A.7: Differences in Filing Behavior across Gender and Age
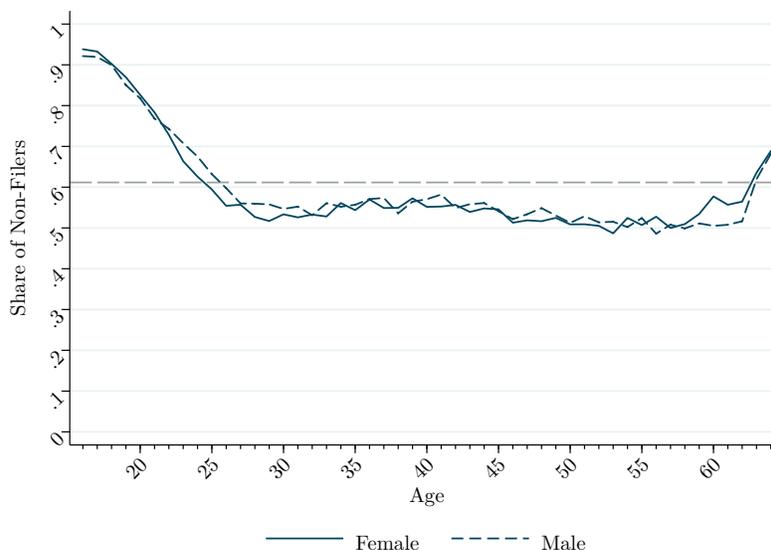
youngest taxpayers are by far most likely to be non-filers. The non-filing share is as high as 90% for teen-aged individuals and then sharply declines until it reaches a value below 60% for individuals in their mid-twenties. Second, starting from from taxpayers in this age range, the share of non-filers is very stable for most age groups, with non-filing shares between 50% and 60%. Third, for individuals older than 60, non-filing shares go up again slightly.

Figure A.7 also shows that there are no stark differences in the filing shares of women and men over age. We consider this a surprising finding for two reasons. First, the German labor market is characterized by strong gender differences, including a large gender wage gap that consequently leads to a gender gap in income taxes as well.[26] Second, financial literacy is typically

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[26]In 2014, Germany had the second highest unadjusted gender pay gap within the European Union, with women earning more than 20% less than men (European Commission 2018).

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Figure A.8: Differences in Filing between Married and Non-Married Taxpayers with and without Children
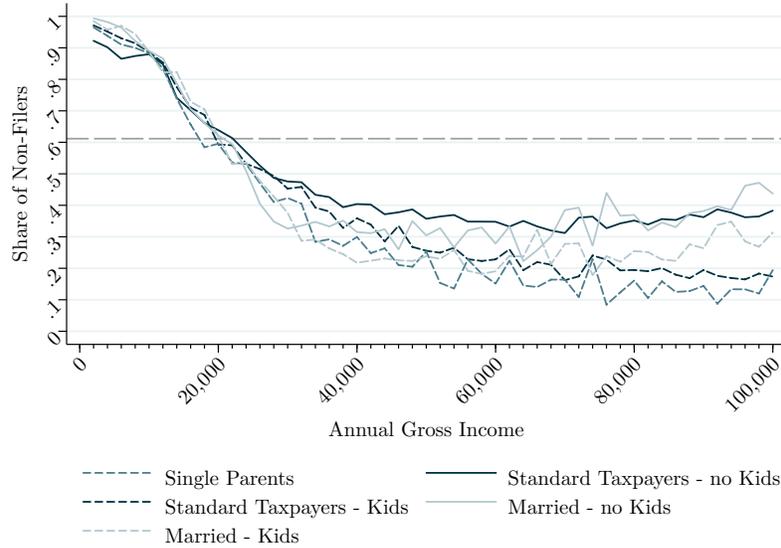
*Notes:* Individuals are grouped in 2,000-€-bins. Share of non-filers over income for five groups: (i) Standard single taxpayers, (ii) married taxpayers, (iii) single parents, (iv) single taxpayers with children but no single parents, (v) married taxpayers with children. Dashed grey line: Average share of non-filers (61.15%) across all groups and gross income levels.

lower for women (Bucher-Koenen et al. 2017). Given both these factors, one may expect a systematic difference in filing behavior across women and men, which is not supported by the data.

Figure A.8 illustrates non-filing shares over income split up along two additional dimensions: marital status and children. Generally, both single and married taxpayers with children are more likely to be tax filers. Single taxpayers without children have the highest non-filing share for close to all income levels. We suggest that a potential explanation for this difference can be found in different filing incentives: While opportunity costs are likely to be higher for single taxpayers with children, they still exhibit a larger share of filers, conditional on income. Similarly, both single and married parents have higher deduction potential (e.g. childcare expenditures) and might be more liquidity

constrained. Therefore, these taxpayers might view tax filing as an opportunity to obtain a refund.

**Filing Behavior**.

When voluntarily filing an income tax return, the majority of taxpayers itemize deductions and claim values beyond the standard values of 1,000 € and 36 € for work-related expenses and special expenses, respectively. We provide specific numbers on this in Table A.10. Conditional on itemizing, taxpayers claim on average 1,700 € for work related expenses and 400 € for special expenses beyond the standard values. Given the low standard values, this is not surprising. For example, simply itemizing commuting costs is already sufficient to exceed the standard deduction for a significant share of wage earners.[27]

While less than 5% of voluntary filers declare extraordinary burden, e.g. due to severe illnesses, about 21% are able to report expenses qualifying as tax credits. This number is however relatively low, given that household related services, e.g. for cleaning or facility management and home improvement costs for craftsmen are included in this category. Thus, both homeowners and renters are likely to benefit from this regulation.

How much does tax filing pay off for voluntary filers over the income distribution? We address this question by plotting the effective tax liability of voluntary filers over gross income in Figure A.9. As in Figure 3, the zero line corresponds to the statutory tax liability for a given level of gross income when correcting for potential over-withholding and accounting for standard deductions. While non-filers over-remit taxes at all income levels, the opposite is true for voluntary filers. They always reach at least the minimal filing situation (zero intercept) or further reduce their tax liabilities by itemizing deductions beyond the standard value.

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[27]Data from the Federal Institute for Research on Building, Urban Affairs and Spatial Development (`https://www.bbsr.bund.de/BBSR/DE/Home/Topthemen/2017-pendeln.html`; last accessed: 2020-02-13) shows an average commute of 16.8 km in 2015. Only itemizing the average commuting of about 15 km is sufficient to surpass the standard deduction in 2014.

Figure A.9: Effective Tax Payments of Optional Filers
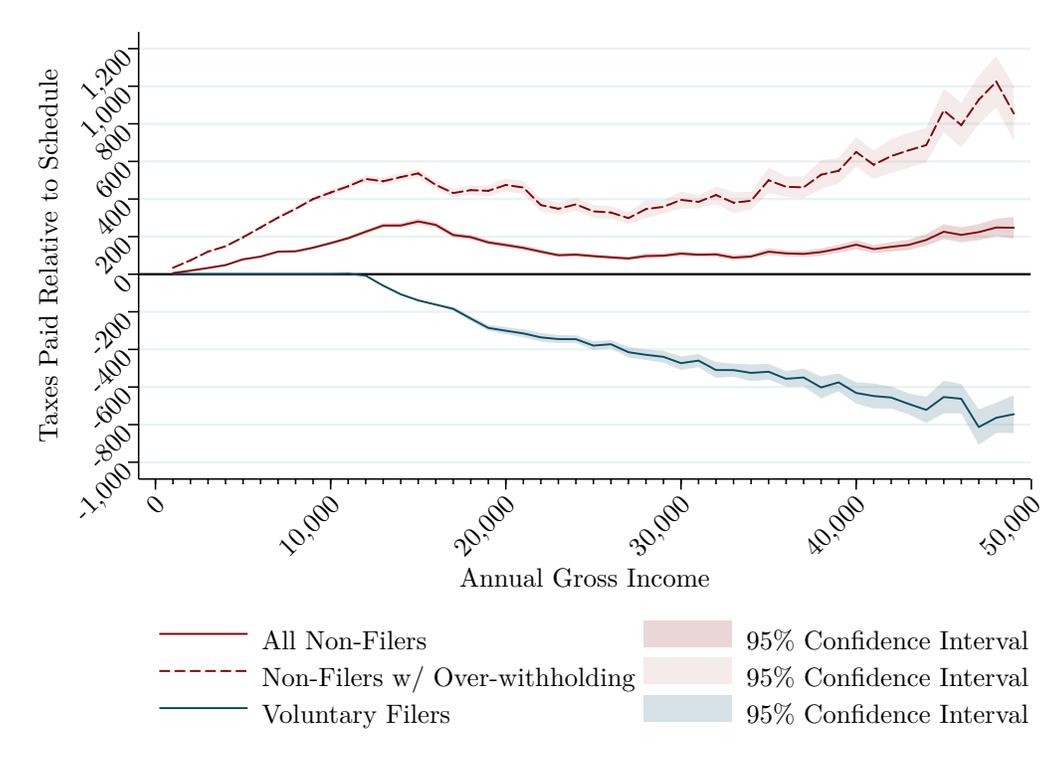
Naturally, voluntary filers with income below the basic allowance, i.e. around 10,000 € in gross income, pay no income tax. As there is no way to reduce the tax payments below zero here, voluntary filers remain on the zero line. Above the allowance threshold, tax refunds almost linearly increase with income. The maximum refund is reached for individuals with an annual gross wage income of 47,000 € and is as high as 813 € for this group. Put differently, in addition to correcting for over-remitted taxes through automatic withholding, voluntary filers in this income bin itemize deductions which lead to an additional average refund of 813 €.

There are two channels for why tax refunds increase with income. First,

higher income taxpayers face higher marginal tax rates. Reducing taxable income by the same amount of deductions consequently leads to higher tax refunds for higher income levels. Second, the amount of claimed deductions may be positively correlated with income. Higher income taxpayers may have more expenses or be more likely to claim expenses if there is a positive correlation between tax literacy and income.

Table A.10: Declared Deductions

| | | Work Related Expenses | Special Expenses | Extraordinary Burden | Tax Reductions |
|---|---|---|---|---|---|
| Declared Value | mean | 1,715.78 | 402.48 | 235.51 | 95.65 |
| | p25 | 536.00 | 127.00 | 36.00 | 22.00 |
| | p50 | 1,181.00 | 303.00 | 67.00 | 45.00 |
| | p75 | 2,328.00 | 489.00 | 306.00 | 85.00 |
| | p90 | 3,804.00 | 683.00 | 569.00 | 186.00 |
| Share of voluntary filers | | 58.48 | 64.43 | 4.70 | 21.05 |
| N | absolute | 99,207 | 105,185 | 9,996 | 21,027 |
| | weighted | 2,290,281 | 2,523,092 | 183,994 | 824,275 |

*Data:* RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Lohn- und Einkommensteuerstatistik, 2014, own calculations.
*Notes:* Declared deductions in €. *Share of Voluntary Filers*: who itemize deductions in the corresponding category. *Income Related Expenses*: Deductions claims that go beyond the basic deduction of 1,000 €. *Special Expenses*: Deductions claims that go beyond the basic deduction of 36 €. *Tax Reductions*: Reduce the tax liability while all other deductions reduce the taxable income.

## A.6 Tax Filing Forms

Figure A.10: Yearly Tax Information Provided by the Employer

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# Figure A.11: Documents for Minimal Filing

(a) Main Form - First Page

(b) Social Insurance Contributions

*Notes:* Relevant forms for minimal filing for 2014. Taken from `https://www.formulare-bfinv.de/printout/034040_14.pdf` (a) and `https://www.formulare-bfinv.de/printout/034098_14.pdf` (b; both last accessed: 2021-08-31), red cells added manually. In order to correct for over-withholding, taxpayers have to fill in the cells which are marked red. For the solid red lines, information is provided by the employer (Figure A.10), letters indicate correspondence to cells in Figure A.10. For the dashed line the information (tax number) is not provided by the employer but by the local financial authority after filing a tax return for the first time. If filing for the first time with the local tax authority, this is left blank. Additionally, taxpayers have to indicate personal details (name, address, bank account etc.) as well as the responsible tax authority (line 4 - 22 in the left panel).

# Online-Appendix
# Optional (Non-)Filing and Effective Taxation

## Tobias Hauck, Luisa Wallossek

# B   Online Appendix

## B.1   Main Results for 2010

Figure B.1: Prevalence of Non-Filing over Gross Income (2010)
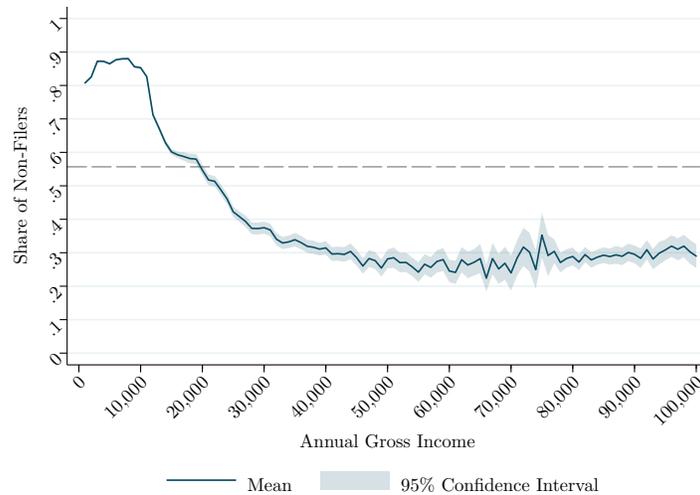
*Notes:* Individuals are grouped in 1,000-€-bins. Share of non-filers among optional filers over annual gross wage income. Dashed grey line: Average share of non-filers (55.69%) across all gross income levels. Statistics refer to taxable units which may be either an individual or married spouses in case of joint filing. For jointly filing spouses, we consider the average gross income.

Figure B.2: Tax Over-Remittance for Non-Filers (2010)
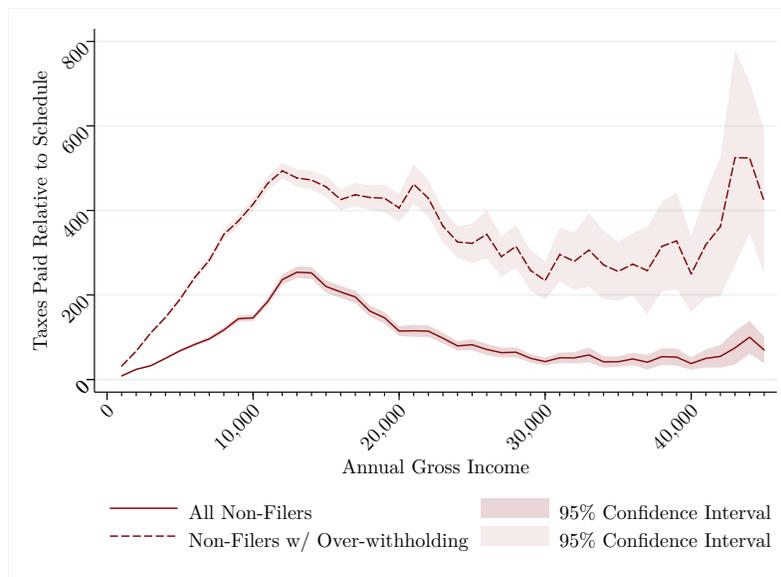
*Notes:* Individuals are grouped in 1,000-€-bins. Non-filers only. This graph shows over-remitted taxes for non-filers over annual gross income, relative to the statutory tax schedule, which is represented by the horizontal intercept at zero.

Figure B.3: Effective Tax Schedule for Non-Filers (2010)
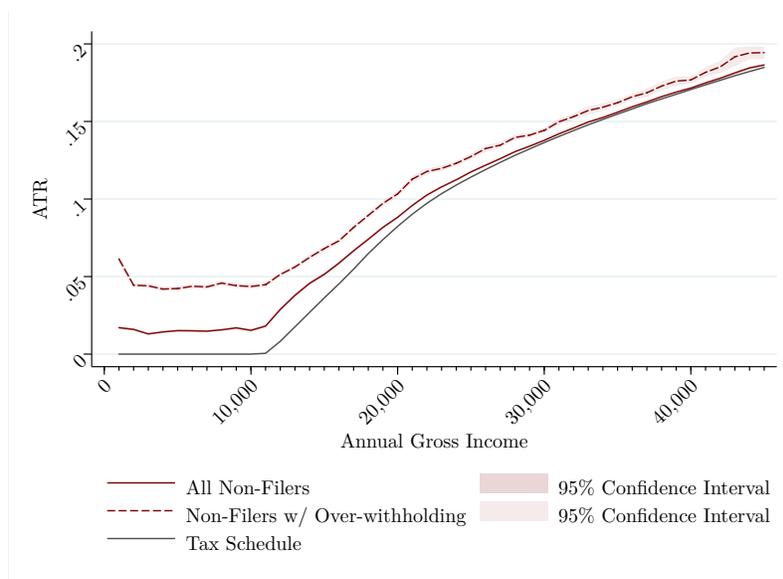
*Notes:* Individuals are grouped in 1,000-€-bins. ATR based on taxes remitted over the year through automatic withholding by the employer. *Tax Schedule*: Statutory ATR that corresponds to the respective gross income in the income tax schedule. This is equivalent to the lower bound for gains from filing/minimal filing.

## B.2 Personal Income Taxation in Germany

### B.2.1 Tax Liability and Marginal Tax Rates

The German personal income tax code ("*Einkommensteuergesetz*") sorts income received by taxpayers into one of seven different income categories:

1. Agricultural and Forestry Income

2. Business Income

3. Self-Employment Income

4. Wage Income

5. Capital Income

6. Rental Income

7. Other Income

While these income sources are mostly self-explanatory and self-containing, the "other income" category is a catch-all category for a variety of income. For example, when taxpayers buy a house and sell it with a margin after less than ten years, the margin is taxable in the other income category. Furthermore, the German personal income tax code also includes a very limited list of income streams, depending on their origin, to be excluded from personal income taxation (§3 EStG, *Steuerfreie Einnahmen*).

For each of these income categories, the taxable income is computed by taking the difference of revenues minus costs. Furthermore, there are some general deductible expenses, see subsubsection B.2.3 that are considered before obtaining the final taxable income.

Germany has a progressive income tax system with (partly) linearly increasing tax rates (§32a EStG, *Steuertarif*). The tax liability $T$ is a function of taxable income $y$. Assume also that $x = \frac{y - 8,354}{10,000}$, i.e. the full Euro amount of taxable income exceeding the basic allowance of 8,354 € divided by 10,000.

Furthermore, let $z = \frac{y-13,469}{10,000}$ be the amount of taxable income that exceeds 13,469 € divided by 10,000. Then, the tax formula $T(y)$, i.e. tax payments, as a function of taxable income $y$ for 2014 can be characterized as follows:

$$T(y) = \begin{cases} 0 & \text{if } y <= 8,354 \\ \frac{974.58 \times x + 1,400}{10,000} \times x & \text{if } 8,354 < y <= 13,469 \\ \frac{228.74 \times z + 2,397}{10,000} \times z + 971 & \text{if } 13,469 < y <= 52,881 \\ 0.42 \times y - 8,239 & \text{if } 52,881 < y <= 250,730 \\ 0.45 \times y - 15,761 & \text{if } y > 250,730 \end{cases} \quad (3)$$

The corresponding marginal tax rates, defined as $T'(y)$, are given in Equation 4. The German income tax code hence features five main parts. First, a tax-free basic allowance of 8,354 € in taxable income. This is followed by the second bracket in which marginal tax rates start at 14 % for taxable income in excess of 8,354 € and rise to about 24% at 13,469 €. After that, for taxable income in the range between 13,470 € and 52,881 €, marginal tax rates increase linearly up until a marginal tax rate of 42%. Afterwards, there are two brackets with flat marginal tax rates of 42% and 45%, respectively.

As seen in Equation 3, the tax liabilities in each bracket are a composite of the maximum tax liability of the bracket before and the additional tax liability for taxable income exceeding the threshold for the respective bracket. In the third bracket for instance, taxpayers pay 971 € $= T(13,469)$ plus taxes which accrue in this bracket for taxable income exceeding 13,469 €.

$$T'(y) = \begin{cases} 0 & \text{if } y <= 8,354 \\ 2 \times 974.58 \frac{y-8,354}{10,000^2} + 0.14 & \text{if } 8,354 < y <= 13,469 \\ 2 \times 228.74 \frac{y-13,469}{10,000^2} + 0.2397 & \text{if } 13,469 < y <= 52,881 \\ 0.42 & \text{if } 52,881 < y <= 250,730 \\ 0.45 & \text{if } y > 250,730 \end{cases} \quad (4)$$

When couples decide to file jointly, their tax liability is defined as twice the

tax liability that corresponds to their mean taxable income following Equation 3. Especially for couples for whom the ratio of intra-household taxable income is far from 1:1, this creates a joint filing incentive. For more details on this particular feature of the German tax system, see Buettner et al. (2019).

### B.2.2 Tax Filing Duty

Generally, all taxpayers in Germany are required to file an income tax return. However, §49 of the German personal income tax code ("*Veranlagung bei Bezug von Einkünften aus nichtselbständiger Arbeit*") relieves taxpayers solely earning wage income from their duty to file, while conclusively listing circumstances under which this exemption is void.

Broadly speaking, taxpayers are required to file an income tax return as soon as their is a chance that they paid less taxes than intended by the tax schedule ($T_i^{eff} < T^{schedule}(y_i)$). For our purposes there are two broad circumstances in which wage earners are required to file an income tax return despite earning wage income only. First, taxpayers can register with their respective tax office to receive a "adjusted standard deduction". In these cases, taxpayers with deductible expenses significantly exceeding the standard deduction can request their tax office to grant these adjusted standard deductions throughout the year. The idea being here that taxpayers benefit every month from a higher standard deduction and do not have to wait for the tax refund in the following year. Usually, taxpayers with long commutes qualify and apply for this feature. While this ensures more liquidity throughout the year, these taxpayers are then required to file an income tax return to ensure correct taxation.

Similarly, as discussed in section 2, married couples who opt-out of the basic withholding scheme have to file an income tax return. Broadly speaking, these couples readjust their basic allowance between the two of them ("*Lohnsteuerklasse IV mit Faktor*" or "*Lohnsteuerklasse III/V*"). To ensure that taxation works correctly, these couples have to file an income tax return.

Second, wage earners with social security payments to replace income, e.g. unemployment or parental leave benefits, which exceed 410 € in total, are

required to file an income tax return. While these income replacements themselves are not subject to income taxation, they increase the applicable average tax rate "*Progressionsvorbehalt*". Therefore, taxpayers receiving these benefits are required to file an income tax return.

### B.2.3    Deductions and Tax Credits

The taxable income is computed by aggregating the income net of expenses over all seven income categories mentioned in subsubsection B.2.1. The number and extent to which costs are deductible for each income category is defined in multiple sections of the German income tax code (§13 - §24 EStG). Conceptually, this sum of all income net of expenses streams computed thereafter is closely related to a form of "*adjusted gross income*".[28]

From this adjusted gross income, taxpayers can further deduct specific *allowances*, *special expenses*, and *extraordinary burdens*. The resulting taxable income is then used to compute the taxpayer's tax liability. However, taxpayers can further reduce their tax liability by itemizing certain expenditures, e.g. household related services.

For the purpose of our paper, three deductible expenses are important: First, work related costs. By law (§9a "*Pauschbeträge für Werbungskosten*"), wage earners are entitled to a standard deduction of 1,000 € in 2014. However, wage earners are of course free to itemize deductions in order to exceed this value. Deductible costs include for example expenses for commuting to work, training expenses not covered by the employer, or job-related moving costs.

Second, social security contributions are (partly) tax deductible. In 2014, 78% of employee-paid contributions to the governmental retirement system are tax deductible. Furthermore, contributions to the nursing care insurance insurance and the health insurance systems are deductible up to 1,900 € for singles and 3,000 € for a single earning spouse.

Third, a limited number of other special expenses are also tax deductible. This includes alimony payments for divorced spouses, church tax payments,

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[28]See Schächtele (2019) for a more comprehensive introduction to the tax base and applicable deductions in Germany.

school fees for children, or donations (excluding those to political parties). By law, all taxpayers are entitled to a standard special expense deduction of 36 €. While taxpayers are likely to exceed these thresholds (see Table A.10), they are only taken into account when filing and reporting them.

Lastly, taxpayers can reduce their tax liability by reporting expenses that qualify for a tax credit (§34 - §35 EStG). The conclusive list in these sections includes, for example, donations to political parties and household related services.

### B.2.4 (Minimal) Tax Filing in Germany

Taxpayers who have to file an income tax return have up to five months to do so. Thus, the tax return for compulsory filers in 2014 is due on May 31, 2015. Whenever taxpayers make use of a tax adviser, this deadline is extended until February the following year, i.e. February 29, 2016. Taxpayers who are not required to file an income tax return have up to four years to (voluntarily) file.

While submission methods have been discussed in section 2, there are broadly two kinds of tax returns for voluntary filers:

First, taxpayers can use the general forms provided either online or printed out in (some) municipal governmental buildings. There exists a cover form ("*Mantelbogen*") in which standard socio-economic data and identification numbers are required and special expenses can be entered. Then, taxpayers need to use a form for each type of income they receive. Furthermore, deductible social security contributions require a separate form, too.

Second, there is a simplified version for wage earners to file taxes. We refer to this form as the *minimal filing* scenario. This so-called "*vereinfachte Einkommensteuererklärung*" is a two-page form which covers the majority of work-related deductions and special expenses. In this form, taxpayers simply copy six numbers from their employee-provided wage tax certificate, as seen in Figure A.10, and paste them into the simplified from in Figure A.11a. In this scenario, taxpayers also have to fill out the form for social security contributions, leading to a total of three pages to fill out.

## B.3 Upper Bound Counterfactual

We have shown that limited filing requirements and the corresponding non-filing behavior lead to substantial tax over-remittances and attenuate tax progressivity. The results presented in section 4 are lower bound estimates. So far, we only corrected for over-withholding and abstracted from additional deduction possibilities. Obviously, calculating the exact refund potential is not possible, as it depends on individual characteristics and deduction possibilities, which are not part of the administrative data set. While we cannot determine the precise sum that non-filers forgo because they claim no deductions, we can provide a range for forgone refunds including potential deductions. The range is bounded by the lower bound presented in subsection 4.2 as well as by an upper bound that builds on the realized refunds of voluntary filers.

For the upper bound scenario, we assign to each non-filer the average refund of voluntary filers in the same gross wage income bin. This can be considered an upper bound because it would only describe the actual amount of forgone refunds through non-filing under arguably unlikely assumptions. First, one would have to assume that the size of deductions is determined by gross income only. While it is certainly likely that deductions increase in gross wage income, they are probably also driven by other, unobservable, circumstances as well. Second, this approach also entails the assumption that there is no self-selection into filing based on deduction potential or the ability of filing within an income bin. This is quite unlikely if we assume that taxpayers have some, though maybe imprecise, information about both their deduction potential and their individual filing costs. In this case, taxpayers with higher deduction potentials (or lower filing costs), on average, expect higher net returns and are hence more likely to file an income tax return.

However, if these assumptions were fulfilled, the upper bound would represent the real average refund potential for non-filers within a given income bin. If not, then the real refund potential is lower.[29] It is important to note that the upper bound consists of two parts: First, it accounts for any over-remitted

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[29]This approach does not represent an upper bound only in the (fairly unlikely) case that taxpayers who select into filing are characterized by a below-average refund potential.

tax through automatic withholding which would be refunded by minimal filing (this is the lower bound). Second, it includes potential deductions for which filing costs are likely to be significantly higher. Since filing costs are not observable, we make no claims on whether it would be optimal for non-filers to actually invest these costs.

Table B.1: Taxes Over-remitted through Non-Filing - Upper Bound Estimates (2014)

|  |  | (A) All Non-Filers | | (B) With Over-Remittance | |
| --- | --- | --- | --- | --- | --- |
|  |  | All | y < threshold | All | y < threshold |
| Over-Remittance | total | 2,487,869,769 | 317,948,477 | 1,387,748,772 | 317,774,299 |
|  | mean | 307.14 | 79.41 | 525.01 | 247.40 |
|  | p25 | 0.00 | 0.00 | 124.00 | 45.00 |
|  | p50 | 188.00 | 0.00 | 385.69 | 137.00 |
|  | p75 | 489.57 | 38.00 | 722.26 | 348.00 |
| N | absolute | 208,251 | 103,761 | 68,138 | 33,350 |
|  | weighted | 8,100,080 | 4,004,070 | 2,643,277 | 1,284,469 |

*Data:* RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Lohn- und Einkommensteuerstatistik, 2014, own calculations.
*Notes:* The upper bound is calculated for 1,000-€-bins. Overpayment is defined as the difference between the the automatically withheld income taxes and the income tax that applies in the upper bound scenario. Overpayments are listed in €. (*A*): All non-filers in the sample. (*B*): Only those non-filers with overpayments, defined as a deviation of more than 5 € from the statutory tax schedule. *y < threshold*: Individuals with an annual gross wage income below the basic tax allowance threshold.

Analogously to Table 1, we show the upper bound counterfactual for over-remitted taxes through non-filing behavior in Table B.1. Non-filers would have gotten 2.5 billion €, or about 2.6 times the lower bound estimate, if they had filed an income tax return and had the same refund realization as voluntary filers in the respective income bins. For individuals below the basic allowance threshold (Column 2 and 4), upper and lower bound coincide, because remitted taxes are entirely refunded in the lower bound scenario already.

Figure B.4 depicts the lower and upper bound filing counterfactual for non-filers over gross income. The shaded area between both estimates is the additional range for forgone tax refunds through non-filing. While the overall

Figure B.4: Forgone Tax Refunds Range for Non-Filers
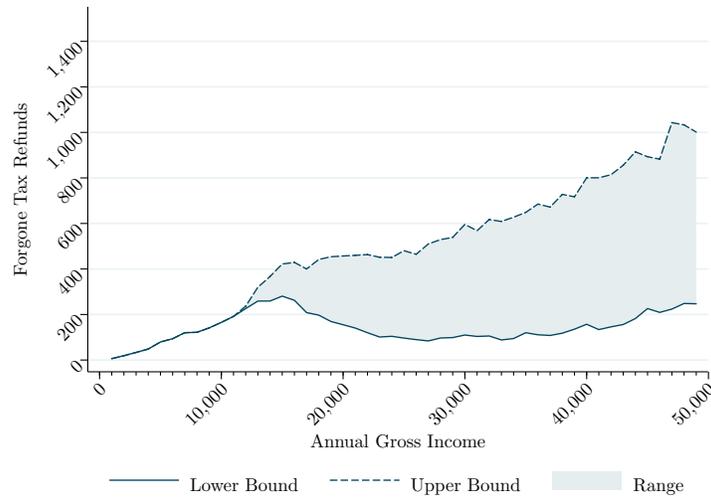
total tax refund in the upper bound counterfactual is 2.6 times as high as for the lower bound, this ratio varies over the income distribution. More precisely, the range widens with income which is driven by two factors. First, for incomes below the basic allowance threshold, there is no uncertainty about their forgone refunds, since all remitted taxes will be refunded in the lower bound scenario already. Second, the upper bound is increasing over income as we observe higher deductions for voluntary filers with higher incomes (see Figure A.9).

## B.4    Budget Neutral Reform

While automatic refunds realign statutory and effective taxation, they come at the cost of reducing the tax revenue and thus the governmental budget. The total 949 million € of tax over-remittances in 2014 account for 0.6% of the wage tax revenue (168 billion €) and 0.15% of the overall tax revenue in

Germany (644 billion €).[30] Automatically refunding over-remitted taxes could thus conflict with other policies that are financed through tax revenue. Such conflicts can be avoided when implementing a budget neutral policy reform that raises the tax revenue by the amount of over-remitted taxes that are refunded.

Effectively, tax authorities can increase marginal tax rates in various brackets of the tax code to balance out refunds for over-remittances of non-filers. Out of many possible ways to reform the German income tax schedule, we provide two simple back-of-the-envelope calculations for the corresponding tax rate changes for high income earners. First, we calculate by how much the marginal tax rate in the top bracket ($\tau_1$) would have to increase in order to generate an increase in the tax revenue of $dR = 949$ million €. We refer to this as *Reform A*. Second, we calculate by how much marginal tax rates in the top two brackets ($\tau_1$ and $\tau_2$) would have to be shifted up for the same $dR$ (*Reform B*). For both reforms, we take a simplified approach, abstracting from income effects and approximating behavioral responses.

Since the data set used for our main analysis in section 4 does only include optional filers below a certain income level (see subsection A.3 for details), we rely on a larger sample for this analysis, including compulsory filers as well as taxpayers of all income ranges. Calculations for *Reform A* are shown below, for *Reform B* see subsubsection B.4.2.

### B.4.1 Policy Implications - Reform A

Following the standard approach for the effect of changes in (top) marginal tax rates (Saez 2001), we decompose the change in revenue ($dR$) into a mechanical ($dM$) and a behavioral effect ($dB$), assuming that

$$dR = dM + dB. \tag{5}$$

The mechanical effect $dM$ describes the change in revenue that would occur

---

[30]Data from the Federal Statistical Office (`https://www-genesis.destatis.de/genesis/online?sequenz=tabellen&language=en&selectionname=71211-0001`; last accessed: 2020-11-26).

if taxpayers did not react to a change in their marginal tax rate. It is defined as

$$dM = N \cdot (y^m - \bar{y}) \cdot d\tau, \tag{6}$$

where $N$ denotes the number of taxpayers in the top bracket and $y^m$ denotes their average taxable income. All taxable income above the threshold of $\bar{y}$ is taxed at the marginal tax rate of $\tau$ and thus affected by the change $d\tau$.

However, taxpayers are expected to adapt their taxable income in response to a change in the marginal rate. The resulting behavioral effect $dB$ on the tax revenue is defined as

$$dB = N \cdot dy^m \cdot \tau. \tag{7}$$

In response to $d\tau$, the average taxpayer in the top tax bracket adjusts her taxable income by $dy^m = \partial y^m / \partial \tau$. As a result, the tax revenue will decrease by $\tau$ times the overall change in taxable income. Since we want to calculate the required change in top tax rates for different elasticities of taxable income, we rewrite $dy^m$ as a function of the elasticity. Following the standard literature, we define elaticity of taxable income with respect to the net-of-tax rate as $\varepsilon_{y^m, 1-\tau} = [(1-\tau)/y^m] \cdot [\partial y^m / \partial (1-\tau)]$. This abstracts from income effects and is also referred to as uncompensated elasticity (Saez 2001). With the definition of $dy^m$ and $\varepsilon_{y^m, 1-\tau}$, we can rewrite Equation 7:

$$
\begin{aligned}
dB &= N \cdot dy^m \cdot \tau \\
\Leftrightarrow \quad dB &= N \cdot \frac{\partial y^m}{\partial \tau} \cdot d\tau \cdot \tau \\
\Leftrightarrow \quad dB &= -N \cdot \varepsilon_{y^m, 1-\tau} \cdot y^m - \frac{\tau}{1-\tau} \cdot d\tau.
\end{aligned} \tag{8}
$$

Summing up the effects from Equation 6 and Equation 8 and rearranging

it leads to

$$dR = \underbrace{N \cdot (y^m - \bar{y}) \cdot d\tau}_{dM} - \underbrace{N \cdot \varepsilon_{y,1-\tau} \cdot y^m \cdot \frac{\tau}{1-\tau} \cdot d\tau}_{dB}$$

$$\Leftrightarrow \quad dR = d\tau \cdot N \cdot (y^m - \bar{y}) \cdot \left(1 - \varepsilon_{y,1-\tau} \cdot \frac{y^m}{y^m - \bar{y}} \cdot \frac{\tau}{1-\tau}\right) \tag{9}$$

$$\Leftrightarrow \quad d\tau = dR \cdot \left[N \cdot (y^m - \bar{y}) \cdot \left(1 - \varepsilon_{y,1-\tau} \cdot \frac{y^m}{y^m - \bar{y}} \cdot \frac{\tau}{1-\tau}\right)\right]^{-1}.$$

Table B.2: Parameters for Reform A and B

| Parameter | Reform A | Reform B |
|---|---|---|
| $\tau_1$ | 0.45 | 0.45 |
| $\tau_2$ | - | 0.42 |
| $\bar{y}_{b_1}$ | 250,730 € | 250,730 € |
| $\bar{y}_{b_2}$ | - | 52,881 € |
| $N_{\tau_1}$ | 76,388 | 76,388 |
| $N_{\tau_2}$ | - | 2,100,109 |
| $y^m_{\tau_1}$ | 667,869 € | 667,869 € |
| $y^m_{\tau_2}$ | - | 82,654 € |
| $y^m_{\tau_1} - \bar{y}_{b_1}$ | 417,139 € | 417,139 € |
| $y^m_{\tau_2} - \bar{y}_{b_2}$ | - | 29,773 € |
| $\bar{y}_{b_1} - \bar{y}_{b_2}$ | - | 197,849 € |
| $dR$ | 949,512,506 € | 949,512,506 € |
| $d\bar{R}$ | 12,430 € | 436 € |

*Data:* RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Lohn-
und Einkommensteuerstatistik, 2014, own calculations.
*Notes:* *Reform A*: change MTR in top bracket by $d\tau$. *Reform B*: change MTR in top two brackets
by $d\tau$ each. The sample includes taxpayers of all income ranges and is not restricted to optional
filers. For jointly filing spouses, we consider their average income and tax liabilities. $\bar{y}_{b_1}$ and $\bar{y}_{b_2}$
refer to individual taxpayers, the thresholds are exactly twice as high for jointly filing spouses.

Based on Equation 9 we can then derive the required $d\tau$ depending on
assumptions about $\varepsilon_{y^m,1-\tau}$ by plugging in the values for the other parameters,
as shown in panel A of Table B.2. Income in the top tax bracket is taxed at
$\tau = 0.45$. In 2014, this applies to individuals with an annual taxable income $y$
above $\bar{y} = 250{,}730$ €. Figure A.1 shows the tax schedule in 2014 in detail. From

the data, we get the number of taxpayers in the top bracket $N = 76,388$ and their average taxable income $y^m = 667,869\text{€}$. On average, the taxable income that is taxed at the top tax rate $(y^m - \bar{y})$ is $417,139\text{€}$. For a given $\varepsilon_{y^m,1-\tau}$, we can thus calculate the $d\tau$ that is required to increase the tax revenue by $dR$ $= 949$ million€, which is the amount of over-remitted taxes as calculated in subsection 4.2.

Table B.3 shows the required change in the marginal tax rate $d\tau$ based on different values for $\varepsilon_{y,1-\tau}$. The first two columns show the results for *Reform A*. Absent any behavioral responses, for $\varepsilon_{y,1-\tau} = 0$, the top MTR $\tau$ would have to increase by 2.98 percentage points up to 47.98% in order to generate $dR = 949$ million€. For $\varepsilon_{y,1-\tau} = 0.2$ (0.3), even higher increases of 4.04 (4.91) percentage points are required. The relatively large values of $d\tau$ can be explained by the rather small number of individuals that face the top MTR in this sample.

### B.4.2 Policy Implications - Reform B

The proposal for *Reform B* analyzes by how much the tax rates in the top two tax brackets would have to increase in order to raise an additional tax revenue of 949 million€. We refer to the top tax rate as $\tau_1$ and to the second top tax rate as $\tau_2$. The increase in tax rates is denoted as $d\tau$, both $\tau_1$ and $\tau_2$ are increased at the same absolute $d\tau$. The calculations are equivalent to those for *Reform A*, and the values for the relevant parameters are given in the second column of Table B.2.

Since we adjust the tax rates in two brackets, we have to consider different mechanical and behavioral effects. We label parameters that refer to effects due to changes in the top (second top) bracket with the subscript $b_1$ ($b_2$). To assign the parameter to taxpayers whose MTR is the top (second top) tax rate, we add the subscript $\tau_1$ ($\tau_2$). for example, $dM_{b_2,\tau_1}$ is the mechanical effect that accrues in the second top bracket for taxpayers whose MTR is $\tau_1$.

Following the standard approach described in subsubsection B.4.1, we can

decompose the change in revenue $dR$ into:

$$
\begin{aligned}
dR =\ & dM + dB \\
=\ & dM_{b_2,\tau_2} + dM_{b_2,\tau_1} + dM_{b_1,\tau_1} + dB_{b_2,\tau_2} + dM_{b_1,\tau_1} \\
=\ & \underbrace{d\tau \cdot \left(y_{\tau_2}^m - \bar{y}_{b_2}\right) \cdot N_{\tau_2}}_{dM_{b_2,\tau_2}} + \underbrace{d\tau \cdot \left(\bar{y}_{b_1} - \bar{y}_{b_2}\right) \cdot N_{\tau_1}}_{dM_{b_2,\tau_1}} + \underbrace{d\tau \cdot \left(y_{\tau_1}^m - \bar{y}_{b_1}\right) \cdot N_{\tau_1}}_{dM_{b_1,\tau_1}} \\
& - \underbrace{\varepsilon_{y_{\tau_2},1-\tau} \cdot y_{\tau_2}^m \cdot N_{\tau_2} \cdot \frac{\tau_2}{1-\tau_2} \cdot d\tau}_{dB_{b_2,\tau_2}\cdot N_{\tau_2}} - \underbrace{\varepsilon_{y_{\tau_1},1-\tau} \cdot y_{\tau_1}^m \cdot N_{\tau_1} \cdot \frac{\tau_1}{1-\tau_1} \cdot d\tau}_{dB_{b_1,\tau_1}\cdot N_{\tau_1}}.
\end{aligned} \tag{10}
$$

Rearranging Equation 10 leads to:

$$
\begin{aligned}
d\tau = dR \cdot \Big[ & \left(y_{\tau_2}^m - \bar{y}_{b_2}\right) \cdot N_{\tau_2} + \left(\bar{y}_{b_1} - \bar{y}_{b_2}\right) \cdot N_{\tau_1} + \left(y_{\tau_1}^m - \bar{y}_{b_1}\right) \cdot N_{\tau_1} \\
& - \varepsilon_{y_{\tau_2},1-\tau} \cdot y_{\tau_2}^m \cdot N_{\tau_2} \cdot \frac{\tau_2}{1-\tau_2} - \varepsilon_{y_{\tau_1},1-\tau} \cdot y_{\tau_1}^m \cdot N_{\tau_1} \cdot \frac{\tau_1}{1-\tau_1} \Big]^{-1}.
\end{aligned} \tag{11}
$$

Table B.3: Required Changes in Top Marginal Tax Rate for Reform A and B

| | Reform A: Top Bracket | | Reform B: Top 2 Brackets | | |
|---|---|---|---|---|---|
| $\varepsilon_{y,1-\tau}$ | $d\tau$ | $\tau_1^{new}$ | $d\tau$ | $\tau_1^{new}$ | $\tau_2^{new}$ |
| 0 | 0.0298 | 0.4798 | 0.0087 | 0.4587 | 0.4287 |
| 0.2 | 0.0404 | 0.4904 | 0.0100 | 0.4600 | 0.4300 |
| 0.3 | 0.0491 | 0.4991 | 0.0108 | 0.4608 | 0.4308 |

*Data:* RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Lohn-
und Einkommensteuerstatistik, 2014, own calculations.
*Notes:* *Reform A*: change MTR in top bracket by $d\tau$. *Reform B*: change MTR in top two
brackets by $d\tau$ each. $\varepsilon_{y,1-\tau}$: Elasticity of taxable income. $d\tau$: Absolute change in marginal tax
rate required to raise 603 million €. $\tau_1^{new}$ ($\tau_2^{new}$): New MTR in the top tax bracket (second top
bracket) after increase of $d\tau$.

Plugging in the values from Table B.2 then leads to the results shown in
the last three columns show the results for *Reform B*. When increasing tax
rates in the top two brackets, the required change $d\tau$ is considerably smaller,

around 1 percentage point. Intuitively, this is driven by two factors. First, the number of affected taxpayers is much higher (see Table B.2), making the required per capita increase in tax revenue lower. Second, taxpayers with income in the top bracket do not only face changes in their MTR $\tau_1$, but also for the share of their income that is taxed at the second highest tax rate of $\tau_2$. When abstracting from income effects, this does not cause any additional behavioral effect. The intuition is outlined in more detail in section 5.