

Fauser, Hannes

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On income tax avoidance – the case of Germany revisited

Hannes Fauser*

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– work in progress - please do not cite without author’s permission –

Abstract

I study tax avoidance along the income distribution based on micro data from the Income and Consumption Survey (EVS) for the year 2013. The richness of the survey concerning income, taxes and expenditures is exploited by modelling the German tax code in terms of the items available in the EVS. I.e., components of taxable income and deductions are estimated as precisely as possible in a microsimulation model. Results confirm findings in the literature claiming that tax avoidance increases with rising income. The estimated amount of avoided tax is largest for the richest decile of individual tax payers, at around 3.1% of taxable income before deductions or 17.2% of taxes paid. Expectedly at the household level, the amount avoided by the highest income decile is reduced somewhat, to 2.1% of taxable income before deductions or 11.2% of taxes paid. Aggregate losses at the national amount to at least EUR 12.4 bn, or 5.0% of assessed income tax revenues.

Keywords: tax compliance, tax avoidance, income taxation, microsimulation, distributional effects

JEL-Codes: D12, D31, D63, H26

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1 Introduction

As inequality has risen in many countries worldwide¹, and as governments have faced the need to raise revenues during and after the Financial Crisis of 2008/2009, tax evasion and avoidance have become topics of rising interest for researchers and policymakers alike. Recently, particularly empirical studies by [Kleven et al. \(2011\)](#), [Zucman \(2013\)](#), [Johannesen & Zucman \(2014\)](#), [Hanlon et al. \(2015\)](#) or [Alstadsaeter et al. \(2018a\)](#), to mention just a few, have contributed to increased academic notice of these phenomena. On the policy side, the negotiation and ongoing implementation of the international Common Reporting Standards for automatic exchange of tax information is regarded as a milestone in the combat against illegal tax shelters.

Studying tax avoidance and evasion is fraught with difficulties. The quantity of interest is hidden by definition and agents go to great lengths to conceal it. In order to make progress, indirect estimation techniques have been applied widely in the literature. These include approaches that compare survey with tax data using national accounts, as implemented for instance by [Matsaganis et al. \(2010\)](#), [Leventi et al. \(2013\)](#) or [Torregrosa \(2015\)](#). Another way of indirectly estimating tax avoidance and evasion was established by [Pissarides & Weber \(1989\)](#), who exploit differences between dependently-employed and self-employed tax payers reporting similar consumption expenses but different taxable incomes. This was further refined by [Lyssiotou et al. \(2004\)](#), who estimate a demand-system approach that reduces biases arising from differential consumption patterns of self-employed, and applied to US tax data by [Feldman & Slemrod \(2007\)](#) who make use of deductions for charities. In contrast, a contribution in the German context relies on a Tobit regression to estimate the amount and distribution of tax savings along the income distribution ([Lang et al. 1997](#)). Using micro data from the Income and Consumption Survey (EVS) of 1983, they estimate that the effective marginal tax rate for the highest income groups was 16 percentage points lower than legislated. Aggregate income tax losses amounted to 34% of taxes paid.

In contrast to these indirect approaches, the first best option to directly study tax evasion on the micro level are randomised tax audit programmes, at least for the bulk of the income distribution. At the top, it has proven beneficial to rely on leaks of data from offshore banks and other service providers. Examples are the 2013 Offshore leaks, the 2015 Swiss leaks, the 2016 Panama Papers or the 2017 Paradise Papers. Furthermore, valuable insights can be derived from cases of tax

¹See [wid.world](#) for an overview.

fraudsters caught by fiscal authorities or evaders who self-reported their abuse to decrease penalties imposed. The first major study that is able to exploit all types of sources mentioned above, including information on top income earners and wealth owners, is [Alstadsaeter et al. \(2018a\)](#), who link these incidents with administrative data for three Scandinavian countries. So far, yet highly desirable, implementing such an approach for Germany is not possible due to data availability.

Instead, inspired by the paper of [Lang et al. \(1997\)](#), I use the most recent wave of EVS data from 2013 to estimate tax avoidance along the income distribution. Beyond their Tobit estimation approach which is replicated in the appendix with the 2013 data, I have programmed a microsimulation model that seeks to exploit the survey information to the greatest degree feasible. To my knowledge, this estimation method for tax avoidance is new to the literature, made possible due to the rich combination of variables within the EVS. The main contribution consists of empirically modelling provisions of the tax code for 2013 as precisely as possible, given constraints of the data available. I provide the first tax model microsimulation tailored to the EVS, and hitherto the most-detailed empirical model of the German income tax code in the literature². Hence, I am able to estimate the tax due of individual tax payers within a reasonable degree of certainty, and compare it with the tax actually paid. For this purpose, the quarterly values provided in the survey are adjusted to yearly level, taking into account the frequency of items to mitigate seasonal biases.

My results confirm findings in the literature claiming that tax avoidance and evasion increase with rising income. My preferred estimate places a lower bound on the amount of tax avoided at 3.1% of taxable income before deductions for the richest decile, which equates to 17.2% of their taxes paid. Unfortunately, due to top-censoring of the data, households with a monthly net income above EUR 18,000 are excluded from the analysis. Nevertheless, my analysis is in line with results of [Alstadsaeter et al. \(2018a\)](#) which show that wealthy individuals are much more likely to use illegitimate tax planning methods.

Germany is an interesting case study for tax avoidance for several reasons: It is the largest Euro area economy, its tax code allows for substantial deductions that

²The main reference is the German section of the EUROMOD tax-benefit model ([Gallego-Granados & Harnisch 2017](#)), which however is calibrated for the use with the Socio-Economic Panel SOEP. Therefore, it does not include reported tax payments and is less detailed concerning expenditures. It comes with the advantage of intertemporal variation within a panel dataset, and the ability to study reactions to policy measures, though. The same holds for the Tax-Benefit Microsimulation Model STSM ([Steiner et al. 2012](#)).

aim to ensure individual fairness but leave room for semi-legal practices, and it has a long history of tax evasion and avoidance. To my knowledge, for Germany no recent empirical estimates, which are based on verifiable quantitative evidence, of the amount and distribution of legal and illegal income tax savings are available in the literature. The figures of Zucman (2013, 2015) and Alstadsaeter et al. (2018b, 2018a) pertain to offshore wealth and include estimates of its share for Germany. However, they exclusively capture offshore evasion and no other, less obviously illegal, tax shelters. On the other hand, estimating avoidance using the EVS comes with the grain of salt that the data are top-censored, and that the statements made by individuals in the survey may be biased downwards because people underreport their true income and wealth. Even though one may argue that the underreporting is smaller than for tax data, it is reasonable to expect some degree of it (Moore et al. 2000, Korinek et al. 2006). Hence, much of the (especially offshore) tax evasion probably goes unnoticed by my approach, as it presumably takes place outside of the confines of a household survey conducted by the Federal Statistical Office. As a consequence, my estimates provide for a lower bound of income tax avoidance in Germany in 2013.

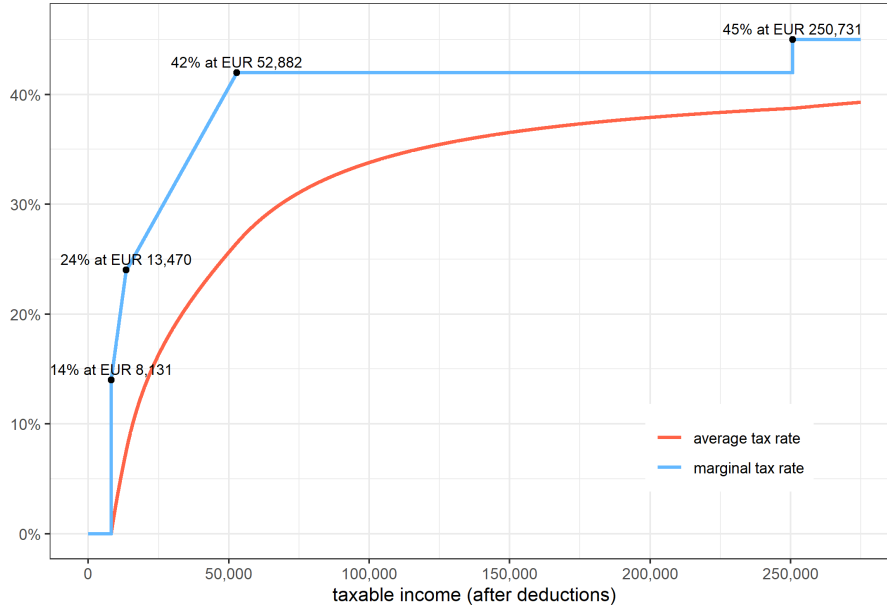
The remainder of this paper is organised as follows: Section two gives an overview about the institutional setting of the German income tax. Section three introduces the dataset, while the methodology of my estimation of the compliance gap is presented in section four. Results are given and their robustness is discussed thereafter, followed by the concluding sixth section.

2 The German income tax

While its roots date back to Prussian and other German States' tax systems, the modern centralised income tax system was introduced during the Weimar Republic in 1920. Compared to pre-WWI levels, the tax rates were increased sharply to cover the costs of war and its aftermath. Throughout the interbellum, and continuing after 1945, the federal income tax remained the backbone of German government finances, even though a decline of its importance can be observed since the 1980s (Corneo 2005). In 2013, 38.9% of tax revenues were generated by the income tax (including flat rate withholding tax on capital income and solidarity surcharge), followed by 31.7% of tax revenues from VAT (Destatis 2014, p. 268).

The formula of the tax, its base and rates are specified in the tax law ("Einkom-

Figure 1: Statutory German income tax schedule 2013, base rate (single filing)



mensteuergesetz”), which is updated continuously. The current system of family taxation with income splitting was introduced in 1958, the last change relevant for my analysis went into effect in 2013: The number of types of tax assessment (“Veranlagungsarten”) was reduced from seven to four. Tax payers are assessed each year, based on their nominal taxable income less deductions. In 2013, tax payers enjoyed a basic allowance of 8,130 EUR, up until income went untaxed. Between the basic allowance and the top statutory tax rate, two tax brackets are defined with tax rates increasing linearly within each bracket. The top income threshold for the regular schedule was 52,882 EUR, however taxpayers are charged an additional rate on income exceeding 250,730 EUR, since the so-called “rich tax” was introduced in 2007 (see figure 1).

For married couples who are assessed together, the relevant amounts are doubled. They enjoy a lower tax burden if their individual incomes differ substantially, especially in case of the traditional sole breadwinner model. This is because the total tax due is calculated by doubling the tax payable on half of the added up taxable incomes of both partners. Hence, the couple is taxed at a lower point at the progressive tax schedule, paying less than when taxed individually.

The taxable income is determined from seven different types of earnings, which are sorted into the two categories of profit income and surplus income. The former is generated from self-employed activities, the latter from dependent employment, rent, capital and other sources. A plethora of deductions are subtracted to get

the taxable income, see table 1 for an overview. There are very detailed provisions concerning what is deductible by whom under which circumstances³, which are described in more detail in the technical appendix.⁴ Once the final taxable income (“zu versteuerndes Einkommen”) is determined and the tax due is calculated, where applicable direct tax reliefs (“Steuerermäßigungen”) are subtracted from that value to get the final amount of income tax to be paid.

Table 1: Calculation of taxable income according to the German tax code, 2013

Profit income	Surplus income
Income from self-employment	Income from dep. employment
+ Income from agriculture and forestry	+ Capital income
+ Business income	+ Income from rent and lease
	+ Other income
– related business expenses	– related professional expenses
= Sum of Revenues	
– Proportional relief for elderly retired persons	
– Relief for single parents	
= Total amount of Revenues	
– Special expenses	
– Extraordinary expenses	
= Income	
– Children’s allowance	
= TAXABLE INCOME (zvE)	

Source: Own table, based on [Dittmann et al. \(2014, p. 22\)](#).

³In short, the bulk of professional expenses are the commuter allowance, travel and educational expenses, expenses for work equipment, the additional meal allowance and expenses for double households. Special expenses are mostly precautionary expenses like contributions for insurances of old age, health and nursing. Moreover, among others they comprise of expenses for education of oneself, the spouse or children living away from home, childcare expenses, alimonies, paid church tax, or contributions to political parties and some clubs. Extraordinary expenses are typically case-specific, however some are categorized as well, for instance for people with disabilities, surviving dependants and non-remunerated care providers. Other expenses that fall under the extraordinary ones are sickness costs, costs of nursing homes and services, alimonies or expenses for modifications of buildings due to health condition. Direct tax reliefs are granted for a rather small range of expenses: Craftsmen and domestic work services, nursing homes and services, and membership fees and donations to political parties and independent voter groups.

⁴The technical appendix, which is supposed to document the data preparation and the methodology, will be available soon. The R Code written for this study is available from the author as well.

3 Data

My analysis is based on the Income and Consumption Survey (EVS), which is conducted by the Federal Statistical Office of Germany every five years. The cross-sectional quota sample is representative for German private households, because it is adjusted to the sample census (Mikrozensus). However, households with a monthly net income of more than 18,000 EUR are excluded, so are people living in institutions and homeless people. The EVS is the largest household survey of its kind in Europe, multiple quality checks on multiple levels assure consistency ([Destatis 2016](#)). Especially, the plausibility of results is checked through a budgeting process that compares income and expenditures of the household, triggering further investigations, if necessary contacting the household again, to resolve differences that are too high ([Destatis 2017a](#)). However, no information is given concerning the treatment of missing values, which typically are imputed in household surveys during the data processing.

Importantly for my analysis, the survey provides quite detailed information on paid taxes, earnings and expenses, but also on financial assets and wealth. On average, the Federal Statistical Office selects a sample of roughly 80,000 households who answer voluntarily. The drop-out rate including those that stopped participating without even having answered the paper questionnaire was 27%, the drop-out rate during the sampling period was 10.5%. The Scientific-Use-File that is applied in my analysis consists of a subsample of 42,792 household observations.

Nevertheless, the EVS comes with a range of disadvantages as well. First of all, the top-censoring leads to a low coverage of high incomes by construction, and of high wealth as a coincidence. On top of that, the figures may be understated by households below the cut-off as well, who might feel uncomfortable to report their true income and wealth. Particularly problematic when studying tax avoidance are survey issues with self-employed individuals. Because they have more leverage about underreporting (part of) their income to tax authorities, it is important to gather or estimate their actual income as precisely as possible. Unfortunately personal draws, which are a source of income that should be stated, may be difficult to ascertain, e.g. when private and business wealth cannot be separated easily. Generally, the volatility of self-employed incomes poses a challenge for proper data gathering in surveys, as households can cope more easily with the reporting of steady streams of income ([Destatis 2016](#), p. 4, [Becker 2014](#)). As [Becker \(2014\)](#) furthermore notes,

due to the voluntary and exclusively German-language sampling procedure the representativeness of the EVS is limited insofar as it inherits a middle-class bias and an undercoverage of households with foreigners.

Moreover, a major obstacle arises from the surveying period: Each household is interviewed only for one quarter of the year, hence quarterly data is provided to the researcher. This approach was introduced with the 1998 wave of the EVS to decrease the drop-out rate of participants over the year. This is problematic for my analysis for several reasons: To begin with, I need yearly data to estimate the taxable income, because the tax code refers to yearly values. This requires a transformation of the data, which is rather straightforward for items with a high frequency, say a salary or food expenses, that may simply be quadrupled. However, it is much more problematic when thinking about items with a low frequency, like lump-sum payments of bonuses or purchases of durables. Biases may arise when simply quadrupling these values where they occur. Adding to that, the quarterly values also introduce seasonal biases: Single payments, e.g. at the end of the year due to the so-called “christmas bonus”, are presumably higher and more frequent for households surveyed in the fourth, than in the first or second quarter. As a consequence, quadrupling these values to get yearly data possibly distorts results, especially as the sample sizes differ by quarter (Q1: $n=11,134$, Q2: $n=11,665$, Q3: $n=10,379$, Q4: $n=9,614$).

To address these issues, some adjustments have to be made when transforming the data from quarterly to yearly values. This problem was tackled by [Bönke et al. \(2013\)](#) before, but they do the transformation in reverse order: Using the EVS samples of 1978-2003, they establish a harmonised database (pooled cross-sections) at the quarterly level. I.e., they reduce the information of the 1978-1993 cross sections, when households were still surveyed over a full year, to get quarterly data for all years.

Adding to that, some adjustments for particular items were proposed by [Becker \(2014\)](#): For income from self-employment, the previous year’s income which fortunately is recorded, is used as a plausibility check to keep the current year’s values within reasonable bounds. A similar procedure is applied to capital income.⁵

⁵If the current year’s self-employment income is stated as zero, it is replaced by the previous year’s value if that was at least EUR 12,000. If the quadrupled quarterly value deviates by more than 30% from the previous year, 70% of the preceeding year’s self-employed income is set for low incomes, 130% for high incomes exceeding EUR 9,000. Also if the current year’s capital income is stated as zero, she replaces it by the previous year’s value. If the previous year’s proceeds from capital are zero, current year receipts are set to the quarterly value stated, assuming no other

To get yearly data, I first identify items that are sensitive to biases arising from multiplying them by four (for more details, see the technical appendix). These are items with low frequency that are relevant in the context of my analysis, i.e. for the tax code. The problem is addressed through two measures.

First, one has to cope with a bias for the number of positive observations in each quarter. For example, the main income earner of the household receives a positive one-time payment in only 6.2% of households surveyed in Q1, but in 37.7% of the households surveyed in Q4. Hence, for the relevant items the households are split by quarter. Next, values for the missing three quarters of each household are imputed using predictive mean matching within a multiple imputation with chained equations ⁶. From the implicates thus generated, one is drawn and the subsequent calculations are applied to this dataset⁷. Finally, all quarters are added up to receive yearly values.

Second, the yearly values are weighted by the quarter’s mean divided by the mean of the whole sample, to correct for higher or lower levels of payments in some quarters. This seasonal adjustment is done for all items, regardless of frequency.

Additionally, I partially follow Becker’s ad-hoc approach by adjusting the specified variables in a similar way. Quadrupled self-employed incomes are restricted within bounds of 50% when deviating positively or negatively from previous year’s incomes. Bonuses, lump-sum payments and indemnities are not quadrupled, but replaced by previous year’s value when stated as zero. Also if they are more than 10% lower in t compared to $t-1$, the preceeding year’s value is pasted. Considering a margin of 20%, the same is done with capital income. Moreover, it is restricted to 150% of the previous year’s capital income, as proposed by [Becker \(2014\)](#).

capital income was generated that year. If both t and $t-1$ show positive amounts, the quadrupled value is restricted to 125% of the previous year’s proceeds

⁶As my problem is quite unique, suitable approaches are difficult to ascertain given that on average 3/4 of the observations have to be imputed for the affected variables. The latter entails a rather high computational load for many algorithms. Any ideas for improvement are highly welcome.

⁷Generating more than a few, say 10, implicates while running 5 - 10 iterations of the algorithm, is computationally not feasible with standard CPUs and R’s “mice”-package at the moment. For robustness, I have applied a couple of different implicates to the subsequent simulation model, and the results changed only slightly. In the future, a little bit more robustness may be achieved here, yet at the cost of a high computational or programming load only.

4 Modelling the German income tax code

The basic idea of the paper is to calculate two income aggregates for each taxpayer. The taxed income is based on the tax paid, the taxable income is estimated using earnings and expenses as stated in the survey. Comparing the two provides for a first estimate of tax savings that may be due to avoidance behaviour. As a next step, comparing paid taxes T_i^{paid} with the hypothetical estimate of taxes to be paid based on taxable income T_i^{inc} , can be formalised as follows:

$$T_i^{loss} = T_i^{inc} - T_i^{paid}$$

To this aim, first the tax function is inverted to calculate the taxable income from taxes paid. Refunds are taken into account by using the previous year's value, corrected for the average growth of refunds between 2012 and 2013⁸.

Second and more complicatedly, an estimate for the taxable income is generated from a variety of items. This follows the tax code as described briefly in table 1. On the income side, some taxable items are available on the household level only. For households with multiple tax payers, these are allocated among the individuals according to their share of tax payments of that particular household.

It is noteworthy that some deductions are quantitatively much more important than others, but still the highest degree of precision is aspired for all items. According to the tax statistics, for instance the commuter allowance makes up almost 60% of professional expenses for an average employed income earner ([Destatis 2015](#)). As the EVS items differ from the tax concepts for many variables, a proper estimation requires additional information to supplement the relevant EVS items. This information is taken mostly from macro statistics, which subsequently contribute to the definition and selection of items for the estimation of deductions.

To illustrate, consider once more the case of the commuter allowance: Households that receive income from employment are entitled to deductions for the commuting distance they have travelled to work. In 2013, the allowance was EUR 0.30 for every completed kilometre one way, compensating the full round trip. In case public transport was used, the tax payer was allowed to claim the full cost as deductions,

⁸The same is unfortunately not possible for arrears, which are not given separately but included in the tax payment item. However, these are quantitatively less important because only 1.5 Mio taxpayers had to pay arrears while 11.5 Mio received refunds in 2013 ([Destatis 2017c](#)), the averages differing not much (EUR 988 and 935, respectively).

up to a limit of EUR 4,500 per year. Unfortunately, the EVS does neither contain the distance to work, nor expenses for commuting directly as separate items. As a consequence, one has to estimate them for all groups that may claim the deduction: car and motorcycle drivers, public transport users, bicyclists, pedestrians and carpool users. To get the deductible allowance, several steps are taken:

1. The relevant items in the EVS are identified. These are expenses for car fuels and lubricants (EF383) and third-person transportation services (EF386).
2. A macro estimate for the shares of employed persons commuting with any of the means of transportation is taken from the sample census of 2012, then these shares are applied to the relevant group within the EVS (employed persons) to get absolute numbers. For example, of the 9,256 single household heads with dependent employment, 4,397 are estimated to commute using their own car, while 951 use public transport and 616 a bicycle.
3. In the absence of more precise information concerning the distribution of commuters along other covariates (sex, age, income, etc), these absolute numbers of commuters of each type are drawn randomly from the relevant items in case of motorvehicle drivers, public transport users and carpool users. For pedestrians and bicyclists, the kilometres driven are estimated ad-hoc using normal distributions. Without more precise information concerning their travel distance, this approach is justifiable on the grounds of the small ranges covered by typical commuters of this kind.
4. For motorvehicle and public transport commuters, the share of the relevant items which are due to commuting have to be estimated. This is done using macro figures about the shares of purposes of kilometres travelled for different types of transport (Source: [Radke 2014](#)). Moreover, for motorized commuters the federal state is taken into account, considering the average journey time to the nearest large city. Also, the size of the community is used to weight the share.
5. Motorvehicle users' kilometres driven are estimated from their gasoline expenses. Therefore, the average price is used to estimate the amount of fuel consumed, taking into account the average kilometres driven by different types of car engines (petrol vs. diesel). From the average fuel consumption per 100km, one can finally get the kilometres driven commuting.

6. Now, the commuter allowance can be computed for all relevant means of transport: The kilometres travelled by motorvehicles, pedestrians and bicycles are simply multiplied by EUR 0.30. The amounts spent by public transport users are claimed under consideration of the maximum limit of EUR 4,500.

In a similar way, items are used to estimate deductible travel expenses for business trips or training courses. Several times, it is necessary to randomly assign some tax payers who report positive expenses for some item to a certain group (e.g., party members), because the items contain mixed information (e.g. party member fees, but also fees for union or club members).

Joint income tax filers, i.e. married couples who opt to be assessed together, are treated as follows: Since the EVS of course contains no information on the type of tax filing, they are first identified by a profitability calculation.⁹ Next, the taxable income is estimated as if everyone was single filer. Finally, joint filing is accounted for by applying the same procedures as the tax authority, i.e. assuming that spouse's incomes are added up, then split by half to get virtual individual taxable incomes, which are finally subjected to the standard tax scale (figure 1). Adding the two amounts of tax up then provides the couple's common tax due.

Essentially, I estimate a full microsimulation model of the German Tax Code for 2013 on the individual taxpayer level, accounting for more details than anywhere in the literature to my knowledge. Detailed accounts of both the data preparation and the calculations performed to get the taxable income can be found in the technical appendix. An overview of the provisions that are taken care of can be found in table 2.

⁹Joint assessment is the default option for married couples and profitable in most cases, especially when the two incomes differ by a large margin, and the smaller amount is non-negative and not subject to progressivity proviso (Dittmann et al. 2014, p. 185). For the sake of simplicity, I assume that partners file their tax return jointly if one differs by more than 20% from the common total Sum of Revenues (i.e., profit income plus surplus income minus related expenses, see table 1). Everyone else is considered a single tax filer.

Table 2: Inclusion of tax code provisions in the microsimulation model

Tax code rule	Included in the model?
<i>Taxable income components:</i>	
Income from self-employment (private and material withdrawals, including from agriculture)	yes
Income from sale of solar power	yes, less estimated deductible expenses
Income from dependent employment: salaries, one-time payments, indemnities, bonuses, other employer benefits	yes
Capital-forming benefits for employees (if not used for private/occupational pension)	yes
Base salary when in part-time retirement	yes
Non-cash benefits for employees (if above allowance)	yes
Capital income: interest, dividends, payouts (subject to withholding tax)	yes
Capital gains: Sale of real estate, other economic goods, financial assets and company shares	yes, but only for financial assets
Income from rent and lease	yes
Income from subletting, if > EUR 520	yes
Other income	yes
Income from public, civil servant and occupational pensions: only partly taxable, depending on year of entry	yes
Income from private pensions: taxable share depends on type and contract signature year	yes
<i>Professional and business expenses:</i>	
Business expenses (of self-employed)	no, because they only report private expenses ¹⁰
Allowance for honorary work	yes
Capital income allowance	yes
Special allowance for income from agriculture and forestry	yes

¹⁰As the self-employed are asked to only report private withdrawals in the survey, I assume that they basically directly report their Sum of Revenues for self-employed income.

Fully deductible expenses of landlords: residential home apportionment for condos, interest on building loans and mortgages, residential building and landowner insurance, other operating expenses	yes
Partly deductible expenses of landlords: acquisition costs, expenses for wear and tear, maintenance and construction costs (multiple conditions apply)	yes
Special depreciation rules for victims of natural disasters	no, not observable
Side costs for sublet rooms, according to m ² used by subtenant	yes
Expenses allowance for pension income	yes
Professional expenses of employees:	
Flat-rate allowance of EUR 1,000, applied if not claiming higher expenses	yes
Costs of a home office (some conditions apply)	no, cannot properly check eligibility
Costs of work equipment: can be deducted fully if < EUR 410, otherwise subject to depreciation over some years	yes, for most relevant items
Commuter allowance	yes, see above
Costs of further education, if related to work	yes
Occupational travel expenses, either actually incurred costs or allowance per km	yes, assuming allowance is used
Travel and accommodation costs wrt professional education	yes
Food expenses during business and educational trips, allowance graded by duration of trip	yes
Membership fees for unions and employer (and similar professional) organisations	yes
Motor vehicle repair if work-related	yes
Professional share of costs for tax lawyer services	no, not identifiable
Professional share of costs for accident insurance	yes
Professional share of costs for liability insurance	no, not observable
Costs of moving due to professional reasons	yes
Medical expenses related to occupational diseases and work accidents	yes
Costs of work-related telecommunications	no, not identifiable
Professional hospitality costs	yes
Allowance for professional account fees	yes, for some occupations

Special expenses:

Standard EUR 36 allowance if not claiming higher expenses	yes
Retirement provision expenses (pension contributions): several conditions apply, e.g. a maximum amount that is cut for some occupations like civil servants	yes
Expenses for health and nursing care insurance, several conditions apply	yes
Unemployment insurance contributions	yes
Private accident insurance contributions	yes
Private share of costs for car liability insurance, fully deductible if commuter allowance is claimed	yes
Contributions for private liability insurance, disability insurance and term life insurance	yes
Contributions for some other capital/pension insurances, some conditions apply	no, not identifiable
Maximum amount for provisional expenses, depending on personal status	yes
Contributions to state-subsidised private pension scheme (Riesterrente)	yes
Contributions to some building societies (Wohnriester)	no, not identifiable
Payments based on pension rights adjustment of split couples, if contractual agreement	no, not observable
Alimony payments when divorced or living permanently separately, up to EUR 13,805	yes
Expenses for own/spouse's education (some conditions apply, e.g. maximum amount of EUR 6,000): tuition and exam fees, equipment, transportation, interest on student loans	yes
Childcare expenses, up to EUR 4,000 per child	yes
Paid church tax	yes
Membership fees and donations to associations that are churchly, charitable or serving the public good	yes
Membership fees and donations to political parties and registered electoral groups, amount that exceeds the possible tax relief, up to 20% of the Total Sum of Revenues	yes, but only dues ¹¹

Extraordinary burden:

¹¹An estimate of the donations will be included in future versions of this work.

Itemised cases for costs of disabled people, nursing of other people; survivor allowance	no, not identifiable
Children’s education, when grown up and staying outside of parent HH	no, not identifiable
Home reconstruction cost in special cases (disability, sickness, danger, etc)	no, not identifiable
Health insurance of other supported persons	no, not identifiable
Expenses for nursing homes, if not only there for ageing reasons	no, very few cases ¹²
Expenses for ambulant nursing care	yes
Sickness costs	yes
Obligatory supportive payments that are not deductible as special expenses	yes
Voluntary supportive payments	no
Sacrifice restriction for supportive payments (Opfergrenze)	yes
Reasonable own burden for all expenses in this category, depending on Total Amount of Revenues and no. of children	yes

Direct tax reliefs:

Craftsmen services at home of tax payer, 20% of the costs w/o material and transportation, up to EUR 1,200	yes
Services close to home, 20% of expenses (further conditions apply if only “minor employment”)	yes
Expenses for ambulant or stationary nursing, some conditions apply (e.g., deduction as extraordinary burden comes first)	yes
Expenses for moving for private reasons, 20% thereof	yes
Maximum amount of EUR 4,000 direct relief for HH services	yes
Membership dues and donations to political parties and registered voter groups, up to EUR 825 per spouse	yes, but only dues for political parties

Further rules:

Joint filing of married couples	yes
Proportional tax allowance for elderly retired persons	yes
Tax relief for single parents	yes

¹²This is due to people living in institutions not being captured by the EVS. Also, further conditions cannot be checked with the data.

Progressivity proviso: some forms of income are tax exempt, but increase the tax rate payed on taxable income	yes
Fifth rule: mitigation of tax progression for high one-time incomes	yes
Check whether child allowance is more profitable than child benefits	yes
Check whether capital income rather be taxed under PIT schedule than with flat-rate withholding tax	yes
Check whether tax deduction rather be used instead of pri- vate pension (Riester) state benefit	no ¹³
Solidarity surcharge	yes

Own table, for more details see the technical appendix.

5 Results and Discussion

Before delving into the details, it should be noted that all results of the microsimulation-based analysis are weighted using the extrapolation factors supplied by the Federal Statistical Office.¹⁴

A descriptive overview about taxable income before deductions and taxed income is presented in table 3. Overall, the progressivity of the tax schedule is visible, albeit less so when comparing average tax rates based on taxable income before deductions (column 9) to taxed income (column 10). Clearly, tax payers are able to substantially reduce their taxed income (column 7), but the ratio of taxed to taxable income increases with income. The maximum for the average tax rate is reached at only 17.8% when based on taxable income (25.26% for taxed income). The coefficient of variation for taxed income is much higher than for taxable income, which is to some extent expectable because taxable income is the order criterion for the data. So far, the results are broadly in line with the findings of [Lang et al. \(1997\)](#) who report a little bit more of progressivity. This fits to changes in the German tax code since 1983, which have mostly reduced the burden for higher incomes, but also

¹³This is profitable for households with high taxable income only, but the calculation will be included in the future as well.

¹⁴These weights are adjusted by the Statistical Office using the sample census (Mikrozensus), a yearly 1% cross section sample of all German households. It is very reliable, because participation is obligatory. The adjustment mitigates representativeness issues of the EVS (see section 3).

increased the basic allowance ¹⁵.

However, a peculiarity shows up: Households in the lowest three deciles seem to experience a higher tax burden than expected, which could point to measurement or data preparation errors. For several reasons though, I am convinced that these effects derive partially from the composition of the sample: I have here included all individuals (not households!) that have *some* amount of income that is theoretically subject to tax, no matter how small. Especially, pensioners with only a small taxable component of their income are present in these deciles. Clearly, the incomes therefore recorded as belonging to the first three deciles are even below the basic allowance of EUR 8,130 which tax payers were granted in 2013. The nevertheless slightly positive mean tax payments, respectively, are driven mostly by outliers. They are in part probably artifacts from the transformation from quarterly to yearly variables. Especially the self-employed have to pay taxes based on previous year's income, so they might record tax payments while not having (as high a) taxable income in the same period¹⁶. The resulting measurement problem is exacerbated by the reduced observation period during the year.

Concluding, I hold this supposedly too high average income tax burden of the poorest deciles to be largely a statistical artifact rather than a real finding.

Adding to that, table 4 shows the percentage of individuals of some taxable income (before deductions) decile with respect to the taxed income decile.¹⁷ Again, it is noteworthy that the first two deciles end up being taxed a lot more than would be expected (see previous paragraph). In principle, as [Lang et al. \(1997, p. 330\)](#) put it, "households in low gross income deciles cannot conceivably reside in much higher taxed income deciles". Even with the spread of more precarious and hence volatile self-employment, this should still hold to some extent.

Apart from that though, the picture is quite comparable to that of the 30-year old data. Individuals in the upper income deciles are able to reduce their tax burden, the richest 10% slightly more than in 1983. Hence, they end up in taxed income

¹⁵See [Bach et al. 2017](#) for an estimate of the distribution of the tax burden in Germany.

¹⁶Indeed, the self-employed account for many of the biggest outliers in the two deciles, the maximum being one tax payer with more than EUR 60,000 in tax payments while showing only some EUR 2,000 of taxable income. That person alone increases the mean tax payments of the decile by EUR 9.

¹⁷It should be noted that in this table, in contrast to my other results, only individuals with positive taxed income are reported. This is done, because due to many individuals with small amounts of income subject to tax, the first two deciles of the taxable income distribution show little to no tax payments. This is to be expected, as the taxable incomes are lower than the basic allowance of EUR 8,130. In turn, this generates the problem that no boundaries between the first two deciles can be determined, which precludes preparing the desired distribution table.

deciles lower than their taxable income decile, as can be witnessed in the lower off-diagonal triangular. This indicates substantial horizontal inequalities, as some people sharing similar incomes end up paying different rates of tax. Whether or not these inequities are justified when investigating the deduction possibilities, is analysed in further detail in the upcoming paragraphs.

The main estimation sets out to measure tax avoidance by comparing a hypothetical estimate of taxable income with taxed income. On the way, the components of taxable income before deductions are calculated, as are deductions and sub aggregates (as defined in table 1). Results are given in tables 5 - 8.

Table 3: Individuals by taxable income decile

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Taxable income decile	Taxable income (YALL)			Taxed income (YTAX)			Tax payments (TAX)		
	Decile range (EUR)	Mean (EUR)	Coeff. of var.	Mean (EUR)	Coeff. of var.	YTAX/YALL (%)	Mean (EUR)	TAX/YALL (%)	TAX/YTAX (%)
1	[1 – 2818]	1501	0.54	721	0.54	48.03	94	6.28	13.08
2	[2818 – 5645]	4290	0.19	1390	0.19	32.41	180	4.20	12.95
3	[5645 – 8135]	6857	0.10	1873	0.10	27.31	206	3.01	11.01
4	[8135 – 11638]	9789	0.10	3932	0.10	40.17	438	4.47	11.13
5	[11638 – 15706]	13628	0.08	7327	0.08	53.76	878	6.44	11.98
6	[15706 – 20949]	18216	0.08	11824	0.08	64.91	1576	8.65	13.33
7	[20949 – 28061]	24330	0.08	17154	0.08	70.50	2583	10.61	15.05
8	[28061 – 37439]	32497	0.08	23593	0.08	72.60	3960	12.19	16.79
9	[37439 – 52616]	44222	0.10	32173	0.10	72.75	6099	13.79	18.96
10	[52616 – 942778]	85554	0.63	60386	0.63	70.58	15253	17.83	25.26

Note: Table includes only individuals with positive taxable income before deductions, which is calculated as outlined in table 1. Source: EVS 2013.

Table 4: Percentage of individuals of taxed income decile within taxable income decile

Taxable income	Taxed income										Total
	1	2	3	4	5	6	7	8	9	10	
1	88.24	7.71	1.62	0.65	0.42	0.36	0.30	0.27	0.11	0.34	100%
2	11.40	67.33	14.33	3.73	1.20	0.82	0.53	0.30	0.21	0.15	100%
3	0.27	19.64	54.90	18.25	4.38	1.35	0.76	0.13	0.17	0.15	100%
4	0.08	3.75	20.97	47.56	20.42	4.19	2.09	0.48	0.42	0.04	100%
5	0.04	1.10	4.89	20.93	44.72	21.96	4.21	1.35	0.59	0.21	100%
6	0.00	0.27	2.02	4.87	19.54	43.43	23.50	4.38	1.43	0.53	100%
7	0.00	0.04	0.89	2.49	5.75	19.32	43.60	23.39	3.50	1.03	100%
8	0.00	0.15	0.34	1.07	2.32	4.95	18.73	48.07	22.38	1.96	100%
9	0.00	0.00	0.04	0.34	0.82	2.82	4.76	18.00	55.53	17.68	100%
10	0.00	0.00	0.04	0.08	0.40	0.76	1.54	3.60	15.66	77.93	100%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

Note: Table includes only individuals with positive taxed income, which is calculated using reported tax payments. Source: EVS 2013.

Table 5: Estimated taxable income, surplus and profit income components

(1) Taxable income decile	(2) (3) Dep. employment		(4) (5) Self-employment		(6) (7) Rent and lease		(8) (9) Capital	
	Mean (EUR)	% of YALL	Mean (EUR)	% of YALL	Mean (EUR)	% of YALL	Mean (EUR)	% of YALL
1	861	57.40	43	2.88	16	1.07	7	0.46
2	1618	37.70	106	2.46	34	0.79	17	0.39
3	2240	32.66	142	2.07	44	0.65	21	0.31
4	4604	47.03	246	2.51	81	0.83	40	0.40
5	8239	60.46	430	3.16	165	1.21	77	0.56
6	13638	74.87	688	3.78	285	1.56	122	0.67
7	20302	83.44	1100	4.52	447	1.84	185	0.76
8	28342	87.22	1595	4.91	649	2.00	203	0.62
9	38495	87.05	2733	6.18	914	2.07	325	0.73
10	64351	75.22	14064	16.44	3499	4.09	1309	1.53

Note: Table includes only individuals with positive taxable income before deductions, which is calculated as outlined in table 1. Source: EVS 2013.

Starting with the income components, it is obvious that income from dependent employment is the major income source for most households across most deciles. Please note that the lower shares in the 1st - 5th deciles are due to retired people, whose pensions are partially liable to tax. Income from self-employment oscillates around 2-6% of taxable income, slowly increasing with income. Expectedly, the richest decile shows a larger share of 16.4%. The rich naturally also stick out with higher shares of income from rent and lease, and from capital income.

Coming to the descriptive statistics for the sub aggregates of taxable income (table 6), it can be seen that going down the calculations in the tax code overview (table 1), taxable income decreases as expected. In relative terms, the reduction attained by claiming professional and business expenses is slightly decreasing from 7 to 4% along the 2nd to 10th deciles. A different picture arises for the finally assessed taxable income: Relative to taxable income before deductions, the share goes up for every decile. Hence, when applied correctly the tax code shows a considerable degree of progressivity, as richer individuals are estimated to reduce their tax burden less.

Next, the different types of deductions are discussed (table 7). Obviously, on average special expenses are the most important deduction category, which is in line with the tax statistics ([Destatis 2017b](#)): The average ratio of special expenses, including precautionary expenses, to the Sum of Revenues¹⁸ was 13.3% according

¹⁸A comparable aggregate to my estimate of taxable income before deductions is not readily

Table 6: Estimated taxable income, sub aggregates

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Taxable income decile	Taxable income (YALL)		Sum of Revenues		Assessed taxable income	
	Decile range (EUR)	Mean (EUR)	Mean (EUR)	% of YALL	Mean (EUR)	% of YALL
1	[1 – 2818]	1501	1165	77.67	597	39.79
2	[2818 – 5645]	4290	3959	92.28	3010	70.16
3	[5645 – 8135]	6857	6456	94.14	4976	72.56
4	[8135 – 11638]	9789	9157	93.54	7157	73.12
5	[11638 – 15706]	13628	12785	93.81	10210	74.92
6	[15706 – 20949]	18216	17210	94.48	14003	76.87
7	[20949 – 28061]	24330	23032	94.66	18940	77.84
8	[28061 – 37439]	32497	30871	95.00	25493	78.45
9	[37439 – 52616]	44222	42210	95.45	35063	79.29
10	[52616 – 942778]	85554	81811	95.63	70048	81.88

Note: Table includes only individuals with positive taxable income before deductions, which is calculated as outlined in table 1. Source: EVS 2013.

to tax statistics, while my estimate based on the EVS puts it at 15.5%. In contrast, professional expenses reduce taxable income by roughly 2-6%, decreasing with income starting at the 2nd decile. Extraordinary burdens, which as the title says are the most difficult to ascertain category, are generally less important. I estimate it to make up 1.4% of the Sum of Revenues, while the tax statistics report 0.9%. Direct tax reliefs are only marginally important across all deciles. There might be some underestimation here, because the tax statistics set them in the same range as the extraordinary burden, however I only estimate a share in the Sum of Revenues of less than 0.1%.

As a whole, these figures lend credibility to my claim of having programmed a rather benevolent tax authority, in order to arrive at a conservative estimate of tax underpayment.

The main results of this paper are shown in table 8, which gives my estimates of tax due and the resulting tax loss (or gain) from under(over)payment of tax. Keep in mind that at least the first two deciles are affected by the caveats made above. Namely, the average amount of tax paid in these deciles is probably largely a statistical artifact. At the aggregate level, assumed average tax overpayments of EUR 29 do not matter much, anyway. These figures pale when comparing them to

available from tax statistics publications, so I compare my figures to the Sum of Revenues which is reported.

Table 7: Estimated taxable income, deductions

(1) Taxable income decile	(2) Prof. expenses		(4) Special expenses		(6) Extraord. burden		(8) Direct reliefs	
	Mean (EUR)	% of YALL	Mean (EUR)	% of YALL	Mean (EUR)	% of YALL	Mean (EUR)	% of YALL
1	421	28.07	499	33.27	41	2.75	1	0.07
2	280	6.52	867	20.22	65	1.51	2	0.05
3	319	4.65	1386	20.21	76	1.10	3	0.04
4	490	5.00	1809	18.48	160	1.64	5	0.05
5	639	4.69	2254	16.54	272	2.00	10	0.07
6	839	4.60	2783	15.28	357	1.96	15	0.08
7	1048	4.31	3594	14.77	382	1.57	18	0.07
8	1258	3.87	4808	14.80	456	1.40	24	0.07
9	1510	3.41	6438	14.56	583	1.32	29	0.07
10	2020	2.36	10880	12.72	751	0.88	57	0.07

Note: Table includes only individuals with positive taxable income before deductions, which is calculated as outlined in table 1. Source: EVS 2013.

the average underpayment of roughly EUR 2,600 for the richest decile. In relative terms, it is clearly visible that the amount of underpayment of tax rises with income when comparing it to taxable income before deductions. Amounting to 3.06% of taxable income before deductions, it is largest for the 10th decile, which equates to 17.15% of taxes paid. A graphic depiction of the estimated vs. statutory average tax rate can be found in figure 2 in the appendix.

Under the assumption that my EVS-based sample of tax-paying individuals is representative for German tax payers, which is reasonable after adjusting with the sample-census-based weights, some calculations out of the envelope may derive an aggregate estimate of income tax thus lost: Multiplying the number of tax payers (with positive taxable income) captured by the tax statistics with the average tax loss for the same group in my sample gives an amount of EUR 12.42 bn of avoided tax. Of those, EUR 9.93 bn can be attributed to the richest decile, i.e. 80% of the avoided amount. Compared to the assessed amount of income tax, the tax loss is 5.04%. Obviously, this is considerably lower than the 34% estimated by [Lang et al. \(1997\)](#) for 1983.

Compared to a net tax gap of 13.7% (relative to the amount that should have been paid, i.e. 15.9% relative to taxes paid) in the U.S. in 2001 or an overall tax gap of 8% in Sweden in 2000 ([Slemrod 2007](#)), which were estimated from random

Table 8: Estimated taxable income (individual taxpayer level), tax loss

(1)	(2)	(3)	(4)	(5)	(6)
Taxable income decile	tax due		tax due – tax paid		
	Mean (EUR)	% of YALL	Mean (EUR)	% of YALL	% of tax paid
1	66	4.37	-29	-1.92	-30.52
2	139	3.25	-41	-0.95	-22.68
3	175	2.56	-31	-0.45	-14.97
4	401	4.09	-37	-0.38	-8.46
5	866	6.35	-12	-0.09	-1.41
6	1635	8.97	59	0.32	3.74
7	2665	10.96	83	0.34	3.21
8	4133	12.72	173	0.53	4.36
9	6562	14.84	463	1.05	7.59
10	17870	20.89	2616	3.06	17.15

Note: A negative value for the tax loss (columns 4-6) implies that individuals have paid more tax than what is estimated as due. Table includes only individuals with positive taxable income before deductions, which is calculated as outlined in table 1. Source: EVS 2013.

tax audits, my estimate seems to be rather low. This strengthens my argument that the estimate is by any means a lower bound, even when taking into account that tax morale in Germany is rather high¹⁹.

The availability of individual taxpayer level items in the household survey, allows me to compare the tax loss on the individual taxpayer level with the household level (table 9). As can be expected, the distributional impact of the studied phenomenon is reduced by shifting the focus on the household (table 9). Nevertheless though, the general direction of the findings remains clear: Richer households are most able to reduce their tax burden, by about 2.05% of taxable income before deductions or 11.16% of taxes paid for the richest decile.

Of course, one may object that tax avoidance is notoriously difficult to measure, and therefore my results may be biased. For several reasons though, I am convinced that my estimate is by any means a lower bound. I shall discuss factors leading to a possible overestimation or underestimation in turn.

Starting with factors contribution to a possible overestimation, I cannot observe whether an individual carries over losses from previous years into the 2013 tax dec-

¹⁹Dörrenberg & Peichl (2018) report a high overall tax morale in a survey experiment with German participants. 89% of them answered that “evasion is ‘not at all justifiable’, ‘not justifiable’ or ‘rather not justifiable’ ” (Dörrenberg & Peichl 2018, p. 25).

Table 9: Estimated taxable income (household level), tax loss

(1) Taxable income decile	(2) tax due	(3)	(4) (5) (6) tax due – tax paid		
	Mean (EUR)	% of YALL	Mean (EUR)	% of YALL	% of tax paid
1	202	5.04	-109	-2.71	-34.97
2	298	2.88	-129	-1.25	-30.25
3	490	3.10	-69	-0.44	-12.39
4	1041	4.62	1	0.00	0.08
5	2167	7.18	-84	-0.28	-3.73
6	4024	9.99	101	0.25	2.57
7	6121	11.47	44	0.08	0.72
8	9185	13.13	170	0.24	1.89
9	13940	14.96	422	0.45	3.12
10	36314	20.47	3645	2.05	11.16

Note: A negative value for the tax loss (column 5) implies that households have paid more tax than what is estimated as due. Table includes only households with positive taxable income before deductions, which is calculated as outlined in table 1. Source: EVS 2013.

laration. This possibility presents itself especially for business owners, even though it is subject to some limitations. Up to EUR 1m for single filers (doubled for joint filers), losses can be carried forward if they cannot be balanced within the current year or with the previous year. Further restrictions apply to certain types of losses, for partners in a limited partnership for instance it is restricted to her contribution in capital in the company. This could reduce taxable income, and therefore lead to some overestimation of tax avoidance. However, there were only EUR 4.9 bn losses carried over in 2013 according to the tax statistics, and this number includes not only losses from the previous year, but also losses of 2013 and of 2014 carried back. This figure equates to about 0.35% of the Sum of Revenues. Hence, the degree of overestimation resulting from this is presumably very limited, but could reduce the tax avoidance amount for richer individuals in particular.

Moreover, it was mentioned already that my estimate of direct tax reliefs seems to be too low, by about 0.8% points as a share of the Sum of Revenues when checked with the tax statistics. Moreover, there are some deduction possibilities that cannot be accounted for because relevant information is unobservable in the data. For instance, this is the case for some extraordinary expense allowances: I cannot check for people with disabilities, non-remunerated care providers, grown-up children's education when staying outside of parent household or health insurance of

other supported persons. Another example is due to the limited surveying period of the cross-sectional survey: If someone bought a computer the year before and deducted it over three years, I am unable to identify this deduction possibility²⁰.

Some general factors that work to the contrary have been mentioned before during the description of the data. First of all, the EVS does not contain the very top households or individuals of the income distribution. Roughly speaking, the top 1% are excluded from the sample. By the general logic of my findings and of the literature, one would expect a higher degree of tax avoidance and evasion among them. Moreover, nonresponse problems and underreporting in surveys are typically rising with income, especially for wealth and asset income (Moore et al. 2000, Korinek et al. 2006). This makes underestimation of tax avoidance and evasion more likely when using the EVS. Furthermore, the distributional effect of tax avoidance and evasion is therefore presumably underestimated.

Adding to that, due to the construction of the EVS dataset, it was not possible to estimate deductions for business expenses for self-employed, freelancers and self-employed farmers. This is because in the survey, they are asked to exclude those and only report their private expenses. Hence, they basically report their Sum of Revenues and I am unable to check how identifiable business expenses reduce their taxable income.

Moreover, the modelling of the deduction possibilities in the German tax code is done in such a way that the tax authority is benevolent. I.e., when there is room for judgement on how some deduction item is distributed, I follow a conservative approach that increases deductions and therefore reduces assessed taxable income and tax due. For example, in the case of commuting expenses, I assume actual commuters to experience twice the average share of commuting in their total car use (in contrast to uses like shopping, holidays, etc.), thereby increasing the kilometres driven that are eligible for commuter allowance.

Furthermore, as shown when discussing table 7, I overestimate special and extraordinary expenses by about 2.2 and 0.5% points of the Sum of Revenues, respectively, when compared to the tax statistics. This seems to override concerns of underestimation due to unobservables that were mentioned before. At least, no inequality-reducing bias is to be expected, if these unobservable deduction possibilities are more or less evenly distributed along the income distribution. Given

²⁰See the technical appendix for a further discussion of the issue. For instance for landlords, this problems was mitigated by some simplified estimations.

better health conditions and longer life expectancy of richer individuals, the allowances available for people with disabilities or non-remunerated care providers are unlikely to occur more frequently in the upper deciles of the income distribution for example.

Lastly, the EVS is unlikely to include a large fraction of black market incomes which are going untaxed. According to [Schneider & Boockmann \(2018\)](#), the size of the black market economy in Germany is estimated at 12.1% of GDP in 2013. Since these incomes are presumably distributed more in favor of lower income groups, being able to include them would increase the tax loss for the lower deciles. Note that this possibly reduces the distribution of the compliance gap towards high-income earners.

Concluding, it seems apparent that factors contributing to an underestimation of tax avoidance and evasion in my analysis are quantitatively much more important than those that work to the opposite.

It is important to note that I do not claim all of my tax loss estimate to reflect illegal tax evasion. On the contrary, as the most lucrative methods of tax evasion take place offshore, I assume that most of the difference I observe constitutes avoidance rather than evasion. This is because offshore tax evasion is more prevalent among the very top income individuals ([Alstadsaeter et al. 2018b](#)) which are excluded from the EVS. Rather, I interpret most of the tax loss estimated here to be the result of (illegal) underreporting of income sources where the tax payer has some discretion over how much to report, combined with overreporting of deductibles and “semi-legal tax write-off opportunities”, as [Lang et al. \(1997\)](#) put it. Even the standard work for tax advisors that I have used to grasp the plethora of deduction possibilities, is full of legal tax planning advice that seem more or less illegitimate.

6 Conclusions

This paper has set out to analyse income tax avoidance along the income distribution in Germany, using data from the 2013 Income and Consumption Survey. An estimate of taxable income is derived from a detailed microsimulation model of the German income tax code that exploits the richness of the survey items in terms of income, expenditures and taxes. This estimate of tax due is then compared to reported tax payments to get taxes lost due to tax avoidance.

Results confirm findings in the literature that detect more tax avoidance with

rising income. The estimated amount of tax underpayment for the richest decile is 3.1% of taxable income before deductions, or 17.2% of taxes paid (at the individual taxpayer level). At the household level, these figures decrease to 2.1% and 11.2%, respectively. For German public coffers, taking these results to the tax statistics implies a loss of fiscal revenue of at least EUR 12.4bn, which equates to 5.0% of income tax proceeds. The richest decile accounts for almost 80% of this figure. This confirms that inequality measures based on tax statistics underestimate income concentration by a considerable degree.

The results moreover underline the importance of fighting tax evasion and avoidance. Closing tax loopholes seems to be a cat-and-mouse-game where regulators react rather sluggishly, as the recently published “CumEx-Files” have demonstrated once more. From an economic viewpoint, providing a cost-benefit analysis of measures to reduce the tax compliance gap would be desirable. [Keen & Slemrod \(2017\)](#) therefore propose to evaluate the “enforcement elasticity of tax revenue”. Nevertheless, providing such an estimate is beyond the possibilities of this paper, as it requires intertemporal variation that is unlikely to get from the database used here. Even when pooling the EVS waves, the fact that the survey is conducted only every five years presumably prevents to neatly identify sufficient variation.

Nevertheless, it seems safe to assume that some effective measures could be implemented rather cheaply. Using German data, [Dörrenberg & Peichl \(2018\)](#) identify a positive reciprocity treatment effect for a simple intervention: Participants who were told that spending on public goods could be increased if the revenue lost to tax avoidance and evasion was recovered, showed a significantly higher tax morale. When held against a share of merely 11% of participants that find cheating on tax acceptable in their study, increasing tax morale by 2-3 percentage points could be economically significant. By sweeping generalization to my results, tax avoidance could be reduced by an amount of EUR 2.3 - 3.4 bn. As tax payers receive mail from the fiscal authorities anyway, telling them about the drawbacks of tax avoidance and evasion while stressing the benefits of public goods is unlikely to be costly. Another possibility presents itself when assessing the performance of the fiscal authorities: According to newspaper reports, the Federal Court of Auditors criticizes substantial amounts of revenue losses due to underinvestment in the number and training of tax inspectors ([Schäfers 2018](#)).

Moreover, my paper updates the 30-year-old Tobit estimate of [Lang et al. \(1997\)](#) that was done using the 1983 wave of the survey (in the appendix). Results of this exercise, which relates taxed income to taxable income and a range of controls, are

mixed so far.

If access is granted and data protection regulation allows for it, future work could benefit from statistical matching of additional micro data. Particularly useful in the context of the commuter allowance and travel expenses could be the sample census (Mikrozensus) or the employee history statistics (IAB-Beschäftigtenhistorie), as they contain data on commuting distances. But also for other items, they might prove useful. For obvious reasons, matching micro data from the tax statistics could also benefit the precision of the analysis, as it would allow for estimated and actually claimed deductions to be compared. A possible result could be a better calibration of some of the modeling concerning the hypothetically possible deductions.

Future versions of this paper are going to gain from analysing the distribution of the detected compliance gap in further detail along other covariates, e.g. geographically or for different professions. Moreover, further robustness checks shall be introduced, for instance by investigating the effect of excluding sensitive groups that might be driving results, e.g. self-employed persons.

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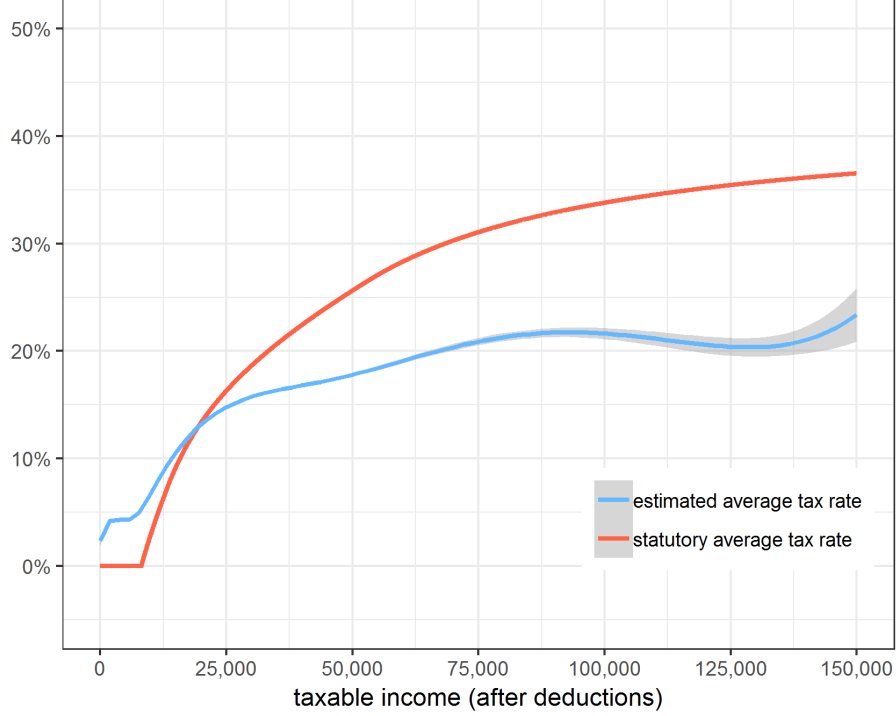
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A Appendix

Figure 2: Statutory vs. estimated average tax rates



Please note: The estimated average tax rate is based on the reported tax payments and my estimate of taxable income after deductions (zvE). It is smoothed using a spline with four knots at the kinks of the tax schedule. The graph is cut at EUR 150,000 taxable income, because there are too few observations beyond this to give an acceptably precise estimate. The calculation takes into account that flat rate withholding taxes on capital income, which are part of the taxes paid reported in the EVS, have to be excluded to make the estimated ATR comparable to the statutory rate.

A.1 A regression-based estimate

Based on [Lang et al. \(1997\)](#), a Tobit regression that seeks to explain taxed income in terms of taxable income and further covariates is estimated. Using the Tobit approach accounts for observations with zero taxed income, which is observed for 13.09% of households.

$$y_i^{tax} = \beta_0 + \beta_1 y_i^{all} + \beta_2 x_i + u_i$$

where y_i^{tax} is taxed income, y_i^{all} is gross income subject to tax and x_i are controls. This exercise is done to test their findings with the latest data available. As a default, I stick to their selection of variables in a linear Tobit estimation²¹ but later

²¹Note that this application is comparable to their working paper version ([Lang et al. 1993](#)). Future versions of my paper will hopefully include a replication of their spline regression estimation

delete some variables while adding new ones that seem more appropriate 30 years after.

Table 10: Variables entering the Tobit estimate, and their definitions

Dependent variable:

y_{tax} = annual household taxed income computed from reported tax payments and previous year's refunds, taking into account joint filing /10,000

Independent variables:

y_{all} = annual household gross income subject to tax (before deductions) of HHs with employed head, income from real estate subtracted by operation and maintenance expenses and interests on related debt /10,000

y_{all2} = $(y_{all})^2/100$

y_{all3} = $(y_{all})^3/1000$

y_{unemp} = annual gross household income subject to tax if HH head is unemployed /10,000

Tax relevant non-asset incomes

$empstatus$ = 0 if main household income is from dependent employment not in civil service

$selfemp$ = 1 if main household income is from non-agricultural self-employment

$selfempa$ = 1 if main household income is from agricultural self-employment

$ysdepemp$ = self-employment income/10,000, if household head is dependent employed

$ystmpemp$ = self-employment income/10,000, if household head is temporarily unemployed

$ysunemp$ = self-employment income/10,000, if household head is permanently unemployed

$civilserv$ = 1 if main household income is from civil service dependent employment

$ttmpemp$ = 1 if head of household is temporarily unemployed

to account for non-linearities in the relationship between taxed and taxable income. Multiple problems with fitting the segments of the cubic spline with two internal knots within a Tobit estimate have so far prevented this.

<i>unemp</i> =	1 if head of household is permanently unemployed or out of labour force
<i>pens</i> =	1 if main household income is from pension
<i>ypension</i> =	household retirement income subject to tax /10,000 (included in yall)
<i>realest</i> =	market value of total real estate of owners of rental real estate /100,000
<i>realestr</i> =	market value of rental real estate owned by renters /100,000
<i>realestoo</i> =	market value of total real estate of owner occupiers /100,000
<i>yinterest</i> =	annual monetary asset income net of capital gains, dividends and returns of investment funds /10,000
<i>ycapinc</i> =	annual capital income subject to tax/10,000 (included in yall)

Tax relevant precautionary contributions

<i>oldagec</i> =	tax deductible contributions for some retirement provision schemes /10,000
<i>healthinsc</i> =	tax deductible contributions for basic health insurance /10,000
<i>nursinsc</i> =	contributions for nursing insurance /10,000

Tax relevant household indicators

<i>child</i> =	no. of persons under 18 in household
<i>otherpers</i> =	no. of persons aged 18-25 in household other than head and partner
<i>age</i> =	1 if household head is 50-65 years old
<i>married</i> =	0 if household head married and living with spouse
<i>unmarried</i> =	1 if household head is unmarried or widowed (but not divorced)
<i>sepfem</i> =	1 if female household head divorced or permanently living separately
<i>sepmal</i> =	1 if male household head divorced or permanently living separately
<i>sepfchild</i> =	1 if sepfem = 1 and at least one child
<i>region</i> =	0 if household lives in a community with more than 20,000 inhabitants; or if selfemp or selfempa or unemp = 1
<i>rural</i> =	1 if household lives in community with up to 20,000 inhabitants, and main income from dependent employment

Own table, based on [Lang et al. \(1997, p. 334\)](#). For more details on the composition of some variables (e.g. gross income subject to tax), see the technical appendix.

The variables considered for the estimate are summarised in table 10, let me motivate their inclusion in turn. Most of them are taken over from [Lang et al. \(1997\)](#), however some changes are applied to improve the estimation and to adapt to the 2013 tax code.

Taxed income *y_{tax}* as the dependent variable is computed from the reported tax payments and refunds of the household. Joint filing of married couples is taken into account by using information from the previous analysis in part 1, where I estimated whether a couple opts for splitting or individual assessment.

Taxable income before deductions *y_{all}* is taken from the previous analysis as well, however in line with Lang et al. income from real estate is reduced by operations and maintenance expenses and related interests on debt. In contrast to them, I exclude imputed rents for owner occupiers, which are included in gross income measures of the EVS but do not constitute tangible taxable income.

Additionally, I consider four groups of explanatory variables that control for deduction possibilities. Sticking to [Lang et al. \(1997\)](#), two groups concern income sources with differential tax treatment, while one contains household characteristics that are relevant for the extent of tax savings. Since most life insurance and building society contributions are not deductible in the same way they were in 1983, those variables are excluded. Instead, I add some tax-relevant precautionary expenses that were defined earlier in the analysis.

The employment status *empstatus* is included to differentiate between different types of employment that enjoy varying tax write-off opportunities: All tax payers with dependent employment are granted a general allowance of EUR 1,000, but may also claim (higher) itemised professional expenses. However, there are major differences when it comes to “special expenses” (see table 1 and the technical appendix for more details) that consist mostly of precautionary spending. For instance for civil servants, most of the sickness costs are covered by the employer, so they normally are no members of the public health or nursing insurance. Moreover, the state pays their pension directly from the fiscal accounts, so they also do not contribute to the public pension system. In contrast, regular dependent employees, including public employees that do not enjoy civil servant status, bear higher mandatory social security costs which are deducted as “special expenses”.

Further controls are established for the self-employed (*selfemp*), who enjoy special general allowances for business expenses if they are members of some freelancer professions. Farmers (*selfempa*) are granted an allowance of EUR 670 if their income is below EUR 30,700 (double amount for jointly filing married couples). In general,

they have more discretion about the amount of income and expenses they report to the fiscal authorities. For the same reason, the self-employment incomes of dependent employees *ysdepemp* and of the temporarily and permanently unemployed (*ytmpemp* and *ysunemp*) are included.

A dummy for temporarily unemployed (*tmpemp*) is included to control for cases of temporary employment where income taxes are withdrawn at the source under the (false) assumption that those incomes persist during the whole year.²² If the head of the household is permanently unemployed (*unemp*), gross taxable income mostly derives from black market activities or employment of further household members.²³ Pension income (*ypension*) is included to follow Lang et al., however for my analysis it only contains taxable components that were calculated during the previous analysis. As these components are already included in *yall*, I alternatively also add the dummy *pens* for households with heads whose main income source is a pension.

The market value of rental real estate *realest* is included primarily because income from rent enjoys considerable tax write-off opportunities in terms of side costs, interests on related debt, depreciation, restoration and modernisation expenses (see the technical appendix). Hence, it may even become negative and then be set off against other sources of income. Therefore on average, tax write-offs may increase with rising real estate market value. The differentiation into rental real estate of renters and owner occupiers (*realestr* and *realstoo*) is implemented to replicate [Lang et al. \(1997\)](#), however their variable for owner occupiers owning no other real estate was excluded because these home owners are not given preferential tax treatment anymore. Further controls concern income from monetary assets, where *yinterest* is defined to replicate the variable of Lang et al. as closely as possible, while *ycapinc* is the taxable component of capital income taken from my previous analysis. German capital income is taxed at the source and the fiscal authority's grip on domestic accounts was strengthened, but substantial possibilities to evade foreign capital income remain ([Fauser & Miethe 2018](#)).

Precautionary expenses are included because they make up the largest share of special expenses, which in turn are the most important deduction category. The

²²Please note that I compute it by taking those household heads that report unemployment benefits (ALG I), since no information on the duration of work contracts is observable (only on the amount of hours worked and whether the job is full or part time). Therefore, it is at best a crude approximation to the desired item.

²³Again, this approximated rather roughly by taking those that receive social welfare benefits (ALG II).

three variables *oldagec*, *healthinsc* and *nurinsc* are taken from the previous analysis.

The number of children is controlled for, because in 2013 each parent was allowed to deduct EUR 3,502 per child per year, i.e. EUR 7,004 for joint filers. However, the tax saving generated by deducting the amount is set off against the child benefits (already paid out). Therefore, only higher income households benefit from this child allowance. Additional write-off opportunities pertain to childcare for children below 14, where 2/3 of expenses up to EUR 4,000 per child are deductible. Eligibility for child benefits or child allowance is extended if the child was unemployed (up to 21 years) or undergoing education (up to 25 years). Hence, *otherpers* is included as a proxy for this constellation. The variable *age* is added to capture possible deductions of EUR 924 for a child undergoing education away from home. As these children are not captured in the EVS data, this case is proxied by an appropriate age bracket of the head of the household.

The variables for unmarried or separated persons (*unmarried* and *sepfem*) should capture the disadvantageous tax treatment in comparison to married couples using joint filing. Replicating Lang et al., *sepmal* controls for tax-deductible alimony payments to children not living in the own household.

Finally, commuter allowance deductions are approximated using the *region* and *rural* controls²⁴.

Results of the replication exercise of [Lang et al. \(1997\)](#) are found in table ?? . Please note that the sole category of analysis are households this time. Column 1 shows results of a specification that stays closely to their application, column 2 deletes some insignificant variables while adding a dummy for pensioners and the precautionary contribution variables. Even though many coefficients show the expected sign, there are some peculiar results that require interpretation.

Unsurprisingly, taxable income before deductions remains a strong predictor for taxed income. Like in [Lang et al. \(1997\)](#), civil servant status seems to increase taxed income. Their reasoning that this profession faces a higher career penalty when detected evading tax, seems to hold in 2013 as well as in 1983.

As expected, the total amount of real estate owned has a negative impact on taxed income. This reflects the deduction possibilities of landlords. Similarly, capital income shows a negative coefficient, pointing at underreporting as a possible explanation. Children (insignificant) and other persons in the household as well as

²⁴Confidentiality restrictions for the EVS data prevent me from replicating the variables of Lang et al. any closer, also taking into account the distance to the next city.

Dependent variable: *ytax*

	(1)	(2)
yall	1.193*** (0.025)	1.080*** (0.026)
yall2	-3.250*** (0.281)	-3.174*** (0.264)
yall3	0.484*** (0.090)	0.540*** (0.089)
yunemp	0.919*** (0.036)	1.047*** (0.024)
empstatus	-1.134*** (0.068)	
selfemp	1.188*** (0.117)	0.008 (0.091)
selfempa	2.165*** (0.437)	1.185** (0.433)
civilserv	1.358*** (0.071)	0.626*** (0.045)
tmpemp	0.596** (0.217)	-0.532* (0.250)
unemp	-1.068*** (0.215)	-1.944*** (0.231)
ypension	0.295*** (0.038)	
ysdepemp	-0.116 (0.070)	
ytmpemp	0.242 (0.637)	
ysunemp	2.388 (2.125)	
realestr	0.006 (0.020)	
realest	-0.056** (0.018)	-0.067*** (0.012)
realestoo	-0.003 (0.021)	
ycapinc	-0.555*** (0.071)	-0.607*** (0.078)
child	-0.024 (0.014)	-0.015 (0.013)
otherpers	-0.145*** (0.034)	-0.174*** (0.034)
age	0.004 (0.020)	0.014 (0.020)
unmarried	0.359*** (0.024)	0.375*** (0.024)
sepfem	0.266*** (0.030)	0.341*** (0.026)
sepmal	0.503*** (0.047)	0.558*** (0.047)
sepfchild	-0.001 (0.049)	
rural	-0.069 (0.039)	-0.012 (0.016)
region	0.043 (0.036)	
pens		-1.040*** (0.065)
oldagec		1.121*** (0.148)
healthinsc		0.789*** (0.079)
nursinsc		3.011*** (0.607)
Constant	-1.929*** (0.068)	-2.152*** (0.057)
Observations	42,792	42,792
Log Likelihood	-56,798.000	-56,541.000
Wald Test	37,915.000*** (df = 27)	40,943.000*** (df = 22)

Note:

*p<0.05; **p<0.01; ***p<0.001

the age variable also show a negative coefficient, which is in line with deduction possibilities and the reasoning provided for including them. Living in a rural area also expectedly reduces taxed income (yet, insignificantly), presumably reflecting commuting expenses which are claimed as tax deductions.

Coming to the coefficients that are at odds with my expectations, most surprisingly self-employment status seems to increase taxed income. Moreover, also temporary employment, unemployment and agricultural self-employment status show positive signs. For the household characteristics, the same is true for status of singles, separated females as well as males.

A range of variables only show insignificant indicators: employment status (which correlates heavily with taxable income), but also pension income, income of households with differing employment status (`ysdepemp`, `ystmpemp` and `ysunemp`), real estate value of renters and owner occupiers, the dummy for separated females with at least one child and also the region indicator.

More work needs to be done to improve the Tobit estimate, and the resulting aggregate estimate (the latter not shown here). Overcoming singularity issues when fitting the Tobit MLE while including the non-linear spline terms is on the author's agenda as well as checking for problems with multicollinearity.