Essays on Inequality: Income Distribution, (Just) Taxation and Well-being

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Kapitel 2: An integrated approach for a top-corrected income distribution

- Kapitel 2 basiert auf einem veröffentlichten Artikel, der zu gleichen Teilen mit Charlotte Bartels verfasst wurde. Teile von Kapitel 2 sind gegenüber dem zitierten Artikel verändert worden.

- Bartels und Metzing (2018) *An integrated approach for a top-corrected income distribution,* Journal of Economic Inequality (Online First).

- Bartels und Metzing (2017) *An integrated approach for top-corrected ginis,* SOEP-papers on Multidisciplinary Panel Data Research 895, DIW Berlin, The German Socio-Economic Panel (SOEP).

- Bartels und Metzing (2017) *An integrated approach for top-corrected ginis,* IZA Discussion Papers 10573, Institute of Labor Economics (IZA).

Kapitel 3: Optimal taxation under different concepts of justness

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- Jessen, Metzing und Rostam-Afschar (2018) *Optimal Taxation Under Different Concepts of Justness,* Ruhr Economic Papers 762, RWI - Leibnitz-Institut für Wirtschaftsforschung, Ruhr-University Bochum, TU Dortmund University, University of Duisburg-Essen.

- Jessen, Metzing und Rostam-Afschar (2017) *Optimal Taxation Under Different Concepts of Justness,* SOEPpapers on Multidisciplinary Panel Data Research 953, DIW Berlin, The German Socio-Economic Panel (SOEP).

- Jessen, Metzing und Rostam-Afschar (2017) *Optimal Taxation Under Different Concepts of Justness,* Discussion Papers 2017/26, Free University Berlin, School of Business & Economics.

- Jessen, Metzing und Rostam-Afschar (2017) *Optimal Taxation Under Different Concepts of Justness,* Hohenheim Discussion Papers in Business, Economics and Social Science 27-2017, University of Hohenheim, Faculty of Business, Economics and Social Science.

Kapitel 4: Do justice perceptions support the concept of equal sacrifice? Evidence from Germany?

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Kapitel 5: Experienced well-being and labor market status: the role of pleasure and meaning

- Kapitel 5 basiert auf einem unveröffentlichten Artikel, der zu gleichen Teilen mit Richard E. Lucas und Tobias Wolf verfasst wurde.
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Contents

1 Preface: Motivation and contribution

1.1 Motivation

Inequality is one of the most discussed issues of our time. Researchers from a variety of fields including but not limited to economics, sociology, and politics are dealing with the subject. Inequality is also frequently discussed in the media and by politicians and thus has a firm hold on the public debate and consciousness.

Inequality is determined by many factors and the adjustment towards equal living conditions requires a variety of fundamental information, e.g. knowledge about income distribution, redistribution principles (implemented through tax schemes) to reduce inequality without reducing welfare, the consideration of social preferences, and the understanding of individual motivation as a factor to reduce inequality. Inequality is not simply expressed through differences in income and wealth, but also by non-monetary factors. The OECD defines eight main dimensions of inequality; income, health, gender, education, tax, region, innovation, and well-being.[1]

When we talk about inequality, most people think of income, wealth, and consumption inequality. Due to an ample availability of data, income in particular is relatively easy to measure.[2] For a long time, those measures have belonged to the main important dimensions of inequality. However, other dimensions are also important in describing inequality. Inequalities in health stem from many factors, such as living standards, working conditions, access to health care, and influence e.g. employment options, income, and well-being. The reduction of gender inequality with respect to education, employment, and entrepreneurship can reduce inequality and may increase growth. Moreover, equality, or at least equal opportunity, in education is also a significant driver for labor income equality due to different options in the job market. Furthermore, to reduce income inequality, tax schemes can play an important role. As discussed by the OECD, economic progress is affected by the impact of innovations. But innovations do not affect everyone equally and can lead to imbalances, e.g. between the urban and rural population. Therefore, the social, economic, and geographic impact of innovation policies must be taken into account. In addition, the OECD focuses on reducing differences between regions as a key driver for reducing inequality. Furthermore, some dimensions of inequality e.g. health or wealth inequality are key indicators for subjective well-being

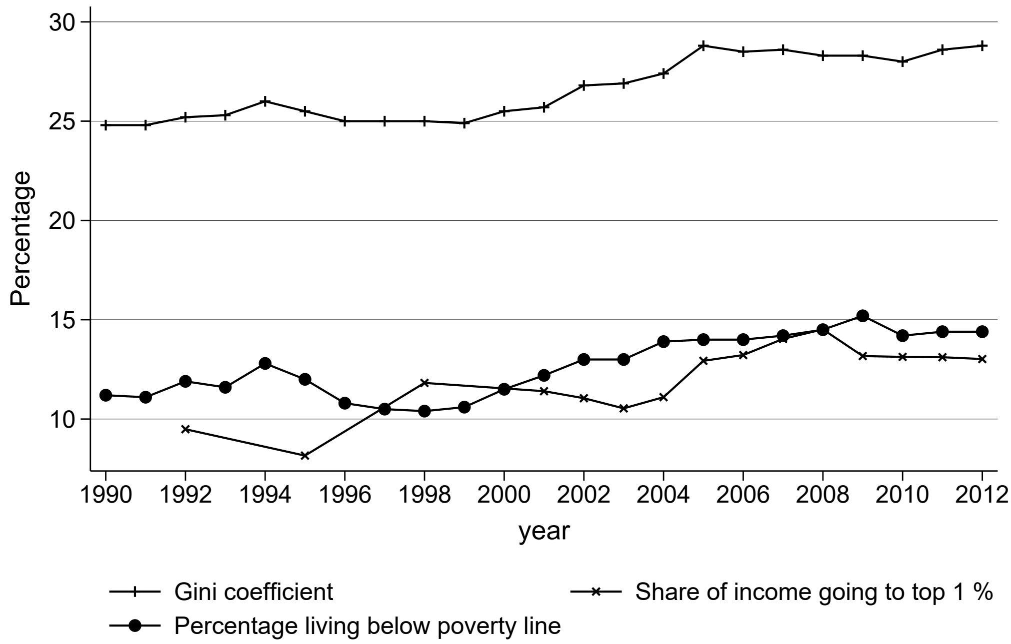
[1] An overview about all eight dimensions including publications is available online at http://www.oecd.org/social/inequality.htm.

[2] There are fewer data sources on wealth and consumption, especially for Germany.

(for an overview see Dolan et al., 2008). This dissertation focuses on three inequality dimensions: income, (just) taxation, and well-being.

1.1.1 Inequality and income

How has income inequality evolved in Germany and other countries? How should it be measured? These questions are not easy to answer. Results and policy recommendations differ depending on the measure used. Three popular measures are: the Gini coefficient, the income share of the top 1%, and the percentage of people living below the poverty line.



Source: https://www.chartbookofeconomicinequality.com/
Note: The calculation of the Gini coefficient and the poverty rate is based on the equivalized (modified OECD scale) disposable household income for household size. The calculation of the Top 1 % is based on gross income (tax units). Gini and percentage living below the poverty line depends on SOEP data, whereas the top incomes, provided by WID, are based on tax income records.

Figure 1.1: Income inequality in Germany, 1990-2012

The big advantage of the Gini coefficient is that it summarizes the degree of inequality of a given income distribution in one index number, ranging between zero and one. A Gini of zero indicates that all incomes are distributed equally, while a coefficient of one describes a totally unequal distribution, in which only one person receives income and all others do not. Documented trends relying on the Gini coefficient are more sensitive to changes in the middle of the distribution and less for changes at the bottom or the top. In contrast, the top income share is much easier to understand. A top 1% income share of 20 indicates that 20 % of all income is held by the top 1% of earners. But here, we only focus on the changes of the very rich within a distribution, while information about the middle incomes and poor are missing. Individuals are commonly defined as poor if their equivalized net income is below a given relative poverty line. The OECD uses, for example, 60% of the median. If the poverty rate is 15%, it means that 15% of the population is in danger of living in poverty. Figure 1.1 shows the three described income inequality measures for Germany (1990-2012).

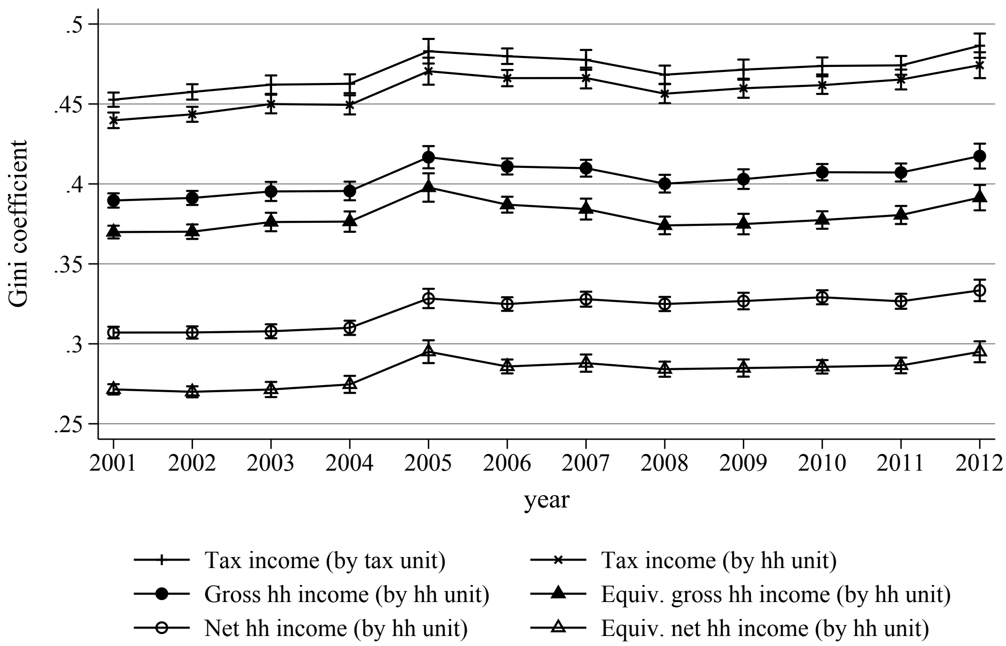
From 1990 until 2000, the Gini, based on equivalized (using the modified OECD scale) disposable household income (household size-weighted), was rather stable in Germany. With the reoccurring rise of unemployment, the Gini rose between 2000 and 2005, when it reached its maximum. Since 2005, the Gini is rather stable on a new plateau. In contrast to the Gini, the top income share and the indicator for poverty are more volatile. The share of the top 1 % decreased from 1992 to 1995, with its first peak in 1998. Until 2004, the top share was slightly decreasing, then it increased until 2008, when it reached a new peak. With the financial crisis in 2009, the top income share dropped slightly. Since 2009, the income share of the top 1 % is also stable. The poverty line also shows a trend similar to the Gini. A first small peak was in 1994; thereafter it decreased and was rather stable until 1999. From 2000, poverty increased until 2004, when it reached a new plateau. A last small peak of the poverty line in 2009 goes hand-in-hand with a drop in the top income share. This cannot be observed in the course of the Gini. For this reason, the choice of the inequality measure is very important and should be carefully considered.

Besides different sensitivity of measures to changes at the top, middle, or bottom of the income distribution, another reason for diverging trends is much less investigated: the underlying data that is used to calculate inequality measures. While the top income share in Figure 1.1 is based on tax data, the Gini and the poverty rate are based on household survey data. As shown in Figure 1.1, top income shares and survey data based Gini coefficients or poverty rates indicate deviating inequality trends for Germany. This divergence is of particular concern if we are interested in current inequality trends and the effect of recently introduced policies. One shortcoming of survey data is the possible undercoverage and underreporting of top incomes, which may produce a downward-bias for survey-based inequality measures. On the flip side, tax data only includes people who complete their tax declaration, mainly rich and middle-income earners. For this reason, a growing number of studies examine these differences by combining administrative and survey data (Burkhauser et al., 2012; Armour et al., 2013; Bricker et al., 2016; Burkhauser et al., 2016; Jenkins, 2017) or by adjusting survey-based Gini coefficients with tax data-based top income shares (Atkinson et al., 2011; Alvaredo, 2011; Bartels and Metzing, 2018). However, most contributions are based on the access to tax record microdata, which is usually difficult to access and which requires extensive knowledge of the country's tax rules in order to harmonize income concepts. Furthermore, most of these studies focus on inequality trends of tax income and do not document inequality trends of living standards.

In chapter 2, Charlotte Bartels and I develop a new method to obtain top-corrected income distributions by combining easily available information from tax and survey data. Our approach does not rely on tax record microdata, which is limited and difficult to obtain in many countries. In addition, our approach does not need cross-database record linkage, which is often not allowed. In contrast to the decomposition approach for top-corrected Gini coefficients (Atkinson, 2007; Alvaredo, 2011), which exclusively relies on tax incomes of tax units, our integrated approach allows for producing inequality measures for a variety of income definitions and for the entire population of a country.

1.1.2 Inequality and (just) taxation

As discussed in the section above, it is important to know which measure and data source is used to evaluate levels and trends in income inequality. In addition, the income definition is also crucial.



Source: SOEP v30 (own calculations).
Note: Gross household income includes social security pensions as they are partly included in taxable income under German tax law. Vertical lines show bootstrap confidence intervals at the 95%-level based on 200 drawings.

Figure 1.2: Gini coefficient, transitioning from tax to survey data definitions, Germany

The gradual transition from income tax data definitions to survey data definitions using German Socio-economic Panel Study (SOEP) data reveals a decline in inequality measured by the Gini coefficient, as shown by Figure 1.2. The highest level of inequality is calulated by a Gini that is based on tax income per tax unit. The Gini coefficient reduces by about 3% if the tax income is aggregated at the household level by household unit. If one considers the gross income of households by household unit instead of the tax income of households, the result is a Gini reduction of about 12%. By equivalizing gross household income by household unit to account for differences in households' needs, the Gini declines by another 5 to 8%. Focusing on net incomes instead of gross incomes results in lower Gini coefficients across all possible observation unit definitions. Regarding net household income by household unit, the Gini declines by 8 to 10%. When equivalizing net household income, the Gini decreases again by around 5%. The application of different definitions of income and observation unit leads to significant differences in inequality levels: the Gini of tax income by tax unit is about 15%-points higher than the Gini of equivalent net household income. Altogether, the income concept has a major influence on the measured inequality level. As increasing inequality is a central topic in politics, tax policy has an important role for reducing it. As shown in Figure 1.2, German tax and transfer policy reduces inequality by around 10 %-points in terms of the Gini.

Therefore, when considering inequality, we should ask the question: What should taxation look like? The standard approach in the welfarist optimal taxation literature is to assume that social weights decrease with income (e.g., Saez, 2001, 2002; Blundell et al., 2009). The hypothesis of decreasing welfarist weights enunciates the idea that the social planner values an increase of net income of the poor by one currency unit more than an increase of net income of higher income groups by one currency unit. This pattern lies within the bounds confined by the two extreme cases of Rawlsian and a Benthamite objective functions. In the case of a Rawlsian objective function, the worst-off individual has the highest weight, e.g. one and all other individuals zero and in an utilitarian framework, Benthamite objective function, the weight for all individuals would be equal to one.

In chapter 3, Robin Jessen, Davud Rostam-Afschur, and I use the optimal taxation framework of Saez (2002) to calculate weights of a social planner's function, as implied by the German tax and transfer system based on different concepts of welfarism and alternative principles, where the social planner minimizes the weighted sum of increasing functions of *absolute* and *relative tax burdens*. This reflects the idea, often espoused in public debates, that the total tax liabilities of specific groups matter for the design of the tax system and that very high tax liabilities should be avoided *per se*. In addition, we use a novel question from the SOEP questionnaire to address subjective justness as an alternative principle. We find that *absolute tax burden principle* corresponds with social weights that decline with net income.

As shown in chapter 3, the evaluation of the German tax and transfer system is in line with decreasing social weights if the social planner minimizes the *absolute tax burden* and not with the common assumption in the optimal taxation literature where the social planner maximizes a welfarist social welfare function with weights that decrease with income. This result leaves open if individual preferences are also in line with alternative principles. With regard to individuals' preferences, Weinzierl (2014) shows that most American respondents prefer a tax scheme that confirms absolute Equal Sacrifice, where everyone has to bear the same absolute sacrifice, or a mixture of absolute Equal Sacrifice and Utilitarianism. The Equal Sacrifice principle goes back to Mill (1848) who ruled out that Equal Sacrifice means that all taxpayers have to bear the same sacrifice where paid taxes can be seen as a sacrifice from taxpayers (Richter, 1983). This alternative to optimal income taxation theory follows the ability-to-pay principle.

In chapter 4, I examine if Germans prefer Equal Sacrifice. The idea is to use the two questions in the SOEP on perceived fair gross and net income, then transform them into an indicator for a derived fair income tax rate and develop a fair (income) tax schedule. To be concrete, I compare three different Equal Sacrifice definitions (see Richter (1983); Young (1988); Musgrave (2005)): (1) Absolute Equal Sacrifice is achieved if everyone gives up the same amount of utility in remitting taxes whereas (2) Relative Equal Sacrifice is achieved if everyone sacrifices the same percentage of utility of the tax burden and (3) Marginal Equal Sacrifice is achieved if the first derivative of the utility in paying taxes is the same for everyone.

1.1.3 Inequality and well-being

Besides the monetary dimensions of inequality, non-monetary dimensions, such as well-being indicators, are also important for measuring and understanding inequality. Therefore, the Stiglitz-Sen-Fitoussi Commission recommended measuring individual welfare to describe the wealth and social progress of nations (Stiglitz et al., 2009). One potential measure of individual welfare is subjective well-being (SWB).

One of the most detrimental life events for SWB is unemployment (see, for instance, Kassenboehmer and Haisken-DeNew (2009)). In contrast to predictions of standard economic models, many studies show that being unemployed has a negative effect on one's general evaluation of life. However, the evaluative measure for life satisfaction misses at least two economically relevant aspects that might be shaped by labor market status: time-use and emotions. Another component of SWB is experienced well-being that combines time-use and the accompanying emotional experiences. A strand of literature in behavioral economics research shows that decisions are shaped largely by emotional experiences (Kahneman et al., 2004b; Adler et al., 2017) and that being unemployed or employed is central for experienced well-being (Knabe et al., 2010). So far, the findings are still puzzling: it is not clear whether there is a disutility from work or if the gain of further leisure improves or deteriorates emotional experiences throughout the whole day.

In chapter 5, Richard E. Lucas, Tobias Wolf, and I investigate experienced well-being for a nationally representative sample. To obtain robust results we control for unobserved individual heterogeneity. We use a unique dataset from the Innovation Sample of the German Socio-economic Panel Study (SOEP-IS) that allows us to assess individual time use and accompanying experienced well-being in a detailed and annually repeated manner. Experienced well-being is surveyed via individual retrospective diaries (the day reconstruction method - DRM) that allows us to mitigate not only the shortcomings of selective experimental samples and cross-section research designs but gives us the further opportunity to propose a temporal cardinal measure of experienced well-being, which states the individual share of total time in pleasurable activities spent during the DRM day.

In chapter 5, we show that - in contrast to evaluative life satisfaction - the average unemployed person experiences more pleasurable minutes due to the absence of working episodes. Hence, we examine working episodes in depth. Besides pleasure at work, meaning could also be a motivation for going to work. In the second part of chapter 5, we focus on the association between perceived meaning at work and the experience of a pleasuarable working episode. Finally, we additionally validate this finding with the standard job satisfaction measure to check if meaning is a driving force for utility from work.

1.2 Main findings and contribution

This dissertation focuses on the three aforementioned dimensions of inequality: income, (just) taxation, and well-being. All chapters focus on a similar time horizon and essentially on the same geographical area: Germany, in 2000 to 2015. The chapters are organized in four parts, each is examining a specific research question and is based on evidence from micro data - the German Socio-Economic Panel (SOEP). The analysis of chapter 2 is additionally based on European Union Statistics on Income and Living Conditions (EU-SILC).

1.2.1 Chapter 2: An integrated approach for a top-corrected distribution

Chapter 2 provides a new integrated approach for top-corrected income distributions. Household survey data provide rich information on income, household context, and demographic variables, but tend to underreport incomes at the very top of the distribution. Administrative data, like tax records, offer more precise information on top incomes, but without household context or the incomes of non-filers at the bottom of the distribution. Therefore, we combine the benefits of the two data sources and develop an integrated approach for top-corrected income distributions where we combine information on the top 1% of the distribution from tax data with the bottom 99% of the distribution from survey data. Concretely, we estimated parameters of the Pareto distribution from top income shares and then replaced the top 1% of the survey income distribution with Pareto-imputed incomes.

One advantage of our approach is that it is easily applicable by relying on information publicly available in the World Wealth and Income Database (WID) and easily accessible survey data as SOEP or EU-SILC survey data. One advantage over other studies (e.g. Jenkins (2017)) is that neither access to tax record microdata nor record linkage is needed. In addition, our integrated approach allows for producing a variety of measures for the inequality of living standards and, in contrast to other approaches as proposed by Atkinson (2007) or Alvaredo (2011), our integrated approach allows for addressing additional research questions: that includes decomposing inequality by groups other than income, applying resampling frameworks (e.g. bootstrap or jackknife), and using the top-corrected income distribution for regression analysis.

For our analysis, we use the Gini as the main inequality indicator in a given income distribution and apply our approach to German SOEP and European EU-SILC survey data, which include administrative data for some countries. The top-corrected Ginis based on German SOEP data for 2001-2012 are about 5% higher than the unadjusted Ginis. In addition, we estimate top-corrected Gini coefficients for European countries where the WID provides information on the top income distribution and find higher inequality in those European countries that exclusively rely (Germany, UK) or have relied (Spain) on interviews for the provision of EU-SILC survey data as compared to countries using administrative data.

1.2.2 Chapter 3: Optimal taxation under different concepts of justness

In chapter 3, we reconcile a striking discrepancy between current tax-transfer-schedules in many countries and the general implications in the optimal taxation literature. A common assumption in the optimal taxation literature is that the social planner maximizes a welfarist social welfare function with weights decreasing with income stemming from decreasing marginal utility of consumption. However, high transfer withdrawal rates in many countries imply very low weights for the working poor in practice. We reconcile this striking descrepancy by extending the optimal taxation framework by Saez (2002) to allow for alternatives to welfarism. In an exercise of positive optimal taxation, we calculate weights of a social planner's function as implied by the German tax and transfer system based on the concepts of welfarism and alternative principles. Under the alternative principles the social planner minimizes the weighted sum of increasing functions of absolute or relative tax burdens (*absolute and relative tax burden principle*). This reflects the idea that the total tax liabilities of specific groups matter for the design of the tax system and very high tax liabilities should be avoided *per se*. While this point is often made in public debates, it does not follow from welfarist considerations.

We make three main contributions to the literature. Firstly, our paper is an extension of the Saez (2002) model to non-welfarist aims of the social planner. In our approach, we define the implicit weights of the social welfare function in terms of justness functions instead of utility functions. Secondly, we make an operationalization of an alternative specific idea of justness, which we label the tax burden approach. According to this approach, the social planner minimizes the weighted sum of increasing functions of (absolute or relative) tax liabilities. Thirdly, we show how the model can be calibrated using survey data. For this, we use a question on the just amount of income from the German Socio-Economic Panel and apply the model to the 2015 German tax and transfer system. Furthermore, we estimate labor supply elasticities using the STSM, a microsimulation and a structural labor supply model (see Steiner et al., 2012; Aaberge and Brandolini, 2014).

We note that the 2015 German tax and transfer system implies very low social weights for the working poor according to the welfarist criterion. The social planner values increasing the income for the working poor by one currency unit 0.75 times as much as increasing the income of top earners by one currency unit. This means that an additional currency unit of consumption for the working poor is valued less than marginal consumption of top income earners. However, we find that the *absolute tax burden principle* is in line with social weights that decline with net income.

1.2.3 Chapter 4: Do justice perceptions support the concept of equal sacrifice? Evidence from Germany?

In chapter 4, I investigate whether individuals consider Equal Sacrifice as fair when it comes to income taxation. The ability-to-pay approach assesses taxes paid as a sacrifice by the taxpayers. This raises the question of how to define and how to measure the sacrifice: in absolute, relative, or marginal terms? U.S. respondents prefer a tax schedule that is either a pure (absolute) Equal Sacrifice or a mixture of Equal Sacrifice and Utilitarianism (Weinzierl, 2014). To determine whether Germans prefer absolute, relative, or marginal Equal Sacrifice principles for their income taxation, I use two novel questions from the German Socio-Economic Panel (SOEP) questionnaire on fair gross and net income. I transform them into an indicator for a fair social security and income tax rate, which is then used to develop a fair social security and (income) tax scheme. As the ability-to-pay differs for different household types, equivalized household income is used. I estimate tax and transfer schedules with regard to three Equal Sacrifice definitions and analyze which of the three is the dominant candidate.

Unique to the approach of this study is that respondents were asked to determine their own fair gross and net incomes directly and did not have to choose between a set of taxation scheme alternatives. Furthermore, I am the first who uses German data in this context.

I find that the principles of absolute Equal Sacrifice and relative Equal Sacrifice are the dominant candidates and fit best with the survey data. I also find that the fair tax schedule should be progressive.

1.2.4 Chapter 5: Experienced well-being and labor market status: the role of pleasure and meaning

In chapter 5, we examine the role of experienced well-being for both - the employed and unemployed. For that purpose, we make use of the Innovation Sample of the German Socio-economic panel study (SOEP-IS). The survey-adapted version of the day reconstruction method (DRM) provides us with representative data in the form of an individual panel, that allows to control for individual heterogeneity. We create an indicator, the P-index, that describes the share of pleasurable minutes during the reported DRM-day. As conducted in other studies, we can omit the choice of relevant mood adjectives (Knabe et al., 2010).

We make two main contributions to the literature. Firstly, we are at the forefront of examining experienced well-being for a nationally representative population. We use a uni-dimensional pleasure measure in a general household survey with individual effects. Secondly, empirical evidence for the importance of meaning for job satisfaction based on a cardinal time use indicator remains to be explored in the literature.

We find that the unemployed report higher experienced well-being. By controlling for a working episode during the reported DRM-day, we find that it is not the labor market status, but rather the existence of a working episode which affects the experienced well-being negatively. Therefore, we examine work in depth. Besides pleasure at work, meaning could also be a motivation for going to work. We find that the meaning of the work episode increases the probability of having a pleasurable working episode. Thus, meaning enhances pleasure at work. We additionally validate this finding with the standard job satisfaction measure, and find that meaning is a driving force for utility from work.

2 An integrated approach for a top-corrected income distribution[1]

2.1 Introduction

Has inequality of living standards in European countries increased in recent years? The answer is far from conclusive, varying as we look at different inequality measures and different data sources. A well-known and intensively discussed reason for diverging trends is the inequality measure's sensitivity to changes in the top, middle or bottom of the income distribution. Another reason for diverging trends is much less investigated: the different nature of the data employed to estimate inequality measures. Whereas the top income share literature based on tax data produces wide evidence of rising inequality in recent decades, survey-data-based inequality studies find less clear trends.[2]

Tax and survey data are substantially different in the definition of income and unit of observation. Household surveys usually apply a comprehensive income concept, while tax data contain income subject to taxation.[3] While incomes in survey data are aggregated at the household level, the income-receiving unit in tax data is the tax unit. If household members pool their income, the narrower sharing unit of a tax unit usually produces higher inequality. Furthermore, survey and tax data are affected differently by time-variant factors such as survey response and reporting behavior, tax filing behavior as well as economic, demographic and legislative changes. Undercoverage and underreporting of top incomes may produce a downward-bias for survey-based inequality measures. Tax filing behavior is sensitive to changes in the income tax law creating downward-

[1] This is a post-peer-review, pre-copyedit version of an article published in The Journal of Economic Inequality. The final version is available online at: `https://link.springer.com/article/10.1007/s10888-018-9394-x`

[2] The top incomes literature produces internationally comparable measures for income concentration at the top of the distribution based on taxable incomes received by tax units, which are assembled in the World Inequality Database (WID) available online at `http://www.wid.world/`. Top income shares and survey-data-based Gini coefficients, e.g., collected in the OECD database, indicate deviating inequality trends for some countries. In Germany and the United Kingdom, the income share of the top 1% has increased since the mid-2000s, whereas the Gini remains rather stable. In Spain, while the top 1% income share falls after peaking in 2006, the Gini has steadily increased since 2006 (see Appendix Figures 2.A1 and 2.A2).

[3] Not only do household surveys document a variety of market income sources, they also incorporate private transfers. In contrast, tax incomes ever more frequently exclude capital income due to the introduction of dual income taxation where capital income is taxed separately. This is the case for Germany since 2009.

or upward-bias before or during reform years. Top income earners tend to benefit disproportionately from economic growth (Roine et al., 2009), which in turn produces higher inequality estimates in tax data than in survey data where top income earners are underrepresented. Changes in the number of unmarried couples affects tax-based inequality measures in countries with joint taxation where the direction of the effect depends on the degree of assortative mating.

For the United States and the United Kingdom, a growing number of studies investigates these differences by reconciling estimates from administrative and survey data (Burkhauser et al., 2012; Armour et al., 2013; Bricker et al., 2016; Burkhauser et al., 2016; Jenkins, 2017) or adjusting survey-based Gini coefficients with tax-data-based top income shares (Atkinson et al., 2011; Alvaredo, 2011). However, these contributions draw on access to tax record microdata which require substantial knowledge of the country's tax rules to harmonize income concepts and are usually difficult to access. This makes cross-country comparisons rather difficult. Furthermore, most of these studies document inequality trends of tax income over tax units that do not necessarily reflect how inequality of living standards evolved for the entire population.

We develop a new method to obtain top-corrected income distributions by combining easily available information from tax and survey data. We replace the top 1% of the survey income distribution with Pareto-imputed incomes using information on the top incomes' distribution from the World Inequality Database (WID).[4] Our approach is easily applicable by relying on information publicly available from the WID for the upper tail of the distribution and easily accessible survey data, such as the German SOEP or EU-SILC, for the middle and bottom of the distribution. Neither access to tax record microdata, which is limited and difficult to obtain in many countries, nor record linkage, which is often not allowed, is needed.[5] In contrast to the decomposition approach for top-corrected Gini coefficients (Atkinson, 2007; Alvaredo, 2011), which exclusively relies on tax incomes of tax units, our integrated approach allows for producing inequality measures for a variety of income definitions and for the entire population of a country, e.g., analyzing inequality in households' needs.

We proceed as follows. First, we reconcile German survey and tax data, examining the extent to which differences in top income share estimates from household surveys and tax returns arise from differences in income concepts, observation units or from the coverage of top incomes. Second, we compare our integrated approach for top-corrected Ginis on German survey data with the decomposition approach (Atkinson, 2007; Alvaredo, 2011). Third, we apply our integrated approach to EU-SILC data and estimate top-corrected Gini coefficients for those European countries where information on the top incomes' distribution is available in the WID.

[4] Another example of a top income imputation approach is in Lakner and Milanovic (2016). They distribute the gap between national accounts and survey means over the top decile according to a fitted Pareto distribution in order to obtain a global Gini coefficient.

[5] Bach et al. (2009) is an example where the authors integrate both survey and tax record micro data to obtain Gini coefficients over the whole spectrum of the population in Germany.

Our results are the following. First, reconciled German survey data show that the top 10-5% and top 5-1% income shares are of similar magnitude in both tax return and survey data. In contrast, survey data report a substantially lower top 1% income share which suggests that this group is not sufficiently captured. We find that different definitions of income and observation unit yield substantially different inequality levels in Germany: the Gini of tax income by tax unit is about 10%-points higher than the Gini of equivalent gross household income by household unit. The selected income concept is responsible for the largest part of this gap, whereas the observation unit changes inequality only slightly as most German households form a single tax unit anyway. Second, our top-corrected Ginis for 2001-2012 Germany are about 5% higher than unadjusted Ginis. Our top-correction method indicates similar trends and slightly lower inequality levels than the decomposition approach (Atkinson, 2007; Alvaredo, 2011). Third, the application of our top-correction approach to EU-SILC survey data shows remarkably higher inequality levels in those countries that exclusively rely (Germany, UK) or have relied (Spain) on interviews for the provision of EU-SILC data. I.e., replacing the top of the survey incomes with Pareto-imputed incomes has a bigger effect on inequality which implies that top incomes are not sufficiently covered by the survey in these countries. For most countries using register data, the gap between top-corrected and unadjusted Ginis is negligible.

The paper is structured as follows. In Section 2.2, we reconcile German household survey data with income tax data definitions, then compute top income shares and Gini coefficients contrasting original and reconciled data. Our new integrated approach for top-corrected income distributions is explained in Section 2.3. In Section 2.4, inequality trends according to top-corrected Gini coefficients in European countries are presented. Section 2.5 concludes.

2.2 Reconciling household survey and income tax return data

Two major differences between household survey data and income tax return data call for reconciling the data before comparing inequality measures across data sources. First, survey data and administrative data differ in what is counted as income. Second, data discord in the definition of the income receiving unit. Household survey based inequality measures include incomes before and after taxes as well as transfers collected using the questionnaires. Incomes aggregated at the household level are then usually adjusted to differences in households' needs using an equivalence scale. Income tax return data document taxable incomes before taxes paid and transfers received by the tax unit which may consist of an individual or a married couple (plus their children) depending on the country's income tax legislation.

We reconcile survey data from the German Socio-Economic Panel (SOEP)[6] and German income tax records.[7] We do this by constructing the observation units and the income concepts of the tax data in the SOEP data. Using microsimulation, we can sort individuals observed in the SOEP into tax units and we can compute their tax income as defined by the prevailing tax legislation from their observed individual income sources. In the reconciled SOEP data, a household with a married couple corresponds to one tax unit and a household with an unmarried couple to two tax units. The income concept recorded by the income tax statistics and which we reconstruct in the SOEP data is the total amount of income (*Gesamtbetrag der Einkünfte*) defined by the German Income Tax Act, which is the sum of the seven income categories (agriculture and forestry, business, self-employment, employment, capital,[8] renting and leasing, as well as other income), plus tax-relevant capital gains less income type-specific income-related expenses, savings allowances, and losses. The old-age lump-sum allowance and exemptions for single parents are deducted.[9] Since a number of large tax-deductible items, such as special expenses for social security contributions, are not deducted at that stage, the total amount of income is considerably higher for most tax units than the eventual taxable income to which the tax rate is applied. For reasons of simplicity, we refer to tax income instead of the total amount of income in the following. The opposite direction, i.e., constructing households and household income of the SOEP data in the tax data, is not possible. Tax records offer very limited information on household context such that tax units cannot be summed up to households.

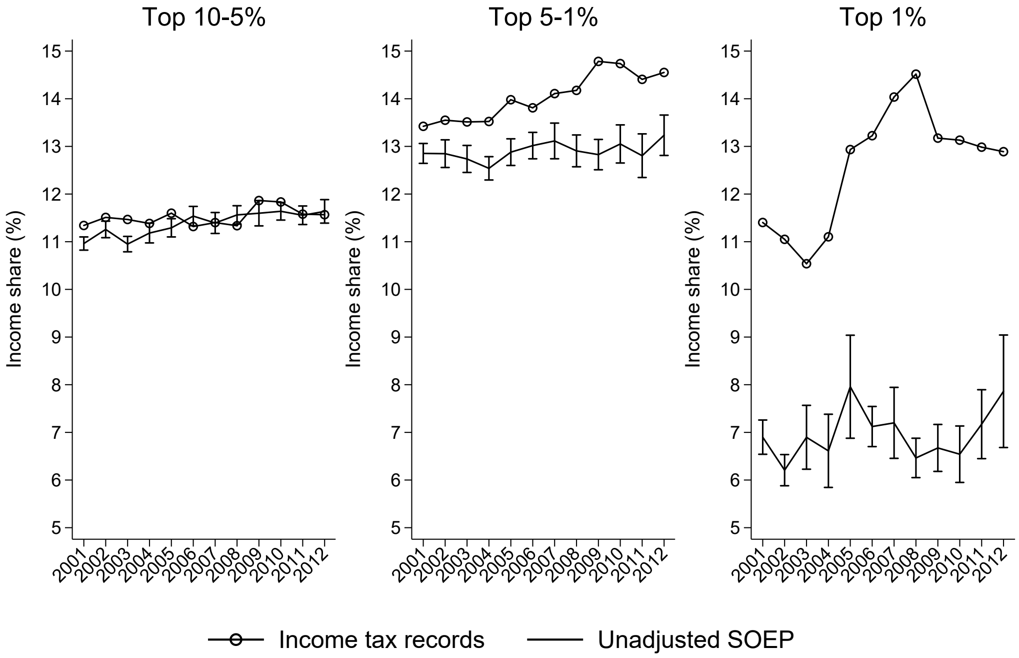
We then compare the estimated share of total income accruing to the top of the income distribution based on reconciled SOEP data and income tax records. In both data sources, the observation unit is the tax unit and the income concept is tax income. It should be noted that SOEP incomes are not, at this stage, top-corrected. Figure 2.1 shows how income accruing to the top decile group in Germany is split among the bottom half (10-5%), the upper 4% (5-1%) and the top 1% and contrasts results from the two data sources.

[6]We use Socio-Economic Panel (SOEP) data for the years 2002-2013, version 30, doi: 10.5684/soep.v30. Incomes in the SOEP date one year back. I.e., incomes from survey year 2002 are from 2001. For further details on German SOEP data see Goebel et al. (2018) or Britzke and Schupp (2017).

[7]Since the data requirement for reconciling data is large and a microsimulation model incorporating the frequent changes of the tax law and transfer regulations must be at hand, we restrict this step of our analysis to Germany. We choose period 2001-2012 because German income tax data became annually available in 2001; 2012 is currently the last available year.

[8]Since the introduction of dual income taxation in Germany in 2009, capital income is taxed separately at a flat rate and, hence, is no longer readily visible in tax data. However, it is still beneficial to declare capital income in their income tax declaration for some tax units, e.g., if the flat rate exceeds their personal income tax rate. But the size of reported capital income is negligible.

[9]The total amount of income is modeled in the SOEP data by deducting the allowances from the gross income of the tax unit and adding the taxable share of the pension income. It should be noted, however, that the total amount of income can only be approximately simulated in the SOEP data because incomes, such as self-employment income, are differently recorded across data sets.



Source: SOEP v30 (own calculations) and income tax records (Bartels and Jenderny, 2015) also available in WID.
Note: The observation unit is the tax unit and the income concept is tax income in both data sources. Vertical lines show bootstrap confidence intervals at the 95%-level based on 200 drawings.

Figure 2.1: Top income shares in income tax and survey data, Germany

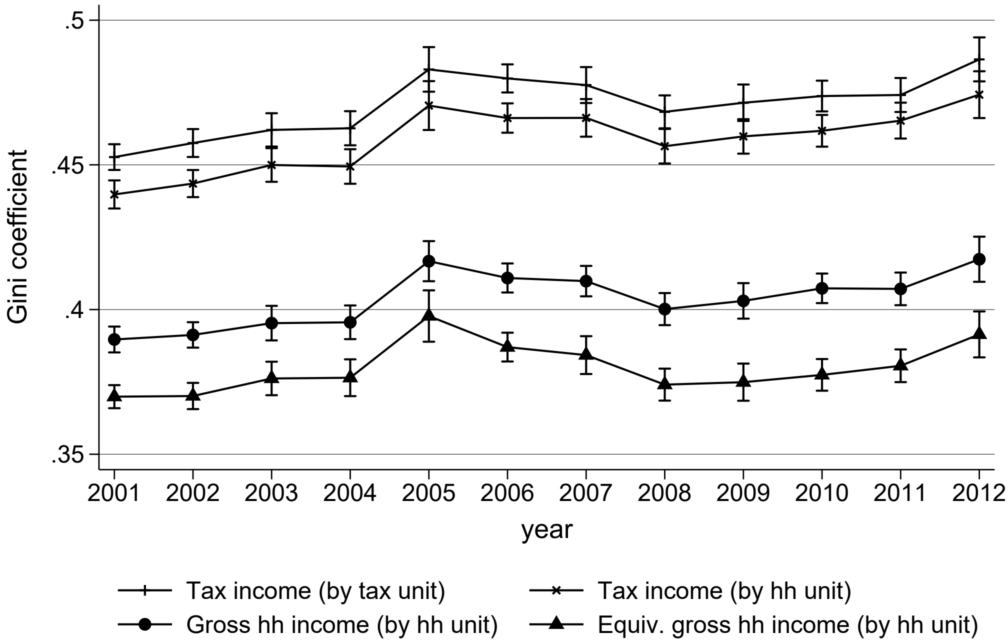
Three findings stand out: First, the estimates of the income share of the top 10-5% and top 5-1% are of similar magnitude in both data sources. The income share of the bottom half (10-5%) is around 12 % in the SOEP data and between 11.2 to 11.8 % in the income tax data.[10] The upper 4 % do not differ significantly until 2008 in both datasets and are between 13.4 and 15 %.

Second, there are large quantitative differences for the top 1% between SOEP and tax data. Tax data measure 3 to 6 %-points higher income shares for the top 1%. The income share in the tax data is between 10.6 % to 15 % whereas the income share in the SOEP data is between 7 % and 8.8 %. The mismatch between the data sources for the top 1% does not come as a surprise as average incomes of the top 1% in the two data sources differ by more than 100,000 Euros. This result also applies to other countries' survey data: sizable larger gaps for the top 1% income share are found by Burkhauser et al. (2012) for the US using March Current Population Survey (CPS) and Internal Revenue Service (IRS) data and by Jenkins (2017) for the UK using Family Resources Survey (FRS) and income tax return data. Based on this finding, we decide to replace the top 1% of the survey income

[10]The result that the income share of the bottom half of the top decile is significantly higher in the SOEP data than in the tax records indicates a potential middle class bias in the SOEP data.

distribution with Pareto-imputed incomes. The underrepresentation of top incomes in survey data increases towards the top. Appendix Figure 2.A3 shows that the gap between the top 0.1% share in tax data and SOEP data is both absolutely and relatively higher than for the share of the lower 0.9% of the top percentile (Top 1-0.1%). The income share of the top 0.01% is between 2 and 3% according to tax data and fluctuating between zero and 1% according to SOEP data.

Third, both data sources document a trend of rising income concentration over the period. But whereas the tax data show a steep increase until 2008, particularly for the top 1%, and then a strikingly stable path following the Great Recession in 2009, SOEP data indicate a decline since 2005 and an increase since 2010.



Source: SOEP v30 (own calculations).
Note: Gross household income includes social security pensions as they are partly included in taxable income under German tax law. Vertical lines show bootstrap confidence intervals at the 95%-level based on 200 drawings.

Figure 2.2: Cross-walking from tax to survey data definitions, Germany

Cross-walking from income tax data definitions to survey data definitions using German SOEP data reveals a gradual decline in inequality measured by the Gini coefficient as shown by Figure 2.2. The Gini based on tax income per tax unit (*Tax income by tax unit*) exhibits the highest level of inequality. Aggregating tax income at the household level (*Tax income by hh unit*) reduces the Gini coefficient by about 3%. Considering gross household income (*Gross hh income by hh unit*)[11] instead of households' tax income yields a Gini reduction of about 12%. Finally, when we equivalize gross household income to account for differences in households' needs (*Equiv. gross hh income by hh unit*), the Gini declines by 5 to 8%. Applying different definitions of income and observation unit yields substantial differences in inequality levels: the Gini of tax income by tax unit is about 10%-points higher than the Gini of equivalent gross household income by household unit. All in all, the income concept is of major importance for the inequality level measured. The unit of observation accounts only for a small change because most households in Germany consist of a single tax unit. In contrast, tax income as defined by German tax law is substantially more unequally distributed than gross household income. As explained above, tax income is obtained after income type-specific income-related expenses, savings allowances, old-age lump-sum allowance, and exemptions for single parents are deducted. If these reductions are relatively more important for middle and low-income households, this contributes to a more unequal distribution of tax income. Furthermore, gross household income includes social security pensions and private transfers that contribute to equalizing the income distribution.

2.3 An integrated approach for top-corrected Gini coefficients

Building on the assumption that top incomes are Pareto distributed, we replace the incomes of the top 1% of the survey income distribution with Pareto-imputed incomes.[12] We opt to replace the top 1% since the comparison of top income shares in Section 2.2 reveals that this group is under represented in the survey data whereas the lower 4% of the top twentieth seem to match the tax data distribution quite well.[13] We first rank tax units by their gross income and then replace the top 1% of the distribution with Pareto-imputed incomes. As a consequence, tax units do not change ranks. Tax units are individuals in countries with individual taxation (such as Denmark, Norway, Sweden, the Netherlands, Italy and the United Kingdom) and couples including dependent children in countries with joint taxation (such as Germany, France, Ireland, Switzerland and Spain). After the imputation, we recombine tax units into households. A nice feature

[11] Gross household income includes household social security pensions in order to increase comparability with tax income. In Germany, an increasing share of social security pensions is subject to income taxation and, thus, included in tax income.

[12] A large literature shows that incomes follow a Pareto distribution, e.g., Clementi and Gallegati (2005b) for Germany, Piketty (2003) for France, Clementi and Gallegati (2005a) for Italy, Atkinson (2007) for United Kingdom and Piketty and Saez (2003) for United States.

[13] Jenkins (2017) finds that undercoverage of top incomes in UK survey data varies over the years starting above P95 in the 2000s and above P99 in the 1990s. This check, however, requires access to microdata and Jenkins (2017) recommends making a judicious choice of the cut-off. Burkhauser et al. (2012) supports undercoverage of the P99 percentile.

of the Pareto distribution is its small number of parameters that need to be estimated. The top income shares documented in the World Inequality Database (WID) suffice to obtain an estimate of the central parameter α. The Pareto distribution function can be written as follows

$$1-F(y)=\left(\frac{k}{y}\right)^{\alpha}, \tag{2.1}$$

where α is the Pareto coefficient and k is the income threshold above which incomes are Pareto distributed. We estimate the Pareto coefficient α following Atkinson (2007) as

$$\alpha=\frac{1}{\left(1-\frac{log(S_j/S_i)}{log(P_j/P_i)}\right)} \tag{2.2}$$

where P_j is the population share of group j and S_j is the income share of group j documented in WID. The indices j and i refer to different fractiles of the population, where i is a subgroup of j, e.g., $P_i = 0.1\%$ and $P_j = 1\%$. Top income shares for Germany in the WID are produced by Bartels and Jenderny (2015).

Empirically, α increases when moving the Pareto threshold from the middle of the distribution to the top (see, e.g., Jenkins (2017); Atkinson (2007)). We use α estimated for $P_i = 0.1\%$ and $P_j = 1\%$. It seems reasonable to calculate α for the top percentile of the distribution, which is less well represented in survey data as shown in Figure 2.1.[14] Threshold k is then obtained from rearranging Eq. 2.1 to

$$k=(1-F(y))^{1/\alpha}\cdot y, \tag{2.3}$$

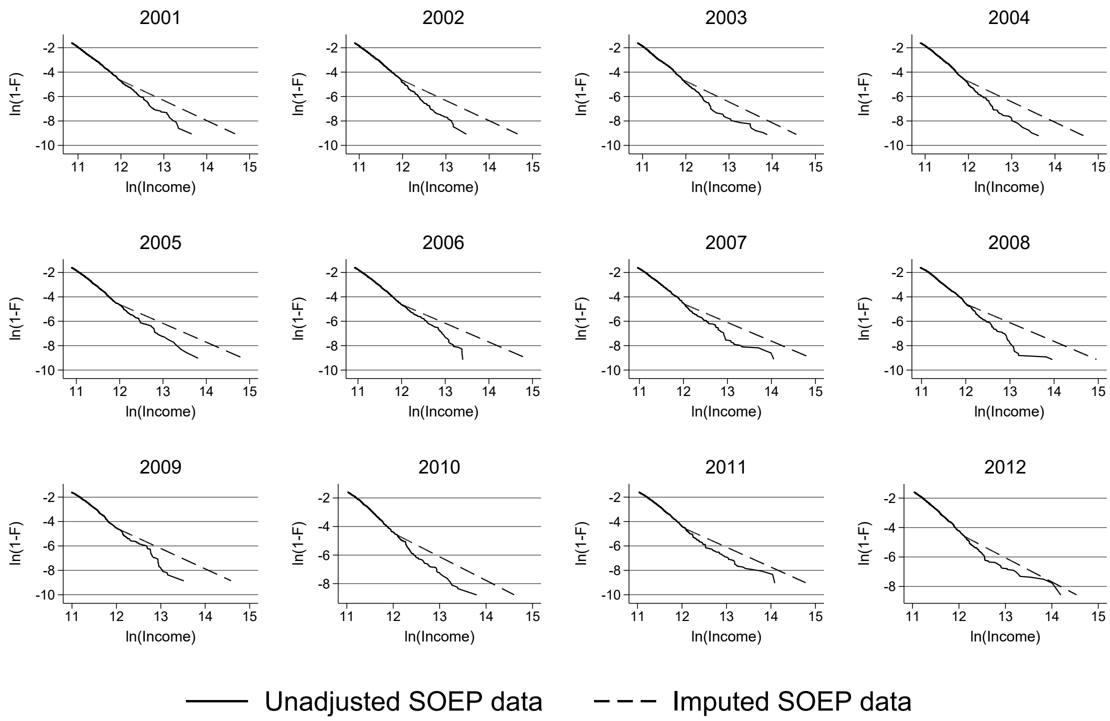
where $F(y)$ and y are taken from the survey data distribution. Since we replace the top 1% of the distribution, y is the P99 percentile.[15] Our results for α and k for Germany are presented in Appendix Table 2.B1. We then replace the top 1% of tax unit incomes

[14] Appendix Figure 2.A4 shows that α estimated for $P_i = 0.1\%$ and $P_j = 1\%$ produces the best fit of the top 1% income share in Germany. Using α estimated for $P_i = 1\%$ and $P_j = 5\%$ or $P_i = 1\%$ and $P_j = 10\%$, which creates a less heavy tail, we obtain a substantially lower top 1% income share in comparison to income tax data. Moreover, α estimated for $P_i = 0.1\%$ and $P_j = 1\%$ yields the best fit for the income share of the lower half of the upper decile (see Appendix Figure 2.A5). Our α estimates for $P_i = 0.1\%$ and $P_j = 1\%$ in Germany are around 1.6, whereas estimates for $P_i = 5\%$ and $P_j = 10\%$ are mostly greater than 1.9 (see Appendix Table 2.B1).

[15] Thresholds between P95 and P99.5 are commonly used. Jenkins (2017) provides an extensive discussion of the choice of the Pareto threshold and shows that choosing different Pareto thresholds has noticeable impacts on estimates of inequality among the rich, but overall inequality trends in the UK are broadly robust to the choice of the threshold.

observed in the survey data with incomes following the Pareto distribution characterized by our estimated parameters.

If one plots $log(1-F(y))$ against $log(y)$, Pareto distributed incomes produce a straight line with the slope $-\alpha$ (a so-called *Zipf plot*). The smaller α (the flatter the line), the more unequal is the income distribution. Figure 2.3 shows this plot for both unadjusted SOEP data and SOEP data with imputed top incomes. Replacing top incomes with Pareto-imputed incomes generates a more unequal income distribution as reflected by the flatter curve than original SOEP incomes. Assuming that tax data provide a more accurate picture of the very top, we would underestimate the tail of the income distribution using Pareto parameters fitted to survey data.[16] Interestingly, in 2002 and 2005 we obtain rather straight lines from original SOEP incomes. However, in most of the years, original SOEP top incomes do not seem to follow a Pareto distribution.

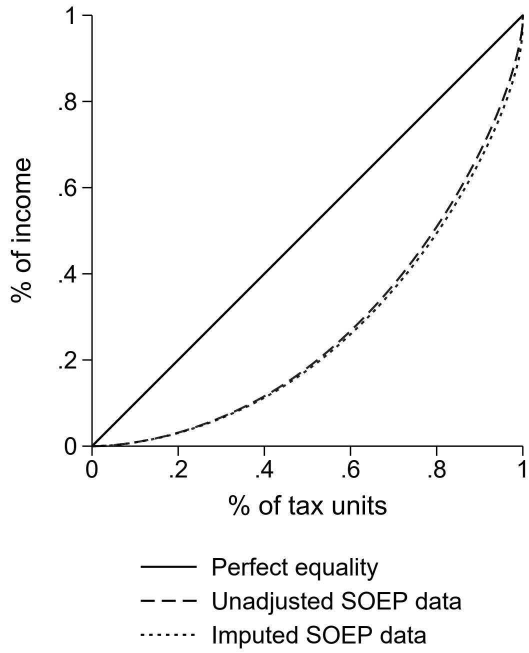


Source: SOEP v30 (own calculations).
Note: F presents the cumulative distribution function. Lines cross at the income level of 99th percentile (P99) above which we impute top incomes.

Figure 2.3: Fit of the Pareto distribution

[16]Jenkins (2017) also states that replacing the top of the survey distribution with Pareto-imputed values fitted from the same source may not produce reliable results and tax return data should be used instead.

Figure 2.4 shows Lorenz curves of both unadjusted and imputed incomes for the year 2012. The Lorenz curve of imputed incomes is below the Lorenz curve of unadjusted incomes, which indicates a more unequal distribution.



Source: SOEP v30 (own calculations).

Figure 2.4: Lorenz curves for unadjusted and imputed incomes, 2012

For calculating top-corrected Ginis reflecting the inequality of living standards of the German population, we undertake two steps: First, we have to impute gross household incomes for the top. We rank tax units by their gross income and then replace the top 1% of the tax unit distribution with Pareto-imputed incomes, as described above. After the imputation, we recombine tax units into households, i.e., we sum up imputed gross income by tax unit to imputed gross income by household. Second, we have to compute (equivalent) net household incomes from the imputed gross household incomes. We use an approximation of the tax-benefit-system introduced by Feldstein (1969):

$$y^{net} = \lambda(y^{gross})^{1-\tau}, \tag{2.4}$$

where y^{net} presents the net household income and y^{gross} the gross household income. Parameter τ is the degree of progressiveness[17] and λ is an indicator for the average

[17]A positive τ indicates a progressive tax schedule, whereas a negative τ indicates a regressive tax schedule.

level of the household taxation. This approximation is increasingly used in the recent literature on progressivity of tax-benefit-systems (e.g., Heathcote et al. (2017) and Blundell et al. (2016)) and in dynamic macro-economic models (e.g., Benabou (2002)). Heathcote et al. (2017) show that this functional form offers a remarkably good approximation of the actual tax-benefit-system in the United States. As a microsimulation model is often not at hand and if so, data often require a particular structure for the microsimulation model, this approximation method provides a useful tool to impute a top-corrected net income distribution. E.g., the microsimulation model EUROMOD only runs on adjusted EU-SILC data with additional variables which are available only for every second year for most countries (or even less frequently) and these data need to be ordered separately.

We estimate the following equation for year t and five household types h[18] in order to account for different tax allowances and exemptions for gross and net household incomes as recorded in the survey data:

$$ln(y_{h,t}^{net}) = ln(\lambda) + (1-\tau) ln(y_{h,t}^{gross}) + \gamma ln(y_{h,t}^{gross})^2 + \epsilon_{h,t}. \tag{2.5}$$

If we exclude the second-order polynomial, estimates for τ are between 0.14 and 0.26 for Germany, depending on household type and year, which is similar to Heathcote et al. (2017) who estimate an average of $\tau^{US} = 0.18$ for the United States.[19] Including the second-order polynomial makes the interpretation of τ and γ less straightforward, but greatly improves predicted tax rates for very high incomes. Appendix Tables 2.B3 and 2.B4 show our regression results for SOEP and EU-SILC, respectively. The model fits the relationship between gross and net household income documented in survey data quite well: R^2 is between 0.64 and 0.98. As we have to run the regression on unadjusted incomes, we tend to overestimate tax rates for very high incomes when applying our coefficients to Pareto-imputed incomes. Including a second-order polynomial partly offsets this effect by reducing the steepness of tax rate increase at the top, but at the cost of producing negative average tax rates for a few top income earners in some years. We solve this by fixing the predicted average tax rate either at the P99 threshold for all incomes above or at the maximum average tax rate below the P99 threshold if the prediction at P99 thresholds produces a negative average tax rate.

Appendix Figure 2.A6 shows that predicted average tax rates match those from SOEP microsimulation quite closely in the upper half of the distribution in the year 2012. It should be noted that SOEP net household incomes are simulated by the SOEP team and

[18] Our household types are singles without children, singles with children, couples without children, couples with children, and other household types. Only tax-paying households with a minimum household income of 20,000 Euro are included in the regression sample.

[19] Results excluding the second-order polynomial are available from the authors upon request.

not observed. Across the upper half of the distribution, average tax rates increase from about 20% to almost 40% for both predicted and SOEP simulated net incomes.[20]

Our predicted tax rates for the top percentile are very close to those documented by income tax statistics from the Statistical Office. E.g., in 2012, incomes between 125,000 and 250,000 Euro are subject to an average tax rate of about 28%.[21] For this group, we predict an average tax rate of about 34%. One should note, however, that our prediction also includes social security contributions, which is roughly 3% for this group according to Bach et al. (2016). For incomes above one million Euro, the official average income tax rate is 34% and our prediction is 42%. The SOEP simulates 43% for this group.

The approach derived by Atkinson (2007) and extended by Alvaredo (2011) is based on the Gini decomposition for two non-overlapping subgroups by Dagum (1997)

$$G = \sum_{j=1}^{k} G_{jj} P_j S_j + \sum_{j=1}^{k} \sum_{h=1}^{j-1} G_{jh}(P_j S_h + P_h S_j), \tag{2.6}$$

where G_{jj} is the Gini coefficient of the j-th group, G_{jh} is the Gini coefficient between the j-th and h-th group, P_j is the population share of group j and S_j is the income share of group j. Assuming that the population can be divided into two groups – the top covered by tax records (e.g., the top 1%) and the rest of the population covered by survey data – we can rearrange Eq. 2.6 using the notation from Alvaredo (2011) to

$$G = G^{**} PS + G^{*}(1-P)(1-S) + S - P, \tag{2.7}$$

where P and S are population and income share of the top, respectively, and $1-P$ and $1-S$ are population and income share of the rest of the population. G^{*} is the Gini for the population without the top group. Assuming that top incomes are Pareto distributed, the Gini of the top is computed as $G^{**} = \frac{1}{2\alpha-1}$, where α is the Pareto coefficient obtained from the tax income distribution documented by tax data applying Eq. 2.2.

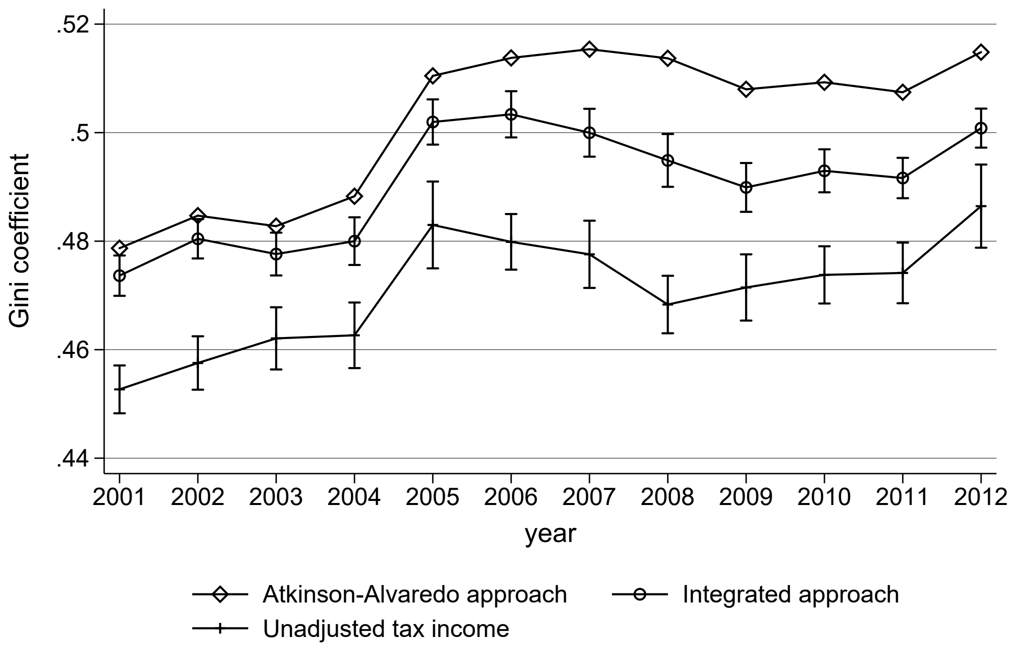
In general, the Atkinson-Alvaredo approach can also be computed for other inequality indices, where inequality within the top income group can be expressed by α. E.g., the Theil coefficient can be expressed as $T^{**} = ln(\frac{\alpha-1}{\alpha}) + \frac{1}{\alpha-1}$. The Half Squared Coefficient of Variation (HSCV), another Entropy inequality measure, can be expressed as $HSCV^{**} = \sqrt{\frac{1}{\alpha(\alpha-2)}}$. For distribitions with a heavy tail, where $\alpha < 2$, which applies to most income distributions at the top, the HSCV is not defined. We compute the Theil coefficient as a robustness check (see Appendix Figure 2.A8). In contrast to the

[20] Appendix Figure 2.A7 shows the fit of the predicted net incomes compared to SOEP net incomes by household type and gross income level. This check is also used in Heathcote et al. (2017) in Figure 1 and shows the good fit of our simple regression model.

[21] The average tax rate results from dividing the income tax by total amount of income in Table B1.1 of the publication *Fachserie 14 Reihe 7.1* of the Statistical Office.

Atkinson-Alvaredo approach, our approach is not restricted to a subgroup of inequality measures.

Our integrated approach allows to further decompose inequality within the top income group or even within a group where only the upper part belongs to the lower part of the top income group (such as P95-99.5 if the top income group is defined as top 1%). This is not possible using the Atkinson-Alvaredo approach, as the definition of the top income group (such as the top 1%) is given by construction. Furthermore, our integrated approach allows decomposing inequality by other groups than income, applying resampling frameworks like bootstrap and jackknife and using the top-corrected income distribution for regression analysis.

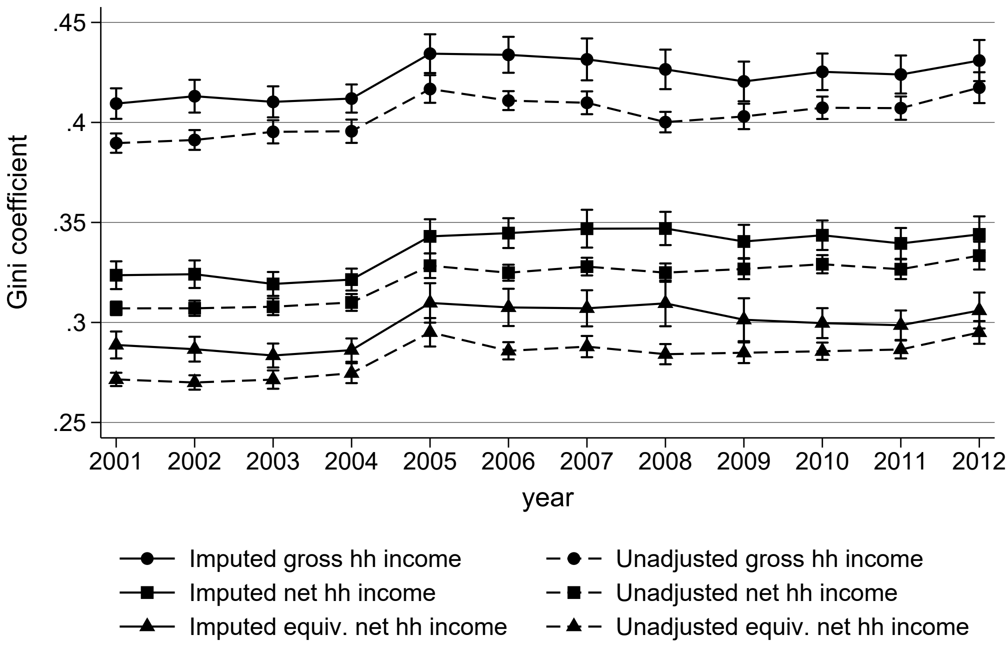


Source: SOEP v30 (own calculations).
Note: Gini coefficients are based on tax income. The integrated approach and the Atkinson-Alvaredo approach are based on P_i = 0.1% and P_j = 1%. Vertical lines show bootstrap confidence intervals at the 95%-level based on 200 drawings.

Figure 2.5: Top-corrected Gini coefficients, Germany

We now turn to the comparison of the two approaches for top-corrected Gini coefficients. As can be taken from Figure 2.5, Gini coefficients of both top-correction methods are substantially higher than Ginis based on unadjusted survey data income. But where the Gini based on unadjusted SOEP data shows a peak of inequality in 2005 and a low point in 2008, the top-corrected approaches rather hint at a plateau between 2005 and

2007 and a low point in 2009.[22] Between 2005 and 2008, incomes of the top 1% grew especially rapidly, which is not sufficiently captured by survey data where this group is underrepresented. The Great Recession hitting Germany in 2009 primarily affected top income earners whose business incomes collapsed (Bartels and Jenderny, 2015). Therefore, top-corrected Ginis exhibit a decline in inequality whereas unadjusted Ginis show a stable path. Interestingly, both top-corrected approaches show a rise in inequality after 2011, even though the income share of the top 1% remained rather stable since 2009.



Source: SOEP v30 (own calculations).
Note: Vertical lines show bootstrap confidence intervals at the 95%-level based on 200 drawings.

Figure 2.6: Top-corrected Gini coefficients (gross, net, equivalent net income), Germany

Both correction approaches produce rather similar levels and trends of income inequality as measured by the Gini coefficient until 2005. After 2005, our integrated approach produces significantly lower top incomes for the top percentile than those obtained from the tax data.[23] This translates into lower inequality levels in our integrated

[22] Biewen and Juhasz (2012) find that the rise in inequality from 1999/2000 to 2005/2006 in Germany is mainly driven by increasing dispersion in labor market outcomes, but also by the growth of part-time and marginal part-time work as well as major income tax reforms in this period.

[23] Our approach imputes lower top incomes in these years because the Pareto parameter k obtained from SOEP data following Eq. 2.3 is lower between 2005 and 2008 than in the preceding years (see Appendix

approach as our top percentile's income share $S_{j,\text{imputed SOEP data}}$ is lower than the top percentile's income share based on tax data $S_{j,\text{tax data}}$ used in the Atkinson-Alvaredo approach (see Appendix Figure 2.A5). The Theil index also shows lower inequality levels with our approach than the Atkinson-Alvaredo approach, but higher inequality than with unadjusted incomes (see Appendix Figure 2.A8).

Figure 2.6 presents top-corrected Ginis for gross, net, and equivalent net household income. The top-corrected Ginis are about 5% higher than the unadjusted. Apart from that, the observed trends do not reverse.

2.4 An application to European survey data

We apply our integrated approach to other European countries where both EU-SILC survey data[24] and top income shares are available from WID. The WID offers long-run series of top income shares for nine European countries: Denmark, France, Germany, Ireland, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland and United Kingdom.[25] Computing the Pareto parameter α from the country-specific top income shares documented in the WID, we then replace the top 1% of the country's gross household income distribution in EU-SILC survey data with Pareto imputed incomes.[26]

Figure 2.7 shows trends of Gini coefficients for gross household income in nine European countries, for which both EU-SILC and WID-data are available, contrasting Ginis based on unadjusted data and imputed top income data.[27] The gap between top-corrected and unadjusted Ginis varies greatly across countries and is mostly explained by the use or non-use of register data for EU-SILC provision.[28]

Table 2.B2). The lower k results from a lower y, which is the income threshold of the top percentile in the SOEP. y hardly grows between 2005 and 2008 while top incomes in tax data strongly increase. Unfortunately, SOEP data seem to loose top income earners exactly in a period where top income earners strongly gain in income what our approach cannot fully compensate by construction.

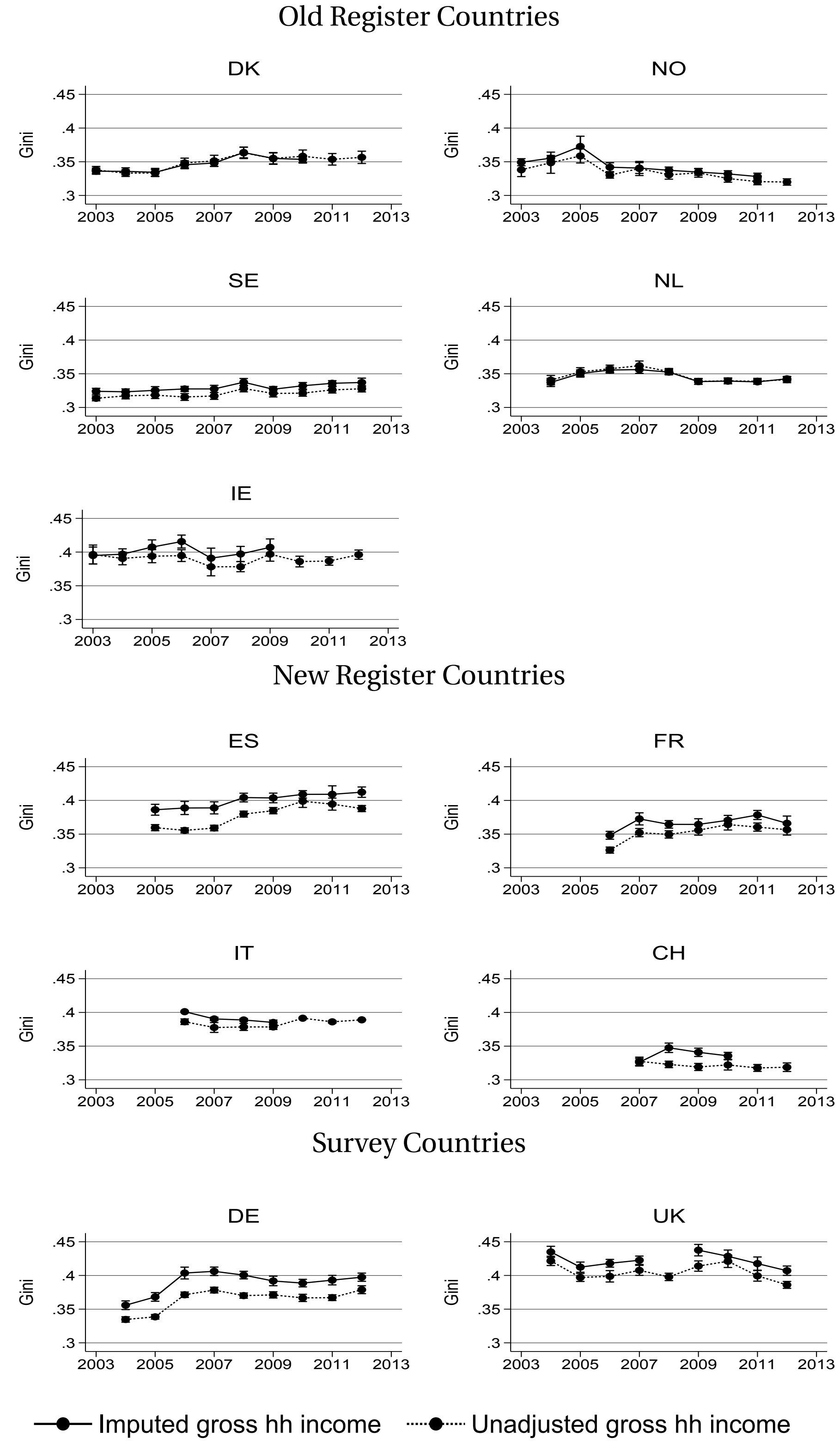
[24] EU Statistics on Income and Living Conditions (EU-SILC) is coordinated by Eurostat and was launched in 2003 in seven countries (Austria, Belgium, Denmark, Greece, Ireland, Luxembourg, and Norway). In 2004, EU-SILC was introduced in fifteen further countries and in 2005, it was expanded to all EU-25 Member States. Until 2007, Bulgaria, Romania, Switzerland and Turkey joined EU-SILC.

[25] The WID-series for Portugal is only available until 2005, when EU-SILC was first conducted in Portugal.

[26] See Appendix Figure 2.A2 for income shares of the top 1% in European countries as provided by the WID. Since EU-SILC incomes do not include capital gains, we take WID-series excluding capital gains for all countries except for Germany. Bartels and Jenderny (2015) show that the difference between German top income shares excluding and including taxable capital gains is negligible as most capital gains are not taxable anyway and therefore not recorded in German tax data. See Appendix Table 2.B5 for the calculated Pareto parameters α and the gross household incomes.

[27] WID years and EU-SILC years do not always coincide. Hence, top-corrected Ginis can only be computed for a subset of EU-SILC data years.

[28] See Jäntti et al. (2013) and Jäntti et al. (2017) for an overview on the use of register and interview data in EU-SILC.



Source: EU-SILC (own calculations).
Note: For Ireland and the Netherlands the Pareto α is calculated with the income share ratios of top 1 % and top 0.5 %, since the income share of the top 0.1 % is currently not available in WID. Vertical lines show bootstrap confidence intervals at the 95%-level based on 200 drawings.

Figure 2.7: Top-corrected Gini of gross household income, European countries

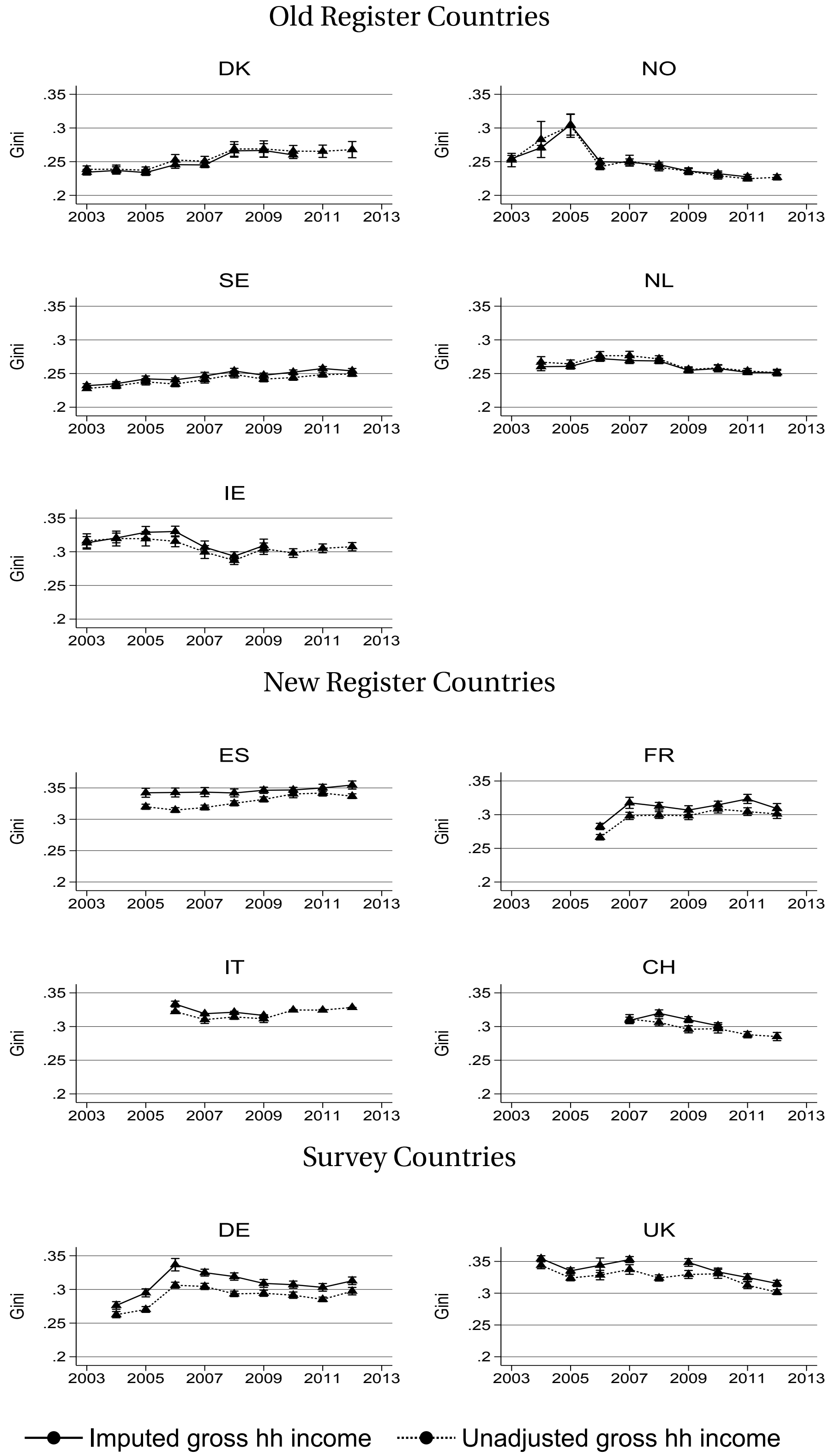
The gap is negligible for countries that have a long tradition of using register information (old register countries), like Denmark, Norway, Sweden, the Netherlands, and Ireland. In Denmark and the Netherlands, our top-correction produces virtually no difference. In the other countries, deviations mostly lie within the confidence intervalls.[29] The rapid increase in Norway's Gini in 2005 is explained by an increase in dividends for top income earners in this year before the implementation of a permanent dividend tax in 2006 (Aaberge and Atkinson, 2010).

The importance of at least partly using register data is stressed by the new register countries that only recently started using income data from registers. All these new register countries apply a mixed strategy of collecting incomes from both registers and interviews as administrative data cover neither all income types (e.g., pensions are often not fully taxable) nor the whole population. In these countries, top incomes seem to be better represented in EU-SILC data after the transition to register-based incomes, which starts in 2008 in Spain and France and in 2011 in Italy. Unfortunately, the WID-Series for Italy stops in 2009 so we cannot evaluate the effect of using register-based incomes for Italy. Surprisingly, Switzerland reveals a sizable gap between top-corrected and unadjusted Ginis even though they rely on incomes from register data. Törmälehto (2017) also finds that Swiss EU-SILC data do not capture top incomes very well in a cross-country comparison with other register countries. He reconciles EU-SILC incomes to tax income definitions and still finds a substantial difference for Swiss top income shares between reconciled EU-SILC and WID data.

Not surprisingly, the gap between top-corrected and unadjusted Ginis is largest in Germany and the UK, where EU-SILC is based on survey data only. Top-corrected Ginis are 5 to 9% higher in Germany and 2 to 5% in the United Kingdom. EU-SILC seems to perform even worse than the SOEP in covering top incomes. The gap between top-corrected and unadjusted Ginis using SOEP is 5% as seen in Figure 2.6.

Figure 2.8 shows trends of Gini coefficients for living standards (equivalent net household income) in the same set of countries based on predicted incomes from Eq.5. The pattern of inequality differences induced by our integrated approach resembles the one found for gross household incomes. As for gross household income, the gap between top-corrected and unadjusted Ginis is almost negligible in most of the register countries and is largest in Germany and United Kingdom, which exclusively use interviews to assess incomes. Top-corrected Ginis are 5 to 9% higher in Germany and 2 to 5% in the United Kingdom, which is the same magnitude as for gross household income.

[29] As for Sweden, Frick et al. (2017) find large annual fluctuations of poverty rates in Sweden and a poverty rate in cross-sectional EU-SILC in 2006 that is twice as high as the poverty rate measured with longitudinal EU-SILC. They speculate that the complete elimination of households where income from a household member is missing (partial unit non-response (PUNR)) might lead to a misrepresentation of low and top income earners (which are more likely to refuse to reply) if no appropriate weighting takes place.



Source: EU-SILC (own calculations).
Note: For Ireland and the Netherlands the Pareto α is calculated with the income share ratios of top 1 % and top 0.5 %, since the income share of the top 0.1 % is currently not available in WID. Vertical lines show bootstrap confidence intervals at the 95%-level based on 200 drawings.

Figure 2.8: Top-corrected Gini of living standards, European countries

All in all, our top-correction approach merging information on the top 1% of the distribution from tax data with the bottom 99% of the distribution from survey data produces remarkably higher inequality levels in those countries that exclusively rely (Germany, UK) or have relied (Spain) on interviews for the provision of EU-SILC data.

2.5 Conclusion

This paper provides a new picture of recent inequality trends in EU countries using a novel top income imputation approach for survey data. We merge information on the top 1% of the distribution from tax data with the bottom 99% of the distribution from survey data. We used the Gini as the main inequality indicator in a given income distribution.

We first reconciled German survey and tax data and examined the extent to which differences in top income share estimates from household surveys and tax returns arise from differences in income concepts, observation units or from the ability to capture top incomes. We found that the top 1% is underrepresented in German SOEP data compared to tax data, but the lower percentiles of the top decile match very well. We find that different definitions of income and observation unit yield substantially different inequality levels in Germany: the Gini of tax income by tax unit is about 10%-points higher than the Gini of equivalent gross household income by household unit. The selected income concept is responsible for the largest part of this gap, whereas the observation unit changes inequality only slightly as most German households form a single tax unit anyway.

For our integrated approach for a top-corrected income distribution, we estimated parameters of the Pareto distribution from top income shares and then replaced the top 1% of the survey income distribution by Pareto-imputed incomes. Our approach is easily applicable by relying on information publicly available in the World Inequality Database (WID) and easily accessible survey data. Neither access to tax record microdata, which is limited and difficult to obtain in many countries, nor record linkage, which is often not allowed, is needed. Of course, the applicability of the approach is restricted by the number of countries and years for which top income shares are available in the WID. However, we expect the WID to grow in the years to come such that our approach becomes usable for many additional countries and years. Furthermore, our integrated approach allows for producing a variety of measures for the inequality of living standards in the entire population of a country also considering differences in households' needs. Our top-correction method indicates similar trends and slightly lower inequality levels than the decomposition approach (Atkinson, 2007; Alvaredo, 2011).

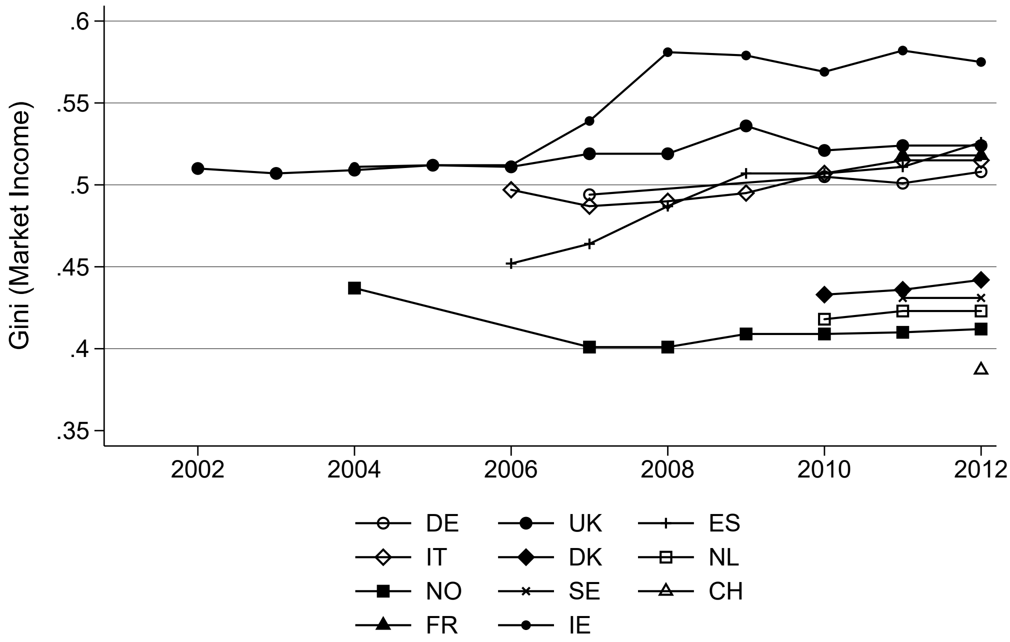
We applied our integrated approach to German SOEP data and European EU-SILC data. Our top-corrected Ginis based on German SOEP data 2001-2012 are about 5% higher than unadjusted Ginis. We estimated top-corrected Gini coefficients for European countries where the WID provides information on the shape of the income distribution's top. The gap between unadjusted and top-corrected Ginis is highest in countries that rely (Germany, UK) or have relied (Spain) on interviews for the provision of EU-SILC data. Top corrected Ginis are 5 to 9% higher in Germany and 2 to 5% in the United Kingdom. This means that German SOEP data provide a comparably better picture of top incomes than German EU-SILC data since inequality levels change less using our integrated approach. For most countries using administrative data, the gap between top-corrected and unadjusted Ginis is negligible since top incomes are already well-represented.

Our integrated approach represents a useful tool to improve cross-country comparisons of inequality. If there exist legal barriers to link administrative to survey data in some countries (like Germany) but not in others, quality and coverage of income components across the distribution are likely to deviate. We found that a significant share of inequality differences across countries stems from data source differences. E.g., investment and property income is often understated in survey data as compared to administrative data (Jäntti et al., 2013). Consistently aligning the top of the distribution with WID-series based on administrative data in all countries improves the comparability of top incomes across countries. In contrast to the Atkinson-Alvaredo approach, our integrated approach allows to address various additional research questions, e.g., decomposing inequality by groups other than income, applying resampling frameworks like bootstrap and jackknife and using the top-corrected income distribution for regression analysis.

Another potential application of our approach is to check the coverage of top incomes in other household surveys than EU-SILC and SOEP. Examples are the Household Finance and Consumption Survey (HFCS) conducted by national central banks and national statistical institutes in 18 Euro area countries, the Luxemburg Income Study (LIS) and surveys in developing countries where WID-series increasingly become available.

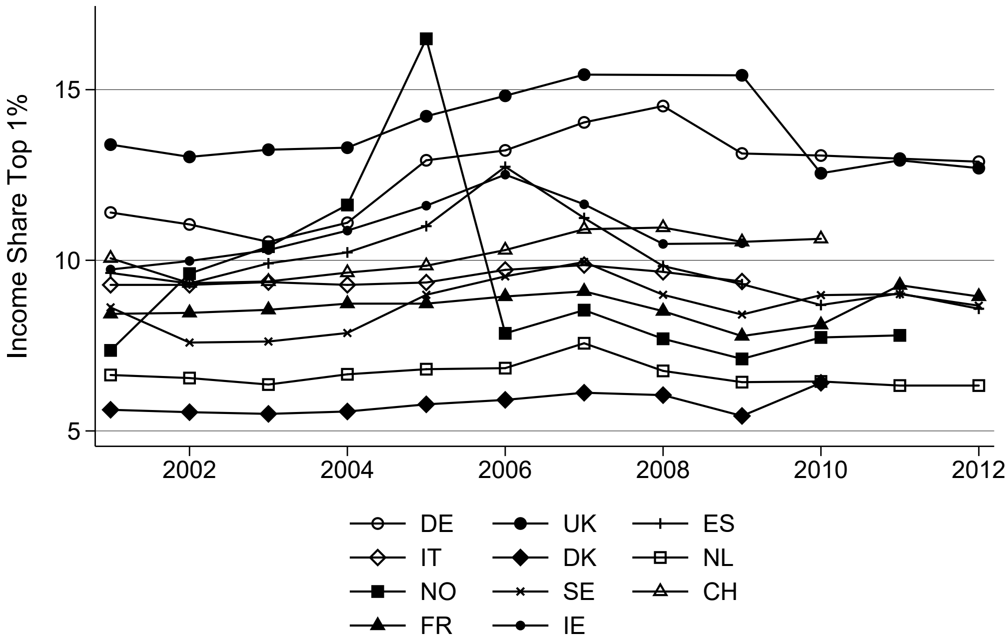
Appendix

A Figures



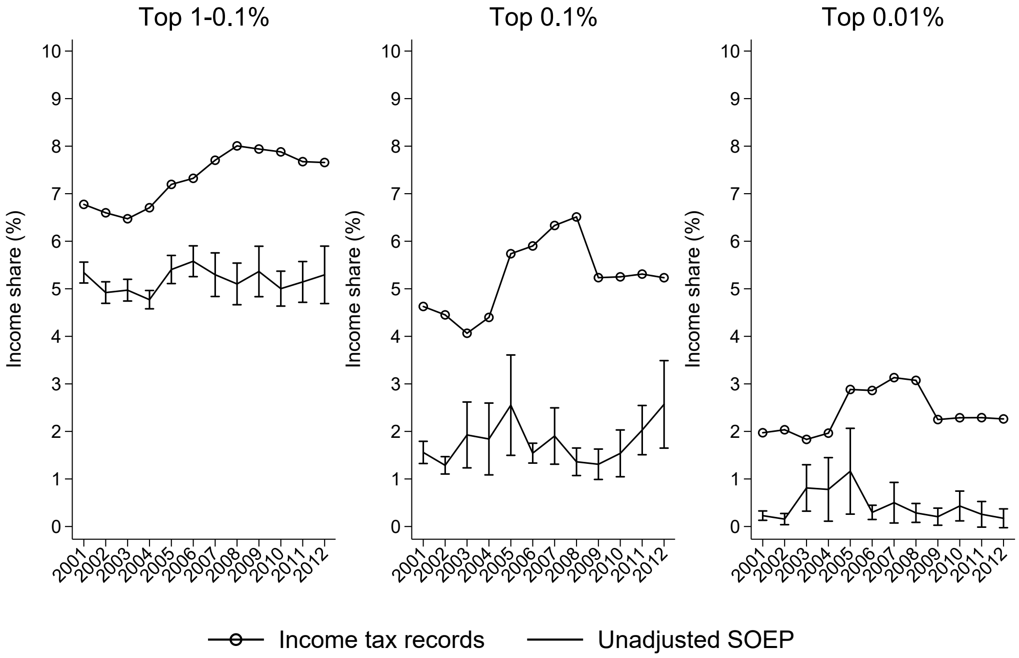
Source: OECD data.

Figure 2.A1: Gini (market income), European countries



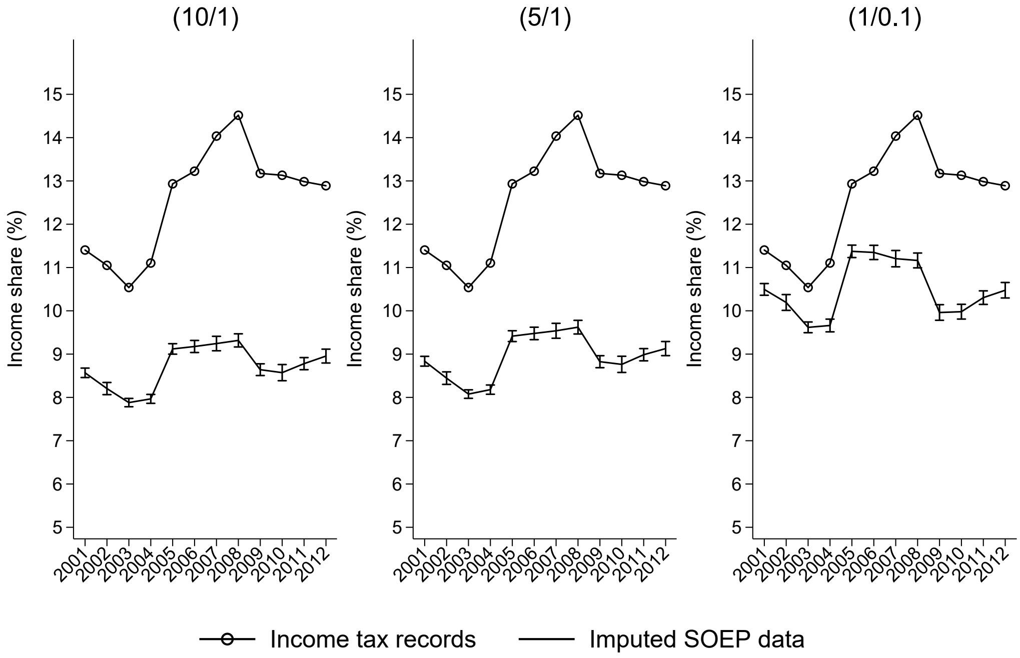
Source: World Wealth and Income Database (WID).

Figure 2.A2: Income share of top 1%, European countries



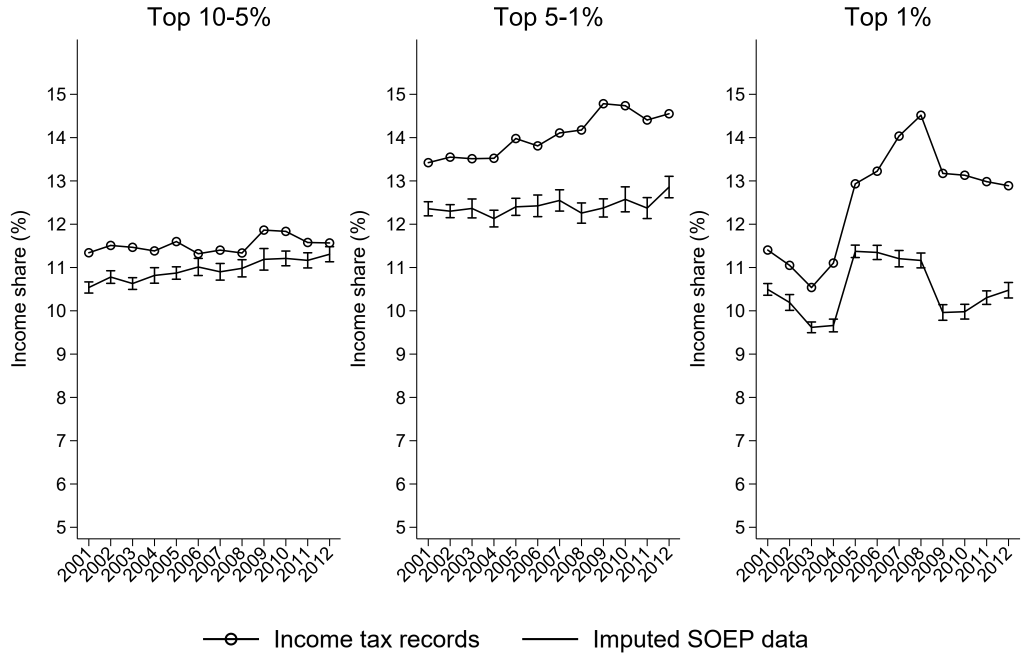
Source: SOEP v30 (own calculations) and income tax records (Bartels and Jenderny, 2015) also available in WID.
Note: The observation unit is the tax unit and the income concept is tax income in both data sources. Vertical lines show bootstrap confidence intervals at the 95%-level based on 200 drawings.

Figure 2.A3: Top income shares in income tax and survey data, Germany



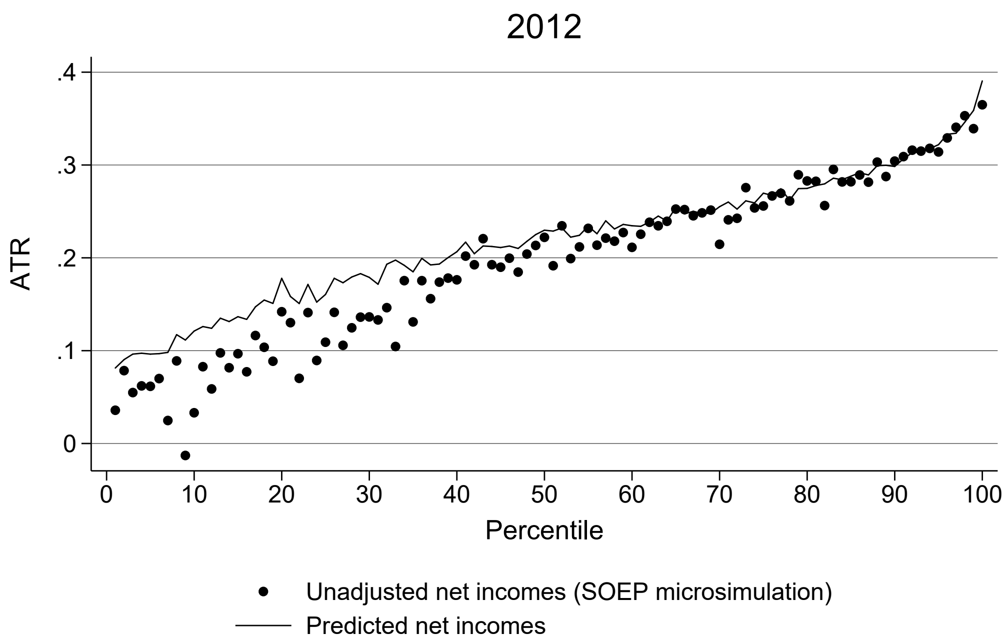
Source: SOEP v30 (own calculations) and income tax records (Bartels and Jenderny, 2015) also available in WID. Vertical lines show bootstrap confidence intervals at the 95%-level based on 200 drawings.

Figure 2.A4: Income share of top 1 % with varying α specifications



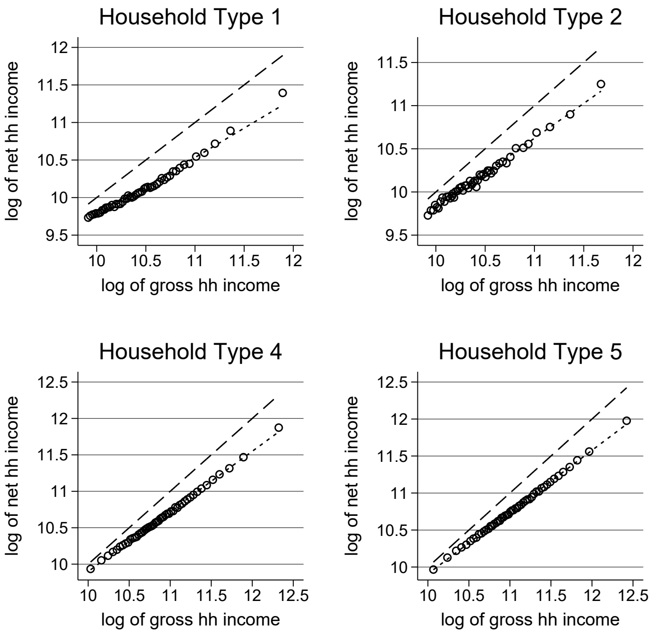
Source: SOEP v30 (own calculations) and income tax records (Bartels and Jenderny, 2015) also available in WID. Vertical lines show bootstrap confidence intervals at the 95%-level based on 200 drawings.

Figure 2.A5: Top income shares (α 1/0.1)



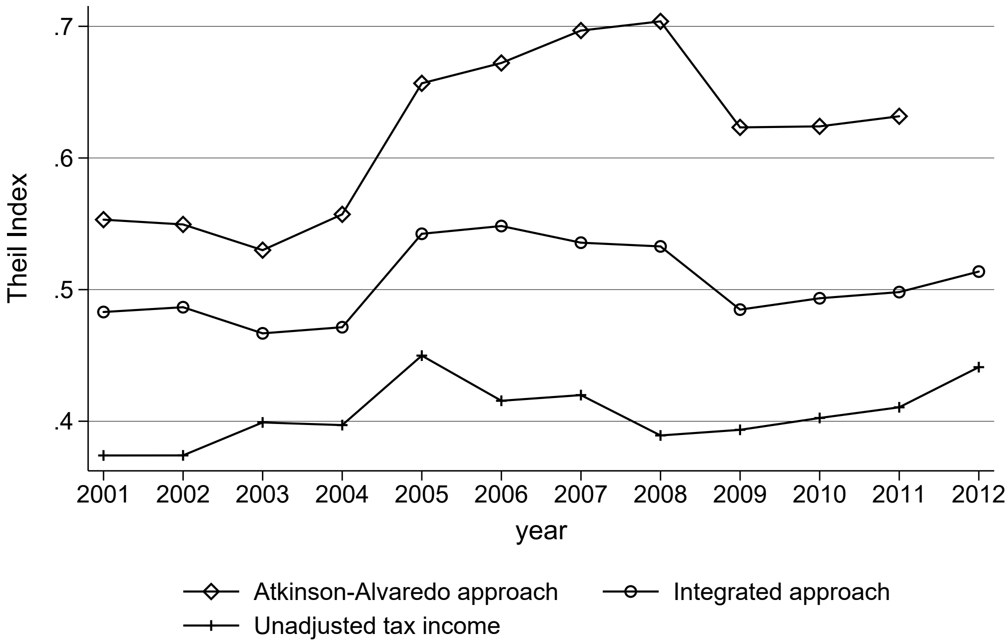
Source: SOEP v30 (own calculations).
Note: The gross household income distribution is bottom-trimmed excluding gross incomes below 20,000 Euro.

Figure 2.A6: Average tax rate for predicted vs. SOEP net incomes



Source: SOEP v30 (own calculations).
Note: The dashed line displays the predicted relationship between gross and net household income by household type. Dotted values are SOEP incomes collapsed into 50 quintiles by household type. Household types are defined as type 1=singles, type 2=singles with children, type 3=couples without children, type 4=couples with children, and type 5=other household compositions. The gross household income distribution is bottom-trimmed excluding gross incomes below 20,000 Euro.

Figure 2.A7: Predicted vs. SOEP net incomes by household type



Source: SOEP v30 (own calculations).

Figure 2.A8: Top-corrected Theil coefficients, Germany

B Tables

Table 2.B1: Pareto distribution parameter, Germany, SOEP, and WID

	$\alpha(10/1)$	$k_{tax}^{0.90}$ (SOEP)	$k_{tax}^{0.95}$ (SOEP)	$k_{tax}^{0.99}$ (SOEP)	$k_{tax}^{0.999}$ (SOEP)
2001	2.01	21539.22	19982.19	15631.38	10976.54
2002	2.06	23191.38	21514.35	16699.69	10738.67
2003	2.12	23330.83	21185.27	17105.35	11087.16
2004	2.04	23110.90	20803.57	15599.65	9730.65
2005	1.90	21398.01	18913.41	14231.33	9804.45
2006	1.86	21373.47	19005.12	13536.57	9967.00
2007	1.82	21359.21	18872.52	13240.77	9058.82
2008	1.79	21712.12	18455.92	12560.18	7901.72
2009	1.92	24218.03	21706.70	15458.62	10372.06
2010	1.93	24912.80	22042.00	16283.81	11485.71
2011	1.91	24987.33	22151.73	15974.31	12072.14
2012	1.93	25338.98	22728.60	16830.07	14750.07
	$\alpha(5/1)$	$k_{tax}^{0.90}$ (SOEP)	$k_{tax}^{0.95}$ (SOEP)	$k_{tax}^{0.99}$ (SOEP)	$k_{tax}^{0.999}$ (SOEP)
2001	1.94	20669.28	18938.64	14394.22	9699.56
2002	1.99	22300.36	20445.22	15441.14	9547.87
2003	2.05	22540.40	20256.27	15965.94	9998.03
2004	1.98	22273.29	19828.01	14489.38	8710.52
2005	1.84	20501.92	17889.50	13064.36	8623.56
2006	1.80	20498.66	17999.39	12451.16	8792.57
2007	1.76	20511.53	17903.94	12210.66	8022.51
2008	1.73	20870.64	17530.80	11605.48	7018.14
2009	1.88	23509.82	20884.50	14567.72	9488.48
2010	1.88	24180.13	21202.39	15340.11	10501.87
2011	1.87	24224.55	21276.01	15013.90	10999.97
2012	1.89	24682.91	21965.97	15969.83	13633.76
	$\alpha(1/0.1)$	$k_{tax}^{0.90}$ (SOEP)	$k_{tax}^{0.95}$ (SOEP)	$k_{tax}^{0.99}$ (SOEP)	$k_{tax}^{0.999}$ (SOEP)
2001	1.64	16733.31	14387.58	9434.12	5146.61
2002	1.65	17617.57	15045.63	9637.12	4707.70
2003	1.71	17944.22	15055.99	10118.60	5044.33
2004	1.67	17989.51	15017.20	9451.92	4589.33
2005	1.55	16199.15	13167.39	8156.12	4253.83
2006	1.54	16517.32	13590.62	8084.21	4600.00
2007	1.53	16804.61	13813.99	8195.96	4411.65
2008	1.53	17555.45	13997.91	8211.36	4176.86
2009	1.67	20165.90	17105.44	10718.36	5988.27
2010	1.66	20602.68	17215.42	11136.75	6496.24
2011	1.64	20360.14	16970.52	10605.81	6530.81
2012	1.64	20624.88	17388.56	11150.40	7954.28

Source: SOEP v30 (own calculations) and income tax records (Bartels and Jenderny, 2015) also available in WID.
Note: α is obtained from top income shares based on income tax returns assuming that top incomes follow the Pareto distribution. Our approach does not produce standard errors. Thresholds k are in current Euros.

Table 2.B2: Pareto distribution parameter, Germany, SOEP, EU-SILC, and WID

	$\alpha(1/0.1)$	$y_{tax}^{0.99}$ (WID)	$y_{tax}^{0.99}$ (SOEP)	$y_{tax}^{0.99}$ (EU-SILC)	$k_{tax}^{0.99}$ (WID)	$k_{tax}^{0.99}$ (SOEP)	$k_{tax}^{0.99}$ (EU-SILC)
2001	1.64	127791.62	155411.00		7757.50	9434.12	
2002	1.65	125622.77	156393.00		7741.02	9637.12	
2003	1.71	125686.31	150573.00		8446.20	10118.60	
2004	1.67	133828.06	148315.00	117653.00	8528.68	9451.92	7497.87
2005	1.55	137476.87	160499.40	113640.16	6986.18	8156.12	5774.87
2006	1.54	145810.49	160951.00	157350.00	7323.74	8084.21	7903.34
2007	1.53	155237.37	166800.00	160868.00	7627.81	8195.96	7904.48
2008	1.53	163361.12	165189.46	156288.00	8120.48	8211.36	7768.88
2009	1.67		169190.00	151262.00		10718.36	9582.60
2010	1.66		178120.00	151535.94		11136.75	9474.61
2011	1.64		177067.00	160136.00		10605.81	9591.69
2012	1.64		183452.00	169358.16		11150.40	10293.76

Source: SOEP v30, EU-SILC and income tax records (Bartels and Jenderny, 2015) also available in WID.
Note: α is obtained from top income shares based on income tax returns assuming that top incomes follow the Pareto distribution. Our approach does not produce standard errors. The index tax indicates tax units and tax income (y_{tax}) whereas hh indicates household unit and household gross income (y_{hh}). Thresholds k and y are in current Euros.

Table 2.B3: Coefficients and R^2 of the net household income estimation (equation 2.5), Germany, SOEP

Year	Household Type	1-$\hat{\tau}$	SE	$\hat{\gamma}$	SE	$\hat{\lambda}$	SE	R^2
2001	Single without children	-1.50	0.27	0.11	0.01	14.26	1.44	0.80
	Single with children	-1.22	1.00	0.09	0.05	12.58	5.32	0.89
	Couple without children	-0.62	0.11	0.06	0.01	9.81	0.60	0.92
	Couple with children	-0.11	0.12	0.04	0.01	6.88	0.65	0.94
	Other household type	0.07	0.13	0.03	0.01	5.91	0.71	0.95
2002	Single without children	-1.93	0.35	0.13	0.02	16.46	1.86	0.79
	Single with children	-0.12	1.57	0.04	0.07	6.63	8.30	0.82
	Couple without children	-0.67	0.12	0.06	0.01	10.13	0.66	0.91
	Couple with children	0.16	0.15	0.03	0.01	5.42	0.81	0.93
	Other household type	0.22	0.15	0.03	0.01	5.09	0.83	0.93
2003	Single without children	-1.26	0.25	0.09	0.01	13.11	1.34	0.77
	Single with children	0.32	1.66	0.02	0.08	4.60	8.73	0.79
	Couple without children	-0.38	0.10	0.05	0.00	8.61	0.53	0.91
	Couple with children	0.07	0.16	0.03	0.01	5.95	0.91	0.92
	Other household type	0.25	0.17	0.02	0.01	4.98	0.95	0.92
2004	Single without children	-2.08	0.28	0.13	0.01	17.41	1.51	0.79
	Single with children	-3.30	1.76	0.19	0.08	23.69	9.28	0.82
	Couple without children	-0.24	0.10	0.05	0.00	7.74	0.55	0.91
	Couple with children	0.11	0.17	0.03	0.01	5.72	0.92	0.93
	Other household type	0.54	0.19	0.01	0.01	3.21	1.07	0.93
2005	Single without children	-1.33	0.22	0.10	0.01	13.18	1.20	0.84
	Single with children	-1.77	0.84	0.12	0.04	15.51	4.50	0.91
	Couple without children	-0.24	0.08	0.05	0.00	7.62	0.43	0.93
	Couple with children	0.14	0.13	0.03	0.01	5.39	0.74	0.94
	Other household type	0.15	0.14	0.03	0.01	5.33	0.79	0.95
2006	Single without children	-1.79	0.24	0.12	0.01	15.71	1.30	0.83
	Single with children	-0.60	0.93	0.07	0.04	9.24	4.92	0.91
	Couple without children	-0.47	0.10	0.06	0.00	8.87	0.55	0.93
	Couple with children	-0.09	0.13	0.04	0.01	6.67	0.73	0.95
	Other household type	-0.11	0.15	0.04	0.01	6.74	0.87	0.95
2007	Single without children	-1.49	0.22	0.11	0.01	14.11	1.17	0.84
	Single with children	-0.03	1.37	0.04	0.06	6.27	7.22	0.92
	Couple without children	-0.29	0.09	0.05	0.00	7.87	0.48	0.94
	Couple with children	-0.06	0.14	0.04	0.01	6.52	0.78	0.95
	Other household type	0.03	0.14	0.04	0.01	5.95	0.80	0.95
2008	Single without children	-0.86	0.19	0.08	0.01	10.70	1.02	0.86
	Single with children	-0.10	1.26	0.04	0.06	6.66	6.68	0.90
	Couple without children	-0.23	0.10	0.05	0.00	7.59	0.56	0.94
	Couple with children	0.17	0.17	0.03	0.01	5.25	0.92	0.95
	Other household type	-0.03	0.16	0.04	0.01	6.33	0.90	0.95
2009	Single without children	-1.21	0.22	0.09	0.01	12.56	1.17	0.86
	Single with children	-1.24	1.40	0.10	0.07	12.62	7.47	0.88
	Couple without children	-0.04	0.09	0.04	0.00	6.51	0.51	0.94
	Couple with children	0.26	0.18	0.03	0.01	4.70	1.00	0.95
	Other household type	0.11	0.16	0.03	0.01	5.58	0.91	0.95
2010	Single without children	-1.02	0.22	0.09	0.01	11.45	1.15	0.87
	Single with children	0.32	1.12	0.02	0.05	4.57	5.94	0.87
	Couple without children	0.06	0.08	0.03	0.00	5.94	0.45	0.94
	Couple with children	-0.15	0.14	0.04	0.01	7.04	0.78	0.96
	Other household type	0.26	0.13	0.03	0.01	4.77	0.73	0.96
2011	Single without children	-0.98	0.18	0.08	0.01	11.28	0.98	0.87
	Single with children	-1.21	0.64	0.09	0.03	12.63	3.45	0.91
	Couple without children	-0.08	0.08	0.04	0.00	6.72	0.45	0.95
	Couple with children	0.01	0.14	0.04	0.01	6.19	0.77	0.95
	Other household type	0.31	0.12	0.02	0.01	4.52	0.70	0.96
2012	Single without children	-1.37	0.19	0.10	0.01	13.41	1.01	0.87
	Single with children	0.12	0.65	0.03	0.03	5.29	3.48	0.94
	Couple without children	-0.01	0.07	0.04	0.00	6.36	0.40	0.95
	Couple with children	0.13	0.08	0.03	0.00	5.53	0.46	0.96
	Other household type	0.31	0.12	0.02	0.01	4.54	0.67	0.96

Source: SOEP v30 (own calculations).

Table 2.B4: Coefficients and R^2 of the net household income estimation (equation 2.5), European countries, EU-SILC

Year	Household Type	1-$\hat{\tau}$	SE	$\hat{\gamma}$	SE	$\hat{\lambda}$	SE	R^2
Switzerland (CH)								
2007	Single without children	2.33	0.17	-0.06	0.01	-7.17	0.88	0.90
	Single with children	4.66	0.47	-0.17	0.02	-20.21	2.47	0.92
	Couple without children	2.50	0.12	-0.07	0.01	-8.82	0.68	0.91
	Couple with children	2.41	0.10	-0.06	0.00	-8.52	0.60	0.94
	Other household type	1.93	0.13	-0.04	0.01	-5.88	0.77	0.93
2008	Single without children	1.31	0.22	-0.02	0.01	-1.62	1.22	0.87
	Single with children	3.52	0.76	-0.12	0.04	-13.82	4.14	0.87
	Couple without children	1.82	0.10	-0.04	0.00	-5.02	0.58	0.93
	Couple with children	2.03	0.10	-0.04	0.00	-6.24	0.55	0.96
	Other household type	2.27	0.17	-0.05	0.01	-7.80	1.01	0.96
2009	Single without children	0.35	0.19	0.03	0.01	3.65	1.02	0.87
	Single with children	2.74	0.73	-0.08	0.03	-9.57	3.99	0.88
	Couple without children	2.29	0.12	-0.06	0.01	-7.54	0.67	0.91
	Couple with children	2.21	0.10	-0.05	0.00	-7.31	0.57	0.96
	Other household type	2.73	0.14	-0.07	0.01	-10.71	0.83	0.95
2010	Single without children	1.39	0.22	-0.02	0.01	-2.10	1.19	0.83
	Single with children	4.52	0.88	-0.16	0.04	-19.73	4.83	0.85
	Couple without children	3.31	0.13	-0.10	0.01	-13.48	0.75	0.89
	Couple with children	1.96	0.10	-0.04	0.00	-5.98	0.61	0.94
	Other household type	3.01	0.16	-0.08	0.01	-12.48	0.93	0.94
2011	Single without children	1.61	0.22	-0.03	0.01	-3.25	1.23	0.87
	Single with children	3.64	0.73	-0.12	0.03	-14.82	4.09	0.86
	Couple without children	2.56	0.10	-0.07	0.00	-9.25	0.59	0.93
	Couple with children	3.08	0.10	-0.09	0.00	-12.67	0.59	0.96
	Other household type	3.05	0.18	-0.09	0.01	-12.71	1.05	0.95
2012	Single without children	1.18	0.20	-0.01	0.01	-1.00	1.12	0.87
	Single with children	4.04	0.59	-0.14	0.03	-16.99	3.36	0.88
	Couple without children	2.35	0.10	-0.06	0.00	-7.99	0.56	0.94
	Couple with children	2.02	0.09	-0.04	0.00	-6.25	0.51	0.97
	Other household type	3.38	0.18	-0.10	0.01	-14.42	1.08	0.94
Germany (DE)								
2004	Single without children	-0.22	0.26	0.05	0.01	7.12	1.39	0.68
	Single with children	-1.17	0.43	0.09	0.02	12.16	2.31	0.81
	Couple without children	-0.55	0.14	0.06	0.01	9.36	0.75	0.81
	Couple with children	0.05	0.12	0.04	0.01	5.71	0.68	0.85
	Other household type	-0.99	0.22	0.08	0.01	11.44	1.21	0.91
2005	Single without children	-0.97	0.38	0.08	0.02	11.06	2.02	0.64
	Single with children	-1.17	1.09	0.10	0.05	11.83	5.70	0.69
	Couple without children	-0.52	0.14	0.06	0.01	9.00	0.78	0.80
	Couple with children	-0.32	0.14	0.05	0.01	7.59	0.79	0.84
	Other household type	0.71	0.21	0.01	0.01	1.99	1.15	0.88
2006	Single without children	-0.47	0.29	0.06	0.01	8.28	1.52	0.65
	Single with children	-1.02	0.63	0.09	0.03	11.44	3.41	0.68
	Couple without children	-0.37	0.13	0.05	0.01	8.16	0.69	0.83
	Couple with children	-0.06	0.13	0.04	0.01	6.30	0.74	0.88
	Other household type	-0.25	0.25	0.05	0.01	7.26	1.43	0.84
2007	Single without children	-1.09	0.28	0.09	0.01	11.74	1.50	0.70
	Single with children	-2.94	1.09	0.18	0.05	21.44	5.77	0.75
	Couple without children	-0.43	0.10	0.06	0.00	8.50	0.56	0.86
	Couple with children	0.35	0.16	0.02	0.01	4.10	0.87	0.82
	Other household type	0.63	0.21	0.01	0.01	2.42	1.20	0.91
2008	Single without children	-2.24	0.28	0.14	0.01	17.98	1.51	0.75
	Single with children	-1.27	1.26	0.10	0.06	12.74	6.61	0.76
	Couple without children	-0.26	0.11	0.05	0.00	7.64	0.57	0.87
	Couple with children	-0.50	0.13	0.06	0.01	8.71	0.73	0.88
	Other household type	0.65	0.28	0.01	0.01	2.50	1.59	0.88

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Year	Household Type	1-$\hat{\tau}$	SE	$\hat{\gamma}$	SE	$\hat{\lambda}$	SE	R^2
	Single without children	0.18	0.15	0.03	0.01	4.92	0.83	0.77
	Single with children	1.13	1.02	-0.02	0.05	0.20	5.35	0.79
2009	Couple without children	0.09	0.08	0.03	0.00	5.72	0.41	0.91
	Couple with children	0.34	0.12	0.02	0.01	4.17	0.69	0.89
	Other household type	-0.43	0.26	0.06	0.01	8.54	1.43	0.90
	Single without children	-1.60	0.31	0.11	0.01	14.49	1.65	0.73
	Single with children	-0.65	0.72	0.07	0.03	9.37	3.85	0.85
2010	Couple without children	0.07	0.08	0.03	0.00	5.81	0.45	0.89
	Couple with children	0.36	0.09	0.02	0.00	3.97	0.53	0.92
	Other household type	-0.51	0.23	0.06	0.01	8.94	1.29	0.88
	Single without children	-1.55	0.37	0.11	0.02	14.23	1.97	0.69
	Single with children	3.68	1.76	-0.13	0.08	-13.95	9.36	0.57
2011	Couple without children	0.07	0.08	0.03	0.00	5.89	0.44	0.90
	Couple with children	0.39	0.12	0.02	0.01	3.86	0.68	0.91
	Other household type	-0.13	0.25	0.04	0.01	6.71	1.39	0.90
	Single without children	-1.04	0.36	0.09	0.02	11.53	1.90	0.67
	Single with children	-0.98	0.39	0.09	0.02	10.98	2.13	0.90
2012	Couple without children	-0.20	0.08	0.05	0.00	7.31	0.45	0.90
	Couple with children	0.02	0.12	0.04	0.01	5.73	0.70	0.88
	Other household type	0.55	0.19	0.02	0.01	2.78	1.07	0.92
Denmark (DK)								
	Single without children	-0.21	0.24	0.05	0.01	7.04	1.30	0.92
	Single with children	1.66	1.54	-0.05	0.07	-2.34	8.24	0.65
2003	Couple without children	-0.06	0.09	0.04	0.00	6.37	0.53	0.94
	Couple with children	0.12	0.08	0.03	0.00	5.68	0.48	0.93
	Other household type	3.51	0.29	-0.12	0.01	-13.63	1.64	0.89
	Single without children	0.20	0.28	0.03	0.01	4.87	1.46	0.93
	Single with children	2.36	0.52	-0.08	0.02	-6.26	2.78	0.90
2004	Couple without children	-0.06	0.10	0.04	0.00	6.37	0.58	0.96
	Couple with children	1.95	0.12	-0.05	0.01	-4.93	0.69	0.91
	Other household type	0.15	0.33	0.03	0.01	5.51	1.91	0.93
	Single without children	0.19	0.27	0.03	0.01	4.95	1.45	0.94
	Single with children	4.06	0.72	-0.15	0.03	-15.33	3.83	0.87
2005	Couple without children	1.08	0.12	-0.01	0.01	-0.12	0.69	0.93
	Couple with children	0.62	0.14	0.01	0.01	2.77	0.78	0.89
	Other household type	0.30	0.09	0.03	0.00	4.19	0.55	0.96
	Single without children	0.14	0.15	0.03	0.01	5.25	0.80	0.94
	Single with children	1.44	0.66	-0.03	0.03	-1.41	3.54	0.90
2006	Couple without children	-0.21	0.08	0.05	0.00	7.20	0.43	0.96
	Couple with children	0.67	0.08	0.01	0.00	2.38	0.49	0.94
	Other household type	-1.21	0.16	0.09	0.01	13.14	0.94	0.95
	Single without children	-0.19	0.31	0.05	0.01	6.96	1.64	0.88
	Single with children	2.31	0.74	-0.07	0.03	-6.33	4.00	0.87
2007	Couple without children	0.25	0.07	0.03	0.00	4.70	0.38	0.97
	Couple with children	0.54	0.07	0.01	0.00	3.10	0.43	0.93
	Other household type	0.62	0.12	0.01	0.01	2.78	0.72	0.96
	Single without children	-0.05	0.18	0.04	0.01	6.27	0.96	0.94
	Single with children	1.87	0.45	-0.05	0.02	-3.94	2.43	0.93
2008	Couple without children	1.26	0.08	-0.02	0.00	-1.01	0.48	0.96
	Couple with children	0.79	0.09	0.00	0.00	1.89	0.50	0.93
	Other household type	0.89	0.17	0.00	0.01	1.17	1.01	0.95
	Single without children	0.64	0.24	0.01	0.01	2.60	1.27	0.94
	Single with children	2.55	0.77	-0.08	0.04	-7.44	4.15	0.89
2009	Couple without children	-0.07	0.06	0.04	0.00	6.41	0.37	0.97
	Couple with children	3.59	0.12	-0.12	0.01	-14.33	0.69	0.92
	Other household type	3.79	0.12	-0.13	0.01	-15.82	0.71	0.97
	Single without children	0.13	0.24	0.03	0.01	5.16	1.26	0.93
	Single with children	1.81	0.32	-0.05	0.01	-3.68	1.72	0.95
2010	Couple without children	0.49	0.07	0.02	0.00	3.21	0.38	0.98
	Couple with children	1.13	0.08	-0.01	0.00	-0.48	0.46	0.95
	Other household type	2.37	0.18	-0.06	0.01	-8.28	1.08	0.93

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Year	Household Type	1-$\hat{\tau}$	SE	$\hat{\gamma}$	SE	$\hat{\lambda}$	SE	R^2
	Single without children	1.00	0.23	-0.01	0.01	0.46	1.23	0.95
	Single with children	2.69	0.51	-0.09	0.02	-8.37	2.73	0.92
2011	Couple without children	0.23	0.06	0.03	0.00	4.66	0.36	0.98
	Couple with children	-0.06	0.07	0.04	0.00	6.60	0.43	0.97
	Other household type	4.87	0.38	-0.17	0.02	-22.40	2.22	0.92
	Single without children	0.01	0.08	0.04	0.00	5.79	0.43	0.97
	Single with children	1.81	0.54	-0.05	0.02	-3.70	2.93	0.95
2012	Couple without children	0.27	0.08	0.03	0.00	4.49	0.46	0.98
	Couple with children	0.50	0.07	0.02	0.00	3.33	0.42	0.97
	Other household type	0.73	0.21	0.01	0.01	1.92	1.25	0.96
Spain (ES)								
	Single without children	1.43	0.40	-0.03	0.02	-1.72	2.03	0.87
	Single with children	2.05	1.65	-0.05	0.08	-5.81	8.45	0.75
2005	Couple without children	0.53	0.19	0.02	0.01	2.71	1.02	0.90
	Couple with children	1.49	0.09	-0.03	0.00	-2.40	0.50	0.95
	Other household type	2.38	0.13	-0.07	0.01	-7.31	0.72	0.95
	Single without children	0.84	0.48	0.00	0.02	1.31	2.47	0.84
	Single with children	-0.01	0.93	0.04	0.05	5.52	4.79	0.88
2006	Couple without children	0.43	0.21	0.02	0.01	3.15	1.13	0.90
	Couple with children	1.37	0.13	-0.02	0.01	-1.80	0.71	0.93
	Other household type	1.70	0.18	-0.04	0.01	-3.65	0.95	0.91
	Single without children	0.63	0.44	0.01	0.02	2.34	2.29	0.86
	Single with children	-1.68	4.42	0.13	0.21	14.10	23.11	0.59
2007	Couple without children	0.88	0.16	0.00	0.01	0.86	0.83	0.94
	Couple with children	1.59	0.09	-0.03	0.00	-2.95	0.51	0.96
	Other household type	1.20	0.10	-0.01	0.00	-0.93	0.56	0.96
	Single without children	0.94	0.18	0.00	0.01	0.72	0.92	0.93
	Single with children	1.58	0.23	-0.03	0.01	-2.58	1.17	0.98
2008	Couple without children	1.26	0.03	-0.02	0.00	-0.94	0.17	0.97
	Couple with children	1.56	0.07	-0.03	0.00	-2.54	0.39	0.96
	Other household type	2.65	0.08	-0.08	0.00	-8.76	0.42	0.96
	Single without children	1.94	0.18	-0.05	0.01	-4.40	0.92	0.92
	Single with children	1.33	0.22	-0.02	0.01	-1.21	1.14	0.98
2009	Couple without children	0.67	0.10	0.01	0.00	2.18	0.54	0.94
	Couple with children	1.15	0.05	-0.01	0.00	-0.34	0.26	0.97
	Other household type	1.07	0.07	-0.01	0.00	0.00	0.37	0.97
	Single without children	0.94	0.17	0.00	0.01	0.57	0.87	0.91
	Single with children	0.96	0.31	0.00	0.02	0.61	1.61	0.96
2010	Couple without children	0.65	0.09	0.01	0.00	2.32	0.47	0.96
	Couple with children	1.34	0.04	-0.02	0.00	-1.37	0.24	0.98
	Other household type	0.85	0.05	0.00	0.00	1.21	0.30	0.97
	Single without children	1.10	0.22	-0.01	0.01	-0.28	1.13	0.89
	Single with children	1.06	0.28	-0.01	0.01	-0.07	1.44	0.95
2011	Couple without children	0.82	0.09	0.00	0.00	1.42	0.50	0.96
	Couple with children	1.18	0.06	-0.01	0.00	-0.53	0.34	0.97
	Other household type	1.48	0.07	-0.03	0.00	-2.26	0.40	0.96
	Single without children	1.77	0.11	-0.04	0.01	-3.63	0.57	0.92
	Single with children	1.40	0.46	-0.03	0.02	-1.64	2.44	0.95
2012	Couple without children	0.98	0.08	0.00	0.00	0.51	0.41	0.95
	Couple with children	1.25	0.06	-0.02	0.00	-0.84	0.33	0.97
	Other household type	1.58	0.08	-0.03	0.00	-2.74	0.45	0.97
France (FR)								
	Single without children	1.15	0.23	-0.01	0.01	-0.35	1.20	0.87
	Single with children	0.54	0.44	0.02	0.02	2.90	2.33	0.91
2006	Couple without children	1.04	0.11	-0.01	0.00	0.34	0.58	0.92
	Couple with children	0.78	0.08	0.01	0.00	1.49	0.44	0.95
	Other household type	-0.39	0.24	0.06	0.01	7.79	1.30	0.93
	Single without children	0.43	0.14	0.02	0.01	3.15	0.75	0.94
	Single with children	0.19	0.22	0.03	0.01	4.59	1.17	0.95
2007	Couple without children	0.36	0.06	0.02	0.00	3.85	0.33	0.97
	Couple with children	0.46	0.05	0.02	0.00	3.12	0.26	0.98

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Year	Household Type	1-$\hat{\tau}$	SE	$\hat{\gamma}$	SE	$\hat{\lambda}$	SE	R^2
	Other household type	1.08	0.09	-0.01	0.00	-0.23	0.51	0.97
2008	Single without children	0.30	0.11	0.03	0.01	3.90	0.57	0.94
	Single with children	0.94	0.26	0.00	0.01	0.61	1.38	0.95
	Couple without children	0.33	0.05	0.03	0.00	3.98	0.26	0.97
	Couple with children	0.56	0.05	0.02	0.00	2.66	0.30	0.98
	Other household type	0.41	0.07	0.02	0.00	3.60	0.41	0.98
2009	Single without children	0.34	0.12	0.03	0.01	3.64	0.62	0.94
	Single with children	2.93	0.19	-0.09	0.01	-10.02	1.00	0.95
	Couple without children	0.53	0.06	0.02	0.00	2.90	0.31	0.97
	Couple with children	0.56	0.05	0.02	0.00	2.66	0.28	0.98
	Other household type	0.12	0.06	0.04	0.00	5.16	0.34	0.98
2010	Single without children	0.48	0.13	0.02	0.01	2.96	0.71	0.95
	Single with children	0.25	0.17	0.03	0.01	4.32	0.92	0.96
	Couple without children	0.48	0.05	0.02	0.00	3.23	0.29	0.97
	Couple with children	0.68	0.05	0.01	0.00	2.00	0.25	0.97
	Other household type	0.90	0.07	0.00	0.00	0.79	0.42	0.98
2011	Single without children	0.96	0.08	0.00	0.00	0.41	0.43	0.94
	Single with children	1.30	0.20	-0.02	0.01	-1.37	1.06	0.96
	Couple without children	0.68	0.04	0.01	0.00	2.10	0.23	0.97
	Couple with children	0.97	0.06	0.00	0.00	0.35	0.33	0.97
	Other household type	0.53	0.08	0.02	0.00	2.77	0.46	0.97
2012	Single without children	1.15	0.10	-0.01	0.00	-0.63	0.52	0.94
	Single with children	0.60	0.18	0.01	0.01	2.44	0.96	0.95
	Couple without children	0.44	0.05	0.02	0.00	3.42	0.30	0.97
	Couple with children	0.58	0.04	0.02	0.00	2.62	0.25	0.97
	Other household type	0.34	0.11	0.03	0.00	3.90	0.63	0.97
Ireland (IE)								
2003	Single without children	-0.31	0.39	0.05	0.02	7.53	2.10	0.91
	Single with children	-0.80	1.63	0.07	0.08	10.55	8.68	0.79
	Couple without children	0.61	0.30	0.01	0.01	2.91	1.64	0.87
	Couple with children	0.05	0.08	0.03	0.00	5.98	0.44	0.96
	Other household type	0.48	0.19	0.02	0.01	3.37	1.07	0.94
2004	Single without children	-0.79	0.41	0.07	0.02	10.41	2.20	0.88
	Single with children	1.41	0.59	-0.03	0.03	-1.14	3.16	0.96
	Couple without children	0.74	0.16	0.00	0.01	2.27	0.90	0.94
	Couple with children	-0.40	0.09	0.06	0.00	8.44	0.52	0.94
	Other household type	1.77	0.21	-0.04	0.01	-3.69	1.17	0.94
2005	Single without children	-0.37	0.38	0.05	0.02	8.16	2.04	0.84
	Single with children	-0.39	0.54	0.06	0.02	7.95	3.09	0.90
	Couple without children	-0.14	0.12	0.04	0.01	7.00	0.67	0.95
	Couple with children	-0.45	0.09	0.06	0.00	8.87	0.49	0.96
	Other household type	0.43	0.17	0.02	0.01	3.68	0.97	0.95
2006	Single without children	0.85	0.28	0.00	0.01	1.54	1.51	0.92
	Single with children	4.51	1.22	-0.17	0.06	-17.81	6.52	0.91
	Couple without children	0.55	0.09	0.01	0.00	3.17	0.48	0.97
	Couple with children	-0.05	0.08	0.04	0.00	6.63	0.46	0.97
	Other household type	1.11	0.15	-0.01	0.01	0.08	0.84	0.95
2007	Single without children	0.34	0.27	0.02	0.01	4.11	1.47	0.93
	Single with children	1.20	0.58	-0.02	0.03	-0.44	3.19	0.94
	Couple without children	0.74	0.11	0.00	0.01	2.21	0.64	0.96
	Couple with children	0.10	0.09	0.03	0.00	5.85	0.52	0.96
	Other household type	1.66	0.18	-0.04	0.01	-3.07	1.00	0.96
2008	Single without children	-0.05	0.28	0.04	0.01	6.34	1.52	0.93
	Single with children	3.65	1.20	-0.13	0.06	-13.30	6.38	0.94
	Couple without children	0.66	0.11	0.01	0.01	2.70	0.63	0.96
	Couple with children	0.89	0.11	0.00	0.00	1.53	0.61	0.95
	Other household type	1.54	0.14	-0.03	0.01	-2.25	0.80	0.97
2009	Single without children	3.04	0.49	-0.10	0.02	-10.17	2.63	0.87
	Single with children	1.44	0.56	-0.03	0.03	-1.31	3.02	0.93
	Couple without children	1.24	0.19	-0.02	0.01	-0.40	1.03	0.93
	Couple with children	0.09	0.11	0.03	0.00	6.03	0.60	0.95

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Year	Household Type	1-$\hat{\tau}$	SE	$\hat{\gamma}$	SE	$\hat{\lambda}$	SE	R^2
	Other household type	2.68	0.25	-0.08	0.01	-8.69	1.41	0.94
2010	Single without children	-0.16	0.31	0.04	0.01	7.28	1.67	0.90
	Single with children	1.89	0.62	-0.05	0.03	-3.65	3.41	0.92
	Couple without children	0.76	0.19	0.00	0.01	2.42	1.03	0.94
	Couple with children	0.21	0.12	0.02	0.01	5.57	0.67	0.95
	Other household type	1.62	0.24	-0.04	0.01	-2.55	1.37	0.94
2011	Single without children	-0.11	0.34	0.04	0.02	6.99	1.86	0.87
	Single with children	1.01	0.44	-0.01	0.02	1.30	2.41	0.90
	Couple without children	0.47	0.18	0.02	0.01	3.81	1.02	0.93
	Couple with children	-0.14	0.16	0.04	0.01	7.36	0.92	0.91
	Other household type	1.81	0.29	-0.04	0.01	-3.65	1.65	0.94
2012	Single without children	-0.35	0.38	0.05	0.02	8.34	2.10	0.85
	Single with children	0.82	0.49	0.00	0.02	1.79	2.66	0.93
	Couple without children	0.15	0.16	0.03	0.01	5.64	0.89	0.92
	Couple with children	0.41	0.14	0.02	0.01	4.33	0.80	0.93
	Other household type	1.93	0.23	-0.05	0.01	-4.36	1.31	0.93
Italy (IT)								
2006	Single without children	0.42	0.20	0.02	0.01	3.53	1.10	0.87
	Single with children	1.00	0.36	0.00	0.02	0.29	1.97	0.92
	Couple without children	1.07	0.11	-0.01	0.01	-0.04	0.62	0.92
	Couple with children	0.71	0.06	0.01	0.00	2.01	0.34	0.97
	Other household type	1.14	0.07	-0.01	0.00	-0.45	0.37	0.97
2007	Single without children	-0.02	0.20	0.04	0.01	5.89	1.06	0.88
	Single with children	1.74	0.61	-0.04	0.03	-3.28	3.24	0.90
	Couple without children	0.76	0.08	0.00	0.00	1.73	0.42	0.95
	Couple with children	0.77	0.06	0.00	0.00	1.71	0.34	0.96
	Other household type	1.31	0.07	-0.02	0.00	-1.41	0.41	0.96
2008	Single without children	-0.07	0.18	0.04	0.01	6.17	0.94	0.89
	Single with children	2.49	0.42	-0.07	0.02	-7.69	2.27	0.92
	Couple without children	0.67	0.09	0.01	0.00	2.18	0.48	0.95
	Couple with children	0.73	0.06	0.01	0.00	1.93	0.31	0.97
	Other household type	1.62	0.09	-0.03	0.00	-3.14	0.53	0.94
2009	Single without children	0.19	0.17	0.03	0.01	4.78	0.90	0.90
	Single with children	0.71	0.40	0.01	0.02	2.07	2.18	0.84
	Couple without children	0.84	0.10	0.00	0.00	1.31	0.53	0.95
	Couple with children	0.58	0.05	0.01	0.00	2.77	0.29	0.96
	Other household type	1.35	0.07	-0.02	0.00	-1.63	0.40	0.97
2010	Single without children	-0.07	0.14	0.04	0.01	6.24	0.77	0.90
	Single with children	1.39	0.38	-0.02	0.02	-1.63	2.02	0.92
	Couple without children	1.02	0.09	-0.01	0.00	0.25	0.49	0.94
	Couple with children	0.77	0.07	0.00	0.00	1.78	0.37	0.95
	Other household type	0.84	0.07	0.00	0.00	1.17	0.38	0.96
2011	Single without children	-0.06	0.18	0.04	0.01	6.09	0.95	0.91
	Single with children	0.25	0.36	0.03	0.02	4.48	1.95	0.93
	Couple without children	0.81	0.07	0.00	0.00	1.43	0.39	0.96
	Couple with children	0.65	0.06	0.01	0.00	2.41	0.34	0.96
	Other household type	0.70	0.08	0.01	0.00	1.97	0.44	0.96
2012	Single without children	0.00	0.23	0.04	0.01	5.85	1.23	0.85
	Single with children	0.27	0.27	0.03	0.01	4.48	1.48	0.95
	Couple without children	0.36	0.07	0.02	0.00	3.87	0.37	0.96
	Couple with children	0.65	0.07	0.01	0.00	2.42	0.41	0.96
	Other household type	1.05	0.08	-0.01	0.00	-0.01	0.46	0.96
Netherlands (NL)								
2004	Single without children	-0.51	0.28	0.06	0.01	8.85	1.54	0.68
	Single with children	2.85	1.16	-0.10	0.05	-8.25	6.14	0.68
	Couple without children	0.09	0.20	0.03	0.01	5.58	1.12	0.79
	Couple with children	2.73	0.27	-0.09	0.01	-8.81	1.49	0.66
	Other household type	1.77	0.45	-0.04	0.02	-3.96	2.54	0.83
2005	Single without children	-1.17	0.22	0.09	0.01	12.13	1.21	0.85
	Single with children	1.69	0.78	-0.05	0.04	-2.11	4.12	0.84
	Couple without children	0.00	0.11	0.04	0.01	6.27	0.62	0.93

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Year	Household Type	1-$\hat{\tau}$	SE	$\hat{\gamma}$	SE	$\hat{\lambda}$	SE	R^2
	Couple with children	0.01	0.12	0.03	0.01	6.34	0.65	0.90
	Other household type	0.69	0.25	0.01	0.01	1.75	1.42	0.93
2006	Single without children	-3.32	0.21	0.19	0.01	23.53	1.13	0.88
	Single with children	-3.15	0.75	0.19	0.04	22.82	3.97	0.83
	Couple without children	0.09	0.11	0.03	0.00	5.71	0.61	0.91
	Couple with children	-0.49	0.08	0.06	0.00	8.96	0.46	0.94
	Other household type	-0.99	0.28	0.08	0.01	11.81	1.58	0.91
2007	Single without children	-0.34	0.20	0.05	0.01	7.83	1.06	0.84
	Single with children	-1.36	0.57	0.10	0.03	13.52	3.05	0.88
	Couple without children	-0.34	0.11	0.05	0.00	8.00	0.61	0.90
	Couple with children	-0.57	0.08	0.06	0.00	9.44	0.46	0.94
	Other household type	1.33	0.29	-0.02	0.01	-1.64	1.69	0.88
2008	Single without children	-1.42	0.19	0.10	0.01	13.71	1.01	0.86
	Single with children	0.56	0.48	0.01	0.02	3.49	2.57	0.88
	Couple without children	-0.85	0.09	0.07	0.00	10.89	0.52	0.93
	Couple with children	0.83	0.07	0.00	0.00	1.39	0.42	0.95
	Other household type	0.56	0.26	0.01	0.01	2.91	1.49	0.93
2009	Single without children	-2.13	0.27	0.14	0.01	17.48	1.45	0.83
	Single with children	0.30	0.67	0.02	0.03	4.72	3.55	0.87
	Couple without children	-0.29	0.10	0.05	0.00	7.75	0.54	0.93
	Couple with children	0.36	0.10	0.02	0.00	4.06	0.58	0.92
	Other household type	0.87	0.23	0.00	0.01	0.99	1.33	0.94
2010	Single without children	-1.75	0.23	0.12	0.01	15.46	1.23	0.84
	Single with children	-0.25	0.54	0.05	0.03	7.85	2.88	0.85
	Couple without children	-0.33	0.11	0.05	0.01	8.01	0.63	0.90
	Couple with children	-0.04	0.15	0.04	0.01	6.43	0.86	0.85
	Other household type	1.93	0.26	-0.05	0.01	-5.11	1.47	0.93
2011	Single without children	-1.82	0.23	0.12	0.01	15.85	1.23	0.82
	Single with children	-0.63	0.56	0.07	0.03	9.66	3.01	0.87
	Couple without children	-0.34	0.13	0.05	0.01	8.15	0.74	0.90
	Couple with children	0.10	0.11	0.03	0.00	5.56	0.61	0.90
	Other household type	1.70	0.30	-0.04	0.01	-3.74	1.74	0.91
2012	Single without children	-2.04	0.21	0.13	0.01	17.08	1.09	0.88
	Single with children	0.23	0.57	0.02	0.03	5.18	3.06	0.84
	Couple without children	-0.43	0.11	0.05	0.00	8.65	0.60	0.92
	Couple with children	-0.25	0.08	0.05	0.00	7.65	0.48	0.95
	Other household type	0.51	0.33	0.01	0.01	3.28	1.90	0.90
Norway (NO)								
2003	Single without children	-0.47	0.23	0.06	0.01	8.57	1.26	0.92
	Single with children	-0.15	0.21	0.05	0.01	6.89	1.20	0.93
	Couple without children	-0.66	0.11	0.07	0.00	9.87	0.62	0.95
	Couple with children	-0.49	0.06	0.06	0.00	9.13	0.33	0.95
	Other household type	-1.40	0.19	0.10	0.01	14.29	1.12	0.94
2004	Single without children	-0.96	0.12	0.08	0.01	11.06	0.67	0.95
	Single with children	-0.90	0.16	0.08	0.01	11.12	0.90	0.97
	Couple without children	-0.07	0.07	0.04	0.00	6.42	0.40	0.91
	Couple with children	-0.17	0.08	0.04	0.00	7.26	0.48	0.96
	Other household type	2.01	0.44	-0.05	0.02	-5.48	2.52	0.83
2005	Single without children	-0.54	0.32	0.06	0.01	8.90	1.70	0.79
	Single with children	5.06	0.91	-0.20	0.04	-21.01	4.95	0.77
	Couple without children	-1.09	0.13	0.09	0.01	12.23	0.72	0.91
	Couple with children	0.06	0.11	0.04	0.00	5.71	0.66	0.88
	Other household type	0.48	0.09	0.02	0.00	3.02	0.54	0.97
2006	Single without children	-0.29	0.35	0.05	0.02	7.67	1.89	0.76
	Single with children	3.35	1.29	-0.12	0.06	-12.27	6.99	0.62
	Couple without children	-0.06	0.15	0.04	0.01	6.64	0.87	0.91
	Couple with children	0.50	0.10	0.01	0.00	3.58	0.58	0.95
	Other household type	1.29	0.22	-0.02	0.01	-1.33	1.30	0.92
2007	Single without children	-0.32	0.26	0.05	0.01	7.86	1.40	0.92
	Single with children	-0.40	0.31	0.05	0.01	8.51	1.72	0.94
	Couple without children	0.38	0.16	0.02	0.01	4.12	0.92	0.89

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Year	Household Type	1-$\hat{\tau}$	SE	$\hat{\gamma}$	SE	$\hat{\lambda}$	SE	R^2
	Couple with children	0.69	0.07	0.01	0.00	2.47	0.41	0.95
	Other household type	1.14	0.14	-0.01	0.01	-0.33	0.84	0.96
2008	Single without children	-0.50	0.20	0.06	0.01	8.76	1.07	0.95
	Single with children	0.82	0.53	0.00	0.02	1.84	2.95	0.92
	Couple without children	0.22	0.14	0.03	0.01	5.13	0.80	0.90
	Couple with children	0.37	0.10	0.02	0.00	4.28	0.57	0.95
	Other household type	0.78	0.11	0.00	0.00	1.88	0.64	0.97
2009	Single without children	-0.14	0.22	0.04	0.01	6.86	1.18	0.94
	Single with children	1.31	0.85	-0.02	0.04	-0.71	4.61	0.81
	Couple without children	0.02	0.12	0.03	0.01	6.36	0.70	0.92
	Couple with children	0.49	0.07	0.01	0.00	3.70	0.39	0.97
	Other household type	0.94	0.27	0.00	0.01	1.02	1.56	0.95
2010	Single without children	-0.22	0.13	0.05	0.01	7.47	0.69	0.96
	Single with children	1.08	0.58	-0.01	0.03	0.42	3.19	0.92
	Couple without children	0.64	0.17	0.01	0.01	2.93	0.95	0.91
	Couple with children	0.33	0.11	0.02	0.00	4.64	0.63	0.94
	Other household type	1.31	0.18	-0.02	0.01	-1.20	1.03	0.97
2011	Single without children	0.04	0.15	0.03	0.01	6.08	0.81	0.96
	Single with children	1.54	0.39	-0.03	0.02	-2.20	2.13	0.94
	Couple without children	0.85	0.09	0.00	0.00	1.78	0.55	0.95
	Couple with children	1.18	0.09	-0.01	0.00	-0.34	0.51	0.96
	Other household type	0.87	0.11	0.00	0.00	1.31	0.66	0.97
2012	Single without children	-0.08	0.13	0.04	0.01	6.76	0.71	0.96
	Single with children	-0.28	0.26	0.05	0.01	7.75	1.44	0.96
	Couple without children	1.18	0.09	-0.02	0.00	-0.07	0.53	0.95
	Couple with children	0.87	0.09	0.00	0.00	1.51	0.51	0.95
	Other household type	1.40	0.13	-0.02	0.01	-1.79	0.75	0.98
Sweden (SE)								
2003	Single without children	2.03	0.31	-0.06	0.02	-5.00	1.63	0.93
	Single with children	3.14	0.35	-0.11	0.02	-10.64	1.82	0.91
	Couple without children	2.40	0.15	-0.07	0.01	-7.30	0.82	0.95
	Couple with children	2.45	0.12	-0.07	0.01	-7.43	0.66	0.96
	Other household type	1.15	0.04	-0.01	0.00	-0.50	0.20	0.98
2004	Single without children	2.89	0.51	-0.10	0.02	-9.51	2.68	0.86
	Single with children	2.81	0.68	-0.10	0.03	-8.80	3.58	0.86
	Couple without children	1.21	0.09	-0.02	0.00	-0.83	0.49	0.97
	Couple with children	1.52	0.07	-0.03	0.00	-2.32	0.41	0.97
	Other household type	1.42	0.04	-0.03	0.00	-1.91	0.18	0.98
2005	Single without children	0.92	0.22	0.00	0.01	0.89	1.13	0.89
	Single with children	2.09	0.75	-0.06	0.04	-5.34	3.98	0.91
	Couple without children	1.38	0.10	-0.02	0.00	-1.73	0.57	0.96
	Couple with children	2.51	0.10	-0.08	0.00	-7.77	0.57	0.96
	Other household type	1.53	0.05	-0.03	0.00	-2.24	0.24	0.97
2006	Single without children	1.52	0.40	-0.03	0.02	-2.21	2.13	0.83
	Single with children	4.02	0.73	-0.15	0.03	-15.46	3.88	0.89
	Couple without children	1.59	0.11	-0.03	0.01	-2.97	0.63	0.93
	Couple with children	1.67	0.13	-0.04	0.01	-3.19	0.75	0.90
	Other household type	1.37	0.06	-0.02	0.00	-1.48	0.31	0.96
2007	Single without children	1.64	0.22	-0.04	0.01	-3.09	1.19	0.91
	Single with children	1.98	0.39	-0.05	0.02	-4.52	2.02	0.90
	Couple without children	1.71	0.11	-0.04	0.00	-3.67	0.59	0.95
	Couple with children	1.27	0.07	-0.02	0.00	-0.91	0.41	0.96
	Other household type	1.30	0.06	-0.02	0.00	-1.27	0.33	0.96
2008	Single without children	1.99	0.23	-0.05	0.01	-4.96	1.20	0.93
	Single with children	3.05	0.52	-0.10	0.02	-10.27	2.74	0.94
	Couple without children	1.33	0.08	-0.02	0.00	-1.58	0.46	0.95
	Couple with children	1.64	0.08	-0.04	0.00	-2.96	0.44	0.96
	Other household type	2.37	0.16	-0.07	0.01	-7.28	0.92	0.97
2009	Single without children	1.78	0.30	-0.04	0.01	-3.94	1.58	0.92
	Single with children	2.94	0.42	-0.10	0.02	-9.62	2.22	0.95
	Couple without children	1.60	0.12	-0.03	0.01	-3.07	0.66	0.92

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Year	Household Type	1-$\hat{\tau}$	SE	$\hat{\gamma}$	SE	$\hat{\lambda}$	SE	R^2
	Couple with children	1.24	0.07	-0.02	0.00	-0.72	0.41	0.97
	Other household type	1.34	0.05	-0.02	0.00	-1.42	0.28	0.98
2010	Single without children	2.98	0.20	-0.10	0.01	-10.21	1.03	0.97
	Single with children	3.62	0.88	-0.13	0.04	-13.31	4.65	0.91
	Couple without children	1.64	0.06	-0.03	0.00	-3.29	0.35	0.98
	Couple with children	2.17	0.09	-0.06	0.00	-5.93	0.51	0.97
	Other household type	1.54	0.10	-0.03	0.00	-2.70	0.58	0.97
2011	Single without children	1.17	0.10	-0.01	0.00	-0.65	0.54	0.98
	Single with children	2.76	0.51	-0.09	0.02	-8.77	2.72	0.94
	Couple without children	2.59	0.08	-0.08	0.00	-8.62	0.45	0.96
	Couple with children	2.07	0.07	-0.05	0.00	-5.50	0.42	0.97
	Other household type	1.59	0.06	-0.03	0.00	-2.85	0.33	0.97
2012	Single without children	1.45	0.19	-0.03	0.01	-2.06	0.99	0.97
	Single with children	3.28	0.60	-0.11	0.03	-11.59	3.21	0.94
	Couple without children	1.84	0.06	-0.04	0.00	-4.41	0.34	0.98
	Couple with children	1.84	0.09	-0.04	0.00	-4.20	0.53	0.96
	Other household type	1.24	0.04	-0.02	0.00	-0.92	0.24	0.97
United Kingdom (UK)								
2004	Single without children	0.19	0.22	0.03	0.01	4.81	1.16	0.92
	Single with children	-0.60	0.37	0.07	0.02	9.24	1.98	0.90
	Couple without children	0.42	0.08	0.02	0.00	3.58	0.44	0.96
	Couple with children	0.38	0.06	0.02	0.00	3.94	0.36	0.96
	Other household type	0.61	0.12	0.01	0.01	2.42	0.70	0.96
2005	Single without children	-0.09	0.31	0.04	0.01	6.38	1.68	0.87
	Single with children	1.03	0.73	-0.01	0.03	0.69	3.88	0.88
	Couple without children	0.29	0.10	0.03	0.00	4.29	0.53	0.95
	Couple with children	0.30	0.09	0.02	0.00	4.47	0.50	0.95
	Other household type	1.02	0.13	-0.01	0.01	0.24	0.75	0.96
2006	Single without children	0.10	0.23	0.03	0.01	5.42	1.27	0.90
	Single with children	0.70	0.54	0.01	0.03	2.24	2.88	0.90
	Couple without children	0.58	0.09	0.01	0.00	2.71	0.49	0.96
	Couple with children	0.36	0.10	0.02	0.00	4.07	0.56	0.96
	Other household type	0.49	0.08	0.02	0.00	3.20	0.47	0.97
2007	Single without children	0.16	0.14	0.03	0.01	4.91	0.77	0.92
	Single with children	0.72	0.77	0.01	0.04	2.18	4.12	0.87
	Couple without children	0.58	0.11	0.01	0.00	2.67	0.59	0.95
	Couple with children	0.17	0.09	0.03	0.00	5.12	0.53	0.95
	Other household type	0.10	0.18	0.04	0.01	5.29	1.04	0.95
2008	Single without children	0.25	0.42	0.03	0.02	4.64	2.25	0.82
	Single with children	0.46	0.62	0.02	0.03	3.67	3.29	0.88
	Couple without children	0.52	0.11	0.02	0.01	2.95	0.63	0.96
	Couple with children	0.18	0.11	0.03	0.00	5.08	0.62	0.95
	Other household type	0.84	0.22	0.00	0.01	1.27	1.24	0.95
2009	Single without children	0.46	0.33	0.02	0.02	3.41	1.75	0.88
	Single with children	-0.40	0.63	0.05	0.03	8.58	3.35	0.89
	Couple without children	0.40	0.13	0.02	0.01	3.64	0.74	0.94
	Couple with children	0.13	0.10	0.03	0.00	5.50	0.55	0.96
	Other household type	1.31	0.20	-0.02	0.01	-1.32	1.15	0.95
2010	Single without children	0.48	0.29	0.02	0.01	3.37	1.59	0.85
	Single with children	0.43	0.30	0.02	0.01	3.94	1.70	0.92
	Couple without children	0.64	0.11	0.01	0.00	2.45	0.62	0.95
	Couple with children	0.43	0.11	0.02	0.00	3.88	0.61	0.94
	Other household type	1.39	0.15	-0.02	0.01	-1.73	0.87	0.94
2011	Single without children	0.18	0.16	0.03	0.01	5.10	0.86	0.92
	Single with children	1.42	0.39	-0.03	0.02	-1.10	2.08	0.91
	Couple without children	1.48	0.10	-0.03	0.00	-2.08	0.54	0.95
	Couple with children	0.74	0.09	0.00	0.00	2.16	0.49	0.94
	Other household type	0.72	0.13	0.01	0.01	2.09	0.75	0.97
2012	Single without children	0.34	0.26	0.02	0.01	4.44	1.39	0.86
	Single with children	0.77	0.56	0.00	0.03	2.29	3.01	0.84
	Couple without children	1.18	0.14	-0.02	0.01	-0.33	0.78	0.93

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Year	Household Type	1-$\hat{\tau}$	SE	$\hat{\gamma}$	SE	$\hat{\lambda}$	SE	R^2
	Couple with children	0.19	0.08	0.03	0.00	5.36	0.42	0.97
	Other household type	1.54	0.15	-0.03	0.01	-2.41	0.82	0.97

Source: EU-SILC (own calculations).

Table 2.B5: Pareto distribution parameter, European countries, EU-SILC, and WID

Year	α (1/0.1)	$y_{tax}^{0.99}$ (WID)	$y_{tax}^{0.99}$ (EU-Silc)	$k_{tax}^{0.99}$ (EU-Silc)
Switzerland (CH)				
2001	1.70			
2002	1.81			
2003	1.75			
2004	1.73			
2005	1.75	206638.25		
2006	1.73	216216.15		
2007	1.69	231100.34	243501.55	15961.36
2008	1.70	239240.83	258586.36	17224.04
2009	1.71	232507.30	251645.70	17029.38
2010	1.73	238015.94	276582.84	19308.83
2011			326945.56	
2012			332029.06	
Denmark (DK)				
2001	2.50	79219.37		
2002	2.51	80670.63		
2003	2.52	82217.75	121801.04	19630.64
2004	2.44	83809.36	117587.29	17840.20
2005	2.29	86519.79	117806.73	15765.67
2006	2.22	89192.24	133477.41	16716.66
2007	2.13	92963.48	134209.14	15514.64
2008	2.22	95814.45	137233.48	17178.21
2009	2.51	91813.53	131019.19	20963.05
2010	2.16	103980.64	148513.77	17638.34
2011			153039.59	
2012			152632.44	
Spain (ES)				
2001	1.92	63419.66		
2002	1.99	65418.98		
2003	1.87	68431.64		
2004	1.83	71908.82		
2005	1.73	77617.65	81200.00	5704.88
2006	1.61	87352.59	86172.49	4904.87
2007	1.70	88469.53	89884.00	5973.68
2008	1.83	87391.44	118469.40	9507.18
2009	1.87	85021.10	114933.20	9830.02
2010	1.99	82310.22	118531.56	11750.46
2011	1.89	82781.68	118818.80	10347.05
2012	1.96	79038.49	117943.50	11315.96
France (FR)				
2001	2.11	107081.10		
2002	2.11	109382.51		
2003	1.88	114148.92		
2004	1.80	117172.82		
2005	1.82	118341.90		
2006	1.79	125814.21	124268.11	9510.23
2007	1.76	130580.14	164910.00	12124.05
2008	1.87	133597.60	168354.00	14356.78
2009	2.05	131269.42	168932.00	17901.08
2010	1.95	136595.40	178256.00	16897.61
2011	1.81	144207.17	192420.00	15163.01
2012	1.92	148375.46	184547.00	16745.37
Ireland (IE)				
2001	1.96			
2002	1.95			
2003	1.94		157405.59	14658.59
2004	1.87		155251.23	13228.67
2005	1.80		175026.94	13551.70

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Year	α (1/0.1)	$y_{tax}^{0.99}$ (WID)	$y_{tax}^{0.99}$ (EU-Silc)	$k_{tax}^{0.99}$ (EU-Silc)
2006	1.75		209413.08	15071.16
2007	1.85		200528.95	16637.80
2008	1.96		204274.22	19489.71
2009	1.98		196000.00	19149.40
2010			186818.73	
2011			185790.61	
2012			206038.89	
Italy (IT)				
2001	2.19	74677.68		
2002	2.17	76434.18		
2003	2.14	79285.64		
2004	2.16	80593.19		
2005	2.12	83359.74		
2006	2.03	88476.47	97918.00	10143.30
2007	2.04	91191.19	95641.00	9995.40
2008	2.11	92330.44	95516.29	10746.02
2009	2.18	91747.60	93866.00	11328.91
2010			101300.00	
2011			101066.00	
2012			99242.44	
Netherlands (NL)				
2001	2.63			
2002	2.71			
2003	2.81			
2004	2.84		111392.00	22010.44
2005	2.70		121471.05	22066.43
2006	2.68		136205.11	24430.07
2007	2.89		154739.00	31445.48
2008	2.80		151847.00	29317.07
2009	3.07		135086.00	30140.09
2010	3.11		133763.56	30426.43
2011	3.13		134903.97	30977.55
2012	3.20		140344.80	33281.00
Norway (NO)				
2001	1.90	103499.68		
2002	1.57	113174.17		
2003	1.55	121842.87	135086.61	6965.43
2004	1.48	130071.67	131649.45	5897.76
2005	1.43	159333.81	156986.81	6271.87
2006	1.91	129805.26	146189.69	13157.07
2007	1.87	146481.36	169971.70	14538.73
2008	1.96	149459.87	171710.91	16420.28
2009	2.14	151308.68	166713.80	19293.83
2010	1.96	159462.65	180341.36	17286.12
2011	2.02	168755.35	194503.89	19876.41
2012			202916.63	
Sweden (SE)				
2001	2.02	58676.87		
2002	2.11	52445.42		
2003	2.04	52652.45	82495.91	8667.84
2004	2.08	57343.64	89860.82	9781.63
2005	2.07	64193.74	85971.85	9306.54
2006	1.91	65802.90	97276.22	8727.98
2007	1.93	73618.26	99209.10	9103.36
2008	1.90	77222.49	103989.83	9157.97
2009	2.01	71777.60	89851.83	9054.32
2010	1.97	85188.27	106138.68	10300.94
2011	2.03	97451.21	119906.98	12342.27
2012	1.92	102848.08	122717.55	11146.32
United Kingdom (UK)				

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Year	α (1/0.1)	$y_{tax}^{0.99}$ (WID)	$y_{tax}^{0.99}$ (EU-Silc)	$k_{tax}^{0.99}$ (EU-Silc)
2001	1.82			
2002	1.86			
2003	1.86			
2004	1.82		152891.48	12191.12
2005	1.78		129245.19	9739.95
2006	1.74		160285.81	11428.98
2007	1.69		137273.75	8940.65
2008			118987.93	0.00
2009	1.61		132876.64	7570.93
2010	1.76		138267.95	10028.53
2011	1.76		145281.92	10542.13
2012	1.79	120599.00	131000.06	9985.41

Source: EU-SILC and income tax records excluding capital gains available at WID and for Sweden at `http://www.uueconomics.se/danielw/`.
Note: α is obtained from top income shares based on income tax returns assuming that top incomes follow the Pareto distribution. Our approach does not produce standard errors. The index tax indicates tax units and income (y_{tax}) whereas hh indicates household unit and household gross income (y_{hh}). Thresholds k and y are in current Euros.

3 Optimal taxation under different concepts of justness[1]

3.1 Introduction

Fairness of taxation of incomes and redistribution is a controversial public policy issue, since different concepts of justness may lead to different optimal tax schedules. In fact, the political process may have compromised on a tax policy that respects criteria that cannot be captured by assuming a social planner who weights utility functions. Therefore, we reconcile observed tax transfer practices with an adjusted optimal taxation model allowing for different concepts of justness. More specifically, in an exercise of positive optimal taxation we take the tax and transfer system as given and assume policy makers optimized it under a specific concept of justness taking into account how individuals react to tax changes. We specify three alternative concepts of justness to obtain social weights implied by the tax and transfer system and use two criteria in order to determine, which of the concepts policy makers might have had in mind when designing the tax and transfer system. The first criterion is pareto-efficiency. Even if the government does not explicitly maximize welfare, if some of the weights appear to be negative, then the tax schedule is not second-best Pareto efficient. The second is vertical equity implying that social weights decrease with income as usually assumed in the standard approach in the welfarist optimal taxation literature (e.g., Saez, 2001, 2002; Blundell et al., 2009). Under the welfarist assumption, decreasing weights lie within the bounds confined by the two extreme cases of Rawlsian and Benthamite objective functions. Intuitively, the hypothesis of decreasing welfarist weights expresses the idea that the social planner values an increase of net income of the poor by one Euro more than an increase of net income of higher income groups by one Euro. Saez and Stantcheva (2016) describe welfarism with decreasing weights as one of their two polar cases of interest. In contrast, tax transfer systems in many countries are only optimal if the social planner had chosen social welfare weights in a non-decreasing way. As we show, a major reason for this lies in high transfer withdrawal rates for the working poor.[2] However, tax-transfer systems with high transfer withdrawal rates for the working poor may be optimal and imply decreasing weights under a concept of justness different from the welfarism.

The first main contribution of our paper is an extension of the Saez (2002) model to non-welfarist aims of the social planner. In a recent study, Saez and Stantcheva (2016) propose generalized marginal welfare weights that may depend on characteristics

[1] This chapter is based on Jessen et al. (2017a).

[2] Lockwood and Weinzierl (2016) shows that under present bias and with job search, optimal marginal tax rates are even lower than conventionally calculated. This might be especially relevant for marginal tax rates for the working poor.

that do not enter utility.[3] In our approach, the social planner maximizes an objective function that allows for non-welfarist concepts of justness. In particular, we define the implicit weights of the social welfare function in terms of justness functions instead of utility functions. These functions impose a penalty on deviations of net income from a specific reference point. This implies that even though individuals maximize utility, the social planner does not necessarily maximize a weighted sum of utility but a function potentially including other criteria. The approach in our paper offers the advantage that we can directly quantify the value the social planner puts on a marginal improvement in a specific justness criterion for a given group compared to other groups. Thus, we can show which criterion is in line with social weights that decrease with income.

The second main contribution is the operationalization of an alternative specific idea of justness, which we label the tax burden approach. According to this approach the social planner minimizes the weighted sum of increasing functions of (absolute or relative) tax liabilities. In other words, taxes for groups that have a high tax liability may only be further increased, ceteris paribus, if the social planner attributes a low social weight to this group. This formalizes ideas that are often expressed in public debates over tax reforms. Under the welfarist approach the marginal utility of consumption of an individual is traded off against the efficiency costs of taxing. Instead of focusing on this equity-efficiency trade-off, public debates are often dominated by ideas that refer to the magnitude of the tax liability. Opponents of tax increases argue that specific income groups already contribute their "fair share" of taxes and thus their tax liability should not increase further (even if the efficiency loss and loss in utility of such a tax increase might be low). Equivalently, proponents of tax increases often argue that specific groups do not pay their "fair share" of taxes. Therefore, the tax burden principle is very close to the libertarian concept studied in Saez and Stantcheva (2016).[4]

The related equal sacrifice principle (see Mill, 1848; Musgrave and Musgrave, 1973; Richter, 1983; Young, 1988) is also based on the magnitude of the tax liability. It stipulates that all individuals should suffer the same ‘sacrifice’ through taxes in terms of utility. I.e., the difference in utility derived from gross income and utility derived from net income should be the same for all individuals. Instead, the tax burden principle puts a penalty on high tax liabilities. This penalty is weighted according to the weight the social planner attaches to different income groups. Berliant and Gouveia (1993) show that incentive compatible equal sacrifice tax systems exist. da Costa and Pereira (2014) derive tax schedules that imply equal sacrifice and show that they inhibit inefficiencies for relatively high levels of government consumption as tax rates for high income earners become very large. In contrast, in our application the social planner considers the

[3] Similar to Saez and Stantcheva (2016), we take society’s preferences as given and do not analyze how they could arise through the political process.

[4] Saez and Stantcheva (2016) allow for *welfarist* weights to increase with the amount of taxes paid. Thus decreasing taxes for those with a high tax burden is a high priority for the social planner.

trade-off between loss in tax revenue due to mobility across income groups and the maximization of justness functions for groups with a positive social weight. [5]

The third main contribution is to illustrate how the model can be used with survey data. For this, we use a novel question on the just amount of income from the German Socio-Economic Panel and apply the model to the 2015 German tax and transfer system. In addition, we estimate labor supply elasticities using microsimulation and a structural labor supply model (e.g. Aaberge and Brandolini, 2014). Our study thus adds to the literature on empirical optimal taxation (e.g., Aaberge et al., 2000; Colombino and del Boca, 1990).

Our main result is that the absolute tax burden principle is in line with positive, declining social weights. The explanation for this finding is that the marginal gain in justness increases with the amount of taxes paid and the working poor pay only a low amount of taxes. Although the efficiency costs of redistributing one Euro to this group are relatively small, the reduction in the loss function is small too. In contrast, the weighted increase in utility is high in the welfarist case. A second finding is a confirmation of previous studies: the welfarist approach implies very low weights for the working poor under the 2015 German tax and transfer system.

In the previous literature, researchers used optimal income taxation frameworks that incorporate labor supply responses to obtain "tax-benefit revealed social preferences" (Bourguignon and Spadaro, 2012), i.e., they calculate the social weights under which the current tax and transfer system is optimal. Blundell et al. (2009) apply the Saez (2002) framework to single mothers in Germany and the UK to calculate implied social weights. They find that working mothers with low incomes have low weights compared to the unemployed and most other income groups. For Germany, social weights for working poor single mothers with children under school-age can even become negative, thus implying a non-paretian social welfare function.

Bourguignon and Spadaro (2012) apply positive optimal taxation to the French redistribution system. They find negative social weights for the highest income earners and equally for the working poor if participation elasticities are high. In general, social weights for the working poor are much lower than those for the unemployed or the middle class. Bargain et al. (2014) calculate social weights for 17 European countries and the United States. For all analyzed countries, they find the highest social weights for the unemployed and substantially lower weights for the working poor, i.e., the group with the lowest net income apart from the unemployed. In Belgium, France, Germany, the Netherlands, Portugal, the UK, and Sweden the tax-transfer system implies the lowest social weights for this group.

Lockwood (2016) perform inverse optimal taxation for the US from 1979 to 2010. They find that, if the standard welfarist model is correct, either perceived elasticities

[5]Evidence that the equal sacrifice concept is likely to capture the preferences of a majority is only documented for the U.S: Weinzierl (2014) shows in a survey that around 60 percent preferred the equal sacrifice tax schedule to a welfarist optimal tax schedule.

of taxable income or value judgments have changed considerably over time. This is interpreted as evidence that conventional assumptions of the benchmark model of optimal taxation should be questioned. Immervoll et al. (2007) find for several European countries that expanding redistribution to the working poor would be very cost effective and would virtually imply no deadweight burden.

The next section introduces our optimal taxation model for different concepts of justness, Section 3.3 describes how we calculate actual and just incomes as well as how we estimate extensive and intensive labor supply elasticities for Germany. In Section 3.4, we describe the resulting weights for different concepts of justness, while Section 3.5 concludes.

3.2 A model of optimal taxation for concepts of justness

3.2.1 The general framework

We adjust the canonical model by Saez (2002), which combines the pioneering work by Mirrlees (1971) and Diamond (1980), to capture non-welfarist objective functions. See Appendix A for a formal derivation. The key difference between Saez (2002) model and our extension is that in Saez (2002) the social planner maximizes the weighted sum of utility. The main advantage of our approach is that we allow for the social planner to maximize the weighted sum of 'justness functions' F_m. These functions can depend on various variables and incorporate different concepts of justness. We show that welfarism as in Saez (2002) is a special case.

Net income equals consumption and is given by $c = y - T$, where y denotes gross income and T denotes total taxes paid by the individual to finance a public good G.

The social planer chooses tax liabilities T to optimize a weighted sum L based on individual justness functions F_m. We describe this function in Subsection 3.2.2 in more detail. For now it is sufficient to know that it may depend on c_{i^*}, for instance it could be $F_m(c_{i^*}, c_i^{\text{ref}})$, where c_{i^*} is optimal consumption and c_i^{ref} is a reference point, or on other factors even if they do not enter the utility function of individuals. Individuals are indexed by $m \in M$ with measure $d\,\nu(m)$, where M is a set of measure one. Individuals' utility, $u_m(c_{i^*}, i^*)$, depends on job choice i^* and net income c_{i^*}, where $i = 0, ..., I$ income groups are defined through the group's gross income y_i.[6] The optimization is subject to the government budget constraint:

[6]The number of income groups is assumed to be fixed. In the empirical application, we define groups $1, .., I$ as quintiles of the positive gross income distribution. Bargain et al. (2014) show that changing the cut-off points does not affect the results substantially.

$$\max_{T_0,\ldots,T_I} L = \int_M \mu_m F_m \, d\,\nu(m) \quad \text{s.t.} \quad \sum_{i=0}^{I} h_i T_i = G, \tag{3.1}$$

where μ_m are primitive social weights.[7] Together with the Lagrange multiplier λ, they define the explicit weights $e_m \equiv \frac{\mu_m}{\lambda}$. Each income group has the share h_i of the total population. These shares are endogenous as individuals adjust their labor supply to the tax-transfer system. We assume that the first derivative of F_m with respect to c_i is the same for all individuals in a given group i, i.e.,

$$f_i = f_m \equiv \frac{\partial F_m}{\partial c_i} \quad \text{for all individuals } m \text{ in group } i. \tag{3.2}$$

Average explicit social weights in a given income group are defined as:

$$e_i = \frac{1}{\lambda h_i} \int_{M_i} \mu^m \, d\,\nu(m). \tag{3.3}$$

The ratio of explicit weights of two groups has an intuitive interpretation; it indicates how much the social planner values improving the justness function by one unit for one group relative to doing so for another group. As is common in the literature, for the welfarist case, where $F_m = u_m$, we focus on implicit social weights defined by

$$g_i \equiv \frac{1}{\lambda h_i} \int_{M_i} \mu^m f_m \, d\,\nu(m), \tag{3.4}$$

i.e., the sum of marginal utilities of consumption weighted by the explicit social weights. This approach offers the advantage to remain agnostic about utility functions. The interpretation of the ratio of implicit social weights of two groups is similar to that of explicit weights; it denotes how much the social planner values increasing disposable income of individuals in one group by one Euro relative to doing so for individuals in another group.

We calculate *relative* explicit social weights e_i/e_0 for non-welfarist concepts of justness and relative implicit social weights g_i/g_0 for the welfarist case as in Blundell et al. (2009).

We consider the benchmark case with no income effects, where $\sum_{i=0}^{I} \partial h_j / \partial c_i = 0$ following Saez (2002). Summing the first order conditions (equation (3.19) in the appendix) over all $i = 0, \ldots, I$ we obtain the normalization of weights such that:

[7] Positive values of μ_m imply that the social planner aims at 'improving' F_m.

$$\sum_{i=0}^{I} h_i e_i f_i = 1. \tag{3.5}$$

Following Saez (2002), we assume that labor supply adjustment is restricted to intensive changes to "neighbor" income groups and extensive changes out of or into the labor force. Thus h_i depends only on differences in after-tax income between "neighbor groups" $(c_{i+1} - c_i,\ c_i - c_{i-1})$ and differences between group i and the non-working group $(c_i - c_0)$. The intensive mobility elasticity is

$$\zeta_i = \frac{c_i - c_{i-1}}{h_i} \frac{\partial h_i}{\partial (c_i - c_{i-1})} \tag{3.6}$$

and the extensive elasticity is given by

$$\eta_i = \frac{c_i - c_0}{h_i} \frac{\partial h_i}{\partial (c_i - c_0)}. \tag{3.7}$$

The main result is that the optimal tax formula for group i expressed in terms of the participation elasticities η_j and the intensive elasticity ζ_i is

$$\frac{T_i - T_{i-1}}{c_i - c_{i-1}} = \frac{1}{\zeta_i h_i} \sum_{j=i}^{I} \left[1 - e_j f_j - \eta_j \frac{T_j - T_0}{c_j - c_0} \right] h_j. \tag{3.8}$$

The intuition of this can be seen by considering an increase of the same amount dT in all T_j for income groups $j = i, i+1, \ldots I$. A small increase in taxes mechanically increases tax revenues but induces individuals to move to a lower income class or to unemployment, which reduces tax revenues. After multiplying equation (3.8) with $dT \zeta_i h_i$, the left hand side shows the amount by which tax revenue is reduced due to individuals switching from job i to $i-1$.[8] At the optimum, this must be equal the mechanical tax gains, which are valued at $[\sum_{j=i}^{I} (1 - e_j f_j) h_j] dT$, minus tax losses due to individuals moving to group 0, $-dT \sum_{j=i}^{I} \eta_j h_j \frac{T_j - T_0}{c_j - c_0}$.[9]

[8] Due to the assumption of no income effects and because the differences in net income between groups $i, i+1, \ldots I$ are unchanged, groups $i+1, i+2, \ldots I$ will only adjust at the extensive margin.

[9] At the optimum, individual m moving into different jobs due to a slight tax increase does not impact the objective function if the change in μ_m offsets the difference in the justness function between the two groups. In the welfarist case, were the envelope theorem applies, this implies that μ_m does not change, when a marginal individual changes job.

The difference to the standard model in Saez (2002) is that we replace the implicit weights g_i with $e_i f_i$. This implies that even though individuals maximized utility, the social planner does not necessarily maximize a weighted sum of utility but a function potentially including other criteria. The optimal tax schedule in Saez (2002) depends on elasticities and weights g_i, whereas in the adjusted model, it additionally depend on the derivative of the justness function f_i.

The system of equations defining the optimal tax schedule consists of equation (3.5) and I equations like (3.8). In our application, we use the 2015 German tax system, i.e. we calculate the actual tax liability T_i of each income group, and solve for $e_0, ..., e_I$. Alternatively, one could assume social weights and calculate the optimal tax schedule that maximizes equation (3.1) (as done in Appendix C).

3.2.2 Operationalization of justness concepts

The key advantage of our approach is that the justness function can be defined very generally, thus allowing us to capture a broader set of concepts of justness than the standard approach. In principle, the function can depend on individual and aggregate variables. The variables included in the justness function determine the dimensions along which the social planner considers a redistribution to be just. These variables do not need to be included in the utility function. For instance, utility is defined on after-tax income c_i and the choice of income group i in the standard welfarist approach. Our approach allows considering non-welfarist concepts of justness that rely, e.g., on before-government income y_i.

Our approach nests the welfarist approach, where the justness function equals individual utility, i.e. $F_m = u_m$. Individuals maximize a utility function of the form

$$u_m(c_i, i) = \upsilon(c_i - l_m(i)) \tag{3.9}$$

with $\upsilon'(\cdot) > 0, \upsilon''(\cdot) \leq 0, l'(\cdot) > 0, l''(\cdot) > 0$ and where $l_m(i)$ denotes the disutility of work in income group i.[10] This functional form rules out income effects.

We only require the first derivative of F_m with respect to c_m to be identical for all individuals in an income group. Nonetheless, for simplification, we specify the function F_m itself as F_i, i.e. to be identical for all members of income group i. By introducing this general justness function F_i, we may operationalize other moral judgments that depend directly on variables that do not enter the utility function as in the concept of *absolute tax burden*. We operationalize two ideas of justness that are based on increasing functions of the tax liability: Minimum absolute tax burden based on the absolute tax liability and minimum relative tax burden based on the tax liability relative to the net income. The justness function depends on $F_i(c_{i*}, c_i^{\text{ref}})$, where c_{i*} is net income at optimally chosen

[10] $\log(c_i - l_m(i))$ and the quasilinear utility function $c_i - l_m(i)$ are special cases. In the latter case relative explicit welfare weights equal relative implicit welfare weights, i.e, $\frac{g_i}{g_0} = \frac{e_i}{e_0} \frac{\partial u(c_{i*}, i^*)/\partial c_i}{\partial u(c_{0*}, 0^*)/\partial c_0} = \frac{e_i}{e_0}$.

labor supply and c_i^{ref} is a reference point. With $c_i^{\text{ref}} = y_i$, F_i is a function of the tax burden, i.e., the difference between actual net income and gross income.[11] This loss function is the justness function associated with the tax burden.

In the case of *absolute* tax burden the loss that captures deviations of c_{i*} from gross income y_i is determined by the parameters γ and δ:[12]

$$\begin{aligned} F_i &= -(y_i - c_{i*})^{\gamma} \text{ if } y_i \geq c_{i*}, \\ F_i &= (c_{i*} - y_i)^{\delta} \text{ if } c_{i*} > y_i, \\ &\gamma > 1, \delta \leq 1. \end{aligned} \tag{3.10}$$

The first line gives the penalty of paid taxes. $\gamma > 1$ implies that the penalty increases more than proportionally with the amount of taxes paid. This formalizes the idea that the social planner dislikes the idea of taxes for those who already have a high tax liability. The second line captures the gains of individuals who receive transfers. If δ is smaller than one, the marginal benefits of transfers are decreasing. With positive e_i, the social planner never chooses points on the right hand side of the Laffer curve (which are not Pareto optimal).[13] This justness function respects two properties. First, losses due to negative deviations from zero taxation, i.e., from positive tax liabilities, increase more than proportionally with the size of the deviation. Second, positive deviations, i.e., transfers, of the same size do not offset these losses.[14] It is important to understand that the social welfare weights are the parameters to be estimated, not γ and δ. The choice of these parameters determines the loss function analogously to the decision of an econometrician whether to use a loss function on residuals leading to least squares regression or to least absolute deviations regression. In our main application, we set γ to two and δ to one. The latter parameter affects mainly the unemployed, the only group that receives net transfers in our application and thus has a 'positive tax burden'. The aim of this paper is to show which concepts of justness are in line with declining social weights under a reasonable calibration. See Subsection 3.4.3 for variations of δ and γ.

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[11] In the case of quasi-linear preferences, the difference between gross income and net income equals the difference in utility for these two magnitudes of income. The tax burden can then be interpreted as utility loss of taxation or sacrifice

[12] We leave for future research empirical identification of penalty functions. Note however, that this is only possible if the social weights are known.

[13] Starting from a point on the right-hand side of the Laffer curve for group i, improvements in the objective function of the social planner are possible by decreasing taxes T_i. This would increase F_i and increase tax revenues. This would, in turn, allow reducing taxes for some other group $j \neq i$. This increase in the objective function of the social planner would be a Pareto improvement as long as individual utility increases with net income.

[14] As noted in Weinzierl (2014), this is consistent with loss aversion (Kahneman and Tversky, 1979).

Similarly, we also consider the *relative* tax burden where the function includes deviations of consumption c_i from gross income y_i relative to the level of consumption such that

$$\begin{aligned} F_i &= -\left(\frac{y_i - c_{i*}}{y_i}\right)^{\gamma} \text{ if } y_i \geq c_{i*}, \\ F_i &= \left(\frac{c_{i*} - y_i}{y_i}\right)^{\delta} \text{ if } c_{i*} > y_i > 0, \\ &\gamma > 1, \delta \leq 1. \end{aligned} \tag{3.11}$$

In this case the social planner dislikes large tax payments relative to the level of consumption, i.e., ceteris paribus, at the optimum groups with a higher net income pay more taxes than groups with a lower income. Note that equation (3.11) does not include a definition of the function for $y_i = 0$. Although we are interested in the relative relations of the weights of the groups with positive gross income, with the relative tax burden specification, we need to take a stance on the marginal gain in justness for unemployed, because f_i would equal zero and therefore be meaningless if the same function as that for individuals with positive gross incomes was applied for $y = 0$. A straightforward calibration is to set the value of the derivative of the justness function for income group 0 to equal 1. This does not change the relations of weights for groups with positive gross income, which are the focus of this study.

Note that the resulting *absolute* weights from an inverse optimal taxation simulation with different justness functions differ in magnitude because derivatives of the F_i functions differ. To make the comparison of weights between concepts of justness easier, we therefore calculate relative weights by dividing the obtained absolute weights e_i through the absolute weight of group 0 as in Blundell et al. (2009).

3.3 Empirical calibration

3.3.1 The data

We use data from the 2015 wave of the German Socio-Economic Panel (SOEP), a representative annual household panel survey. Goebel et al. (2018) and Britzke and Schupp (2017) provide a detailed description of the data.[15] As the model does not cover spousal labor supply, we restrict the analysis to working-age singles. We exclude individuals with children, heavily disabled and people who receive Unemployment Benefit I,[16] because their budget constraints and labor supply behavior differ substantially. Group 0 consists

[15] Socio-Economic Panel (SOEP) data for the year 2015, version 32, 2016, doi:10.5684/soep.v32.

[16] This transfer is targeted to the short-term unemployed and depends on the previous labor income.

of the unemployed receiving Unemployment Benefit II.[17] We exclude the long-term unemployed with transfer non-take up, as they differ substantially from the standard case and face a different budget constraint.

Table 3.1: Summary statistics

	Mean	Std. Dev.	Obs.
Monetary variables			
Monthly Gross Income	2,626.75	1,925.41	1,119
Monthly Net Income	1,766.18	991.86	1,119
Demographics			
Sex (1=men, 2=women)	1.41	0.49	1,119
Weekly Hours of Work*	41.66	9.51	990
Age	43.97	10.47	1,119
East Germany Dummy	0.27	0.45	1,119

Source: SOEP v32 (own calculations).
Note: *Excluding the unemployed

Table 3.1 shows summary statistics for our sample. Net incomes equal gross incomes and transfers minus income taxes and social security contributions.

3.3.2 Labor supply elasticities

Similar to Blundell et al. (2009) and Haan and Wrohlich (2010), we calibrate the optimal taxation analysis with labor supply estimates obtained from the same microdata (the SOEP), which we used to generate income groups. To this end we specify a random utility discrete choice labor supply model following van Soest (1995); Aaberge et al. (1995); Aaberge and Brandolini (2014). We flexibly specify the transcendental logarithmic utility function V_{mj}, which is "a local second-order approximation to any utility function" (Christensen et al., 1975). While the highest value of V_{mj} over the j hours alternatives non-stochastically determines the choice of labor supply, additionally an independently and identically distributed random term ε_{mj} captures an idiosyncratic component.

Gross income is defined as the product of wages and hours of work. Of course, we do not observe potential wages for unemployed. Therefore, we predict potential hourly wages of the unemployed using a selectivity-corrected wage regression (results available on request). The selectivity correction follows the two-step Heckman (1979) approach with binary variables for marital status, non-labor income, and indicators for health as exclusion restriction.

Given their hourly wage, individuals make a discrete choice of weekly working hours to maximize utility, which depends on leisure L_{mj} and after-tax and transfer income C_{mj}.

[17] This transfer is targeted at the long-term unemployed and covers the social existence minimum.

We discretize hours of work into five alternatives and unemployment (weekly working hours $\in \{0,10,20,30,40,50\}$) for the precise calculation of net incomes associated with labor supply decisions using the STSM (see Jessen et al., 2017b; Steiner et al., 2012). In contrast to continuous labor supply models this does not require convexity of the budget set.

If the error terms ε_{mj} are assumed to be distributed according to the Extreme-Value type I distribution, the probability that alternative k is chosen by person m is given by a conditional logit model (McFadden, 1974):

$$P_{mk} = Pr(V_{mk} > V_{mj}, \forall j = 1 \ldots J) = \frac{exp(U_{mk})}{\sum_{j=1}^{J} exp(U_{mk})}, k \in J, \tag{3.12}$$

where the deterministic component is

$$U_{mj} = \beta_1 \ln(C_{mj}) + \beta_2 \ln(C_{mj})^2 + \beta_3 \ln(L_{mj}) + \beta_4 \ln(L_{mj})^2 + \beta_5 \ln(C_{mj}) \ln(L_{mj}). \tag{3.13}$$

Observed individual characteristics X_i including age, disability indicators, part time work, living in East/West Germany, and whether the observed person is German citizen are allowed to shift tastes for leisure and consumption: $\beta_1 = \alpha_0^C + X_1' \alpha_1^C$, $\beta_2 = \alpha_0^{C^2} + X_2' \alpha_1^{C^2}$, $\beta_3 = \alpha_0^L + X_3' \alpha_1^L$, $\beta_4 = \alpha_0^{L^2} + X_4' \alpha_1^{L^2}$, $\beta_5 = \alpha_0^{C \times L} + X_5' \alpha_1^{C \times L}$.

To obtain mobility elasticities we first assign each individual m to an income group $i = 1, .., I$ based on the wage-hours combination observed in the data. For instance, a person with an hourly wage of 20 Euros earns a gross income of approximately 860 Euros per month, if she works 10 hours per week and about 1720 Euros if she works 20 hours. If she works 10 hours, she is assigned to group 1, $C_{m=20,k=10} = c_{i=1}$. If she works 20 hours, she is assigned to group II, $C_{m=20,k=20} = c_{i=2}$. In contrast, a person with an hourly wage of 50 Euros is assigned to income group II if she works 10 hours, earning about 2150 Euro per month, $C_{m=50,k=10} = c_{i=2}$.

Changes in net income associated with specific hours points lead to changes in the choice probabilities given by equation (3.12). These allow for the calculation of aggregate labor supply effects of an hypothetical increase in income. We simulate these effects by the *Probability or expectation method*, i.e. we assign to each individual probabilities for each hours category (see Creedy and Duncan, 2002) and thus for different income groups assuming that the income group with the highest probability is chosen.

Then we predict changes in relative employment share s of income groups due to changes in relative net incomes $c_i - c_{i-1}$ and $c_i - c_0$ (in practice we increase annual net income by 10%) and calculate the mobility elasticities given by equations (3.6) and (3.7). The elasticities are reported in the tables in the next section.

3.4 Results

3.4.1 Main results

Table 3.2 shows average monthly individual gross incomes (column I) and corresponding average net incomes (column II) for six income groups. As is apparent from the increase in net incomes from group 0 to group 1, the marginal transfer withdrawal rate is substantial in the status quo.

Column III shows the population share of each income group and columns IV and V display the estimated extensive and intensive mobility elasticities. For group 1, there is only one elasticity, see equations (3.6) and (3.7). Column IV shows relative implicit social welfare weights g_i/g_0 as defined in equation (3.4). The last two columns show relative explicit social weights e_i/e_0 as defined in equation (3.3) for the tax burden approach. The welfarist approach is an application of Saez (2002) as in Blundell et al. (2009). Group 0 has the highest implicit social weight, the working poor (group 1) have the lowest weight in line with previous studies described in the introduction.

Table 3.2: Resulting relative weights for different justness concepts

	I	II	III	IV	V	VI	VII	VIII
Group	Gross Income	Net Income	Share	η	ζ	Welfarist	Tax Burden	
							Abs.	Rel.
0	0	625	0.11	—	—	1	1	1
1	1,137	949	0.19	0.08*	0.08*	0.29068	0.00077	0.29068
2	2,082	1,452	0.17	0.10	0.08	0.37729	0.00030	0.37752
3	2,697	1,755	0.19	0.09	0.07	0.37342	0.00020	0.41932
4	3,472	2,170	0.17	0.07	0.06	0.40902	0.00016	0.55072
5	5,458	3,257	0.18	0.05	0.08	0.38680	0.00009	0.76134

Source: SOEP v32 (own calculations).
Note: German single households without children; own calculations based on the SOEP and the STSM. η presents the extensive and ζ the intensive mobility elasticity. Implicit weights g_i for welfarism, explicit weights e_i for tax burden principle.
*Overall elasticity of group one is 0.16.

At the optimum, the welfarist weights show the costs of redistributing one Euro from individuals in group 0 to individuals in other groups. For instance, an increase in income for individuals in group 1 would reduce income in group 0 by only 0.29 Euro because individuals would move from group 0 to group 1, reducing the transfer burden of the state. Equivalently, the social planner values increasing the income for group 1 by one Euro 0.29 times as much as increasing the income of group 0 by one Euro. The low weights for the working poor are related to the high marginal tax rate for individuals moving from group 0 to group 1.[18] Relative weights of the upper four income groups are close to each other, in line with previous findings for Germany by Bargain et al. (2014).

Table 3.C1 in Appendix C shows the optimal welfarist tax schedule with implicit weights decreasing with income. The resulting optimal tax schedule implies a substantially lower marginal transfer withdrawal rate for the working poor than in the status quo and higher net incomes for groups 1, 2, and 3. This underlines our finding that decreasing welfarist weights would imply lower transfer withdrawal rates.

Column VII of Table 3.2 displays optimal weights for the absolute tax burden approach, i.e., the negative marginal impact of taxes paid by a specific income group on the social planer's objective function is higher, the higher the tax liability of that group and the higher the explicit weight the social planner attributes to this group are. The weights show how much it costs in terms of the loss function of group 0 to reduce the loss function for members of a particular group as defined in equation (3.10). We focus the interpretation on the working groups as the unemployed are net recipients of transfers and thus have a 'positive tax burden', see Section 3.2.2. A comparison of the weights of tax-paying groups shows the highest weight for the working poor, 0.00077, and decreasing weights with income. The social planner is indifferent between imposing a slightly higher increase in the loss function on the working poor and imposing four times this increase on the middle class (group 3). As the loss function increases quadratically with taxes paid, the first derivative of the loss function with respect to consumption for the working poor is relatively small. Consider the benchmark case with fixed incomes and the same derivative of the loss function for all groups. In this case, all weights would be the same. In our analysis the derivative of the loss function is lower for the working poor. Therefore, weights are higher for this group.[19] A similar reasoning applies to the other groups, which results in declining social weights. Consequently, the absolute tax burden principle is in line with the 2015 German tax and transfer system.

Column VIII shows results for the *relative* tax burden principle. Note that the relative weight of group 1 is the same as for the welfarist approach. The reason is that we calibrated f_0 to equal f_1 for the relative tax burden approach, because $y_0 = 0$, as described in Subsection 3.2.2. For the welfarist case the implicit weights g_i indicate the value the social planner attaches to an additional Euro of consumption for individuals in group i. For non-welfarist concepts, when $f_0 = f_1$, the costs of increasing F_1 by one relative to the costs of increasing F_0 by one therefore are the same as the ratio of the costs of giving one Euro to group 1 or group 0, which are reflected by the ratio of implicit welfare weights g_1 and g_0. This is directly reflected by the relative weights, whereas the absolute weights (not reported) differ between the welfarist and relative tax burden approaches. This calibration only impacts the explicit weight of group 0 and does not change the relations of weights for groups 1-5.

[18] *Ceteris paribus*, higher elasticities and higher marginal tax rates imply a position further to the right of the Laffer curve and thus lower social weights.

[19] As the welfarist weights indicate, the deadweight loss of increasing taxes for group 1 is very high. If it was lower, this group's absolute tax burden weight would be even higher.

Again, the working poor have the highest weight of the groups with a positive tax burden. However, in contrast to the absolute tax burden principle, weights are not decreasing with income but U-shaped. Top income earners have relatively high weights according to the *relative* tax burden principle, because the tax paid is divided through a high consumption level. Thus a small increase in taxes would not increase the loss function of this group by much. In fact, the middle class (group 3) has the lowest weight according to this principle as one would have to redistribute less to members of this group than to members of other groups in order to reduce their loss function by a given amount. Thus, the 2015 German tax and transfer system does not imply decreasing social weights under the relative tax burden principle.

In sum, we find that the absolute tax burden principle is in accordance with declining social weights in the status quo. Thus, the minimization of the weighted sum of an increasing function of the tax liability is a good description of the aims of the German society regarding the tax and transfer system.

3.4.2 Results for subsamples

To explore whether the 2015 tax transfer schedule was designed according to a particular concept of justness with focus on a specific group in mind, we split the sample into different groups. These groups differ substantially regarding the income distribution and elasticities, which might lead to different social weights.

First, the sample is split into females and males. We find that women's have a more elastic labor supply than men and lower incomes. Then we present our results for East Germans and West Germans, respectively. These two groups lived under different political systems for more than 40 years. We show that West Germans have higher incomes and less unemployment than East Germans.

Results for men and women

In Table 3.3 we report results for the subsample of women without children, which we compare, in the following, with the results for the main sample and, later, to men.

As expected, gross and net incomes in all income groups are lower and labor supply elasticities are slightly higher. For the welfarist case, the working groups have smaller weights relative to the unemployed than in the main sample. As before, we find that the working poor have the lowest weight. The finding that social weights for the absolute tax burden concept are decreasing with income is robust for this subsample. As before, in the relative tax burden case, the working poor have the highest weights among working groups and top income earners have the second highest weights.

Table 3.3: Resulting relative weights for different justness concepts for women without children

	I	II	III	IV	V	VI	VII	VIII
Group	Gross Income	Net Income	Share	η	ζ	Welfarist	Tax Burden Abs.	Tax Burden Rel.
0	0	615	0.05	—	—	1	1	1
1	976	872	0.19	0.09*	0.09*	0.13061	0.00063	0.13061
2	1,903	1,331	0.20	0.12	0.10	0.16613	0.00015	0.11048
3	2,548	1,705	0.19	0.10	0.10	0.20113	0.00012	0.16912
4	3,342	2,079	0.23	0.07	0.10	0.18486	0.00007	0.17848
5	4,948	3,011	0.15	0.06	0.12	0.18374	0.00005	0.25355

Source: SOEP v32 (own calculations).
Note: German single households; own calculations based on the SOEP and the STSM. η presents the extensive and ζ the intensive mobility elasticity. Implicit weights g_i for welfarism, explicit weights e_i for tax burden principle.
*Overall elasticity of group one is 0.18.

Table 3.4: Resulting relative weights for different justness concepts for men without children

	I	II	III	IV	V	VI	VII	VIII
Group	Gross Income	Net Income	Share	η	ζ	Welfarist	Tax Burden Abs.	Tax Burden Rel.
0	0	627	0.15	—	—	1	1	1
1	1,265	1,038	0.17	0.05*	0.05*	0.49473	0.00109	0.49473
2	2,228	1,520	0.18	0.08	0.04	0.52023	0.00037	0.51742
3	2,875	1,837	0.16	0.07	0.04	0.52845	0.00025	0.59694
4	3,622	2,279	0.17	0.06	0.04	0.56493	0.00021	0.78282
5	6,124	3,581	0.16	0.05	0.06	0.52826	0.00010	1.10515

Source: SOEP v32 (own calculations).
Note: German single households; own calculations based on the SOEP and the STSM. η presents the extensive and ζ the intensive mobility elasticity. Implicit weights g_i for welfarism, explicit weights e_i for tax burden principle.
*Overall elasticity of group one is 0.10.

Table 3.4 shows results for the subsample of men. Incomes are higher and elasticities are lower than for women. In the welfarist case, weights of working groups are higher than for women. This is caused by lower elasticities, which lead to men being further on the left of the Laffer curve. Nevertheless, the working poor again have the lowest weight. The finding that weights in the absolute tax burden case decrease with income holds for men as well. As in the welfarist case, the weight of the working poor is higher for men than for women because male elasticities are lower. Again, in the relative tax burden case, the working poor have the highest weight and the middle class has the lowest weight of working groups.

Results for East and West Germany

Gross and net incomes are higher across all groups in West Germany (see Table 3.6) compared to East Germany (see Table 3.5). In contrast to the main sample and the previously analyzed subsamples, in the sample of East Germans the working poor are net transfer recipients and the marginal withdrawal rate when moving from group 1 to group 2 is still substantial.

The welfarist weights show highest social weights for the unemployed and lowest for the working poor (group 1 in the West, groups 1 and 2 in the East). An increase in income for individuals in group 1 by one Euro would reduce income in group 0 by only 0.27 Euro in West Germany and by about 0.30 in East Germany. The relative weights of the four (three for East Germany) higher income groups are very similar and higher than the weights for the working poor.

Table 3.5: Resulting relative weights for different justness concepts for East Germany

	I	II	III	IV	V	VI	VII	VIII
Group	Gross Income	Net Income	Share	η	ζ	Welfarist	Tax Burden	
							Abs.	Rel.
0	0	596	0.18	—	—	1	1	1
1	774	851	0.17	0.10*	0.10*	0.30249	0.30249	0.30249
2	1,581	1,222	0.18	0.16	0.08	0.33926	0.00044	1.41185
3	2,200	1,594	0.17	0.13	0.08	0.40821	0.00032	1.99735
4	2,808	1,920	0.14	0.11	0.07	0.42652	0.00022	2.29170
5	4,039	2,625	0.16	0.09	0.08	0.40168	0.00013	2.75589

Source: SOEP v32 (own calculations).
Note: German single households; own calculations based on the SOEP and the STSM. η presents the extensive and ζ the intensive mobility elasticity. Implicit weights g_i for welfarism, explicit weights e_i for tax burden principle.
*Overall elasticity of group one is 0.20.

As in our main findings, optimal weights under absolute tax burden are decreasing in both samples, though the weight of group 1 is closer to the weight of group 0 than is the case for West Germany as group 1 in the East are net transfer recipients and thus enjoy a 'positive tax burden'. Note that as group 1 in East Germany consists of transfer net recipients, $f_0 = f_1$ (see equation (3.10)) for this group. Regarding groups with a positive tax burden, the weights imply that the social planner is roughly indifferent between imposing a slight increase in the loss function on the working poor (group 1) in West Germany and imposing five times this increase in the loss function on group 2. For East

Germany, the social planner is indifferent between imposing a slight increase in the loss function for individuals in group 2 and an about 38 percent higher increase in the loss function for individuals in group 3. This shows that the absolute tax burden principle with decreasing weights is in line with the 2015 German tax and transfer system for East and West Germans.

Table 3.6: Resulting relative weights for different justness concepts for West Germany

	I	II	III	IV	V	VI	VII	VIII
Group	Gross Income	Net Income	Share	η	ζ	Welfarist	Tax Burden	
							Abs.	Rel.
0	0	653	0.08	—	—	1	1	1
1	1,408	1,072	0.21	0.07*	0.07*	0.26746	0.00040	0.26746
2	2,324	1,549	0.16	0.09	0.08	0.31984	0.00021	0.37777
3	2,907	1,857	0.19	0.08	0.08	0.31618	0.00015	0.43129
4	3,699	2,321	0.19	0.06	0.06	0.35053	0.00013	0.58990
5	6,010	3,519	0.17	0.05	0.08	0.32097	0.00006	0.78881

Source: SOEP v32 (own calculations).
Note: German single households; own calculations based on the SOEP and the STSM. η presents the extensive and ζ the intensive mobility elasticity. Implicit weights g_i for welfarism, explicit weights e_i for tax burden principle.
*Overall elasticity of group one is 0.14.

Results for the *relative* tax burden principle show that group 3 has the highest weight of the groups with a positive tax burden in East Germany, while in West Germany weights for the top income group are highest. The difference arises because top income earners in West Germany earn considerably more than their East German counterparts. As explained in Section 3.4.1, this implies higher weights for this justness concept because the denominator of the loss function is higher. Thus, the German tax and transfer system does not result in decreasing social weights under the relative tax burden principle.

3.4.3 Robustness and extensions

Subjective justness

Our framework allows using information on the level of taxes that is considered just by individuals in the optimal tax formulae. We specify the justness functions similarly to the case of the tax burden principle and set as reference point the level of just after-tax income taken from the survey (instead of setting gross income as reference point). Thus the absolute formulation of the justness function is

$$
\begin{aligned}
F_i &= -(c_i^{\text{just}} - c_{i*})^{\gamma} \text{ if } c_i^{\text{just}} \geq c_{i*}, \\
F_i &= (c_{i*} - c_i^{\text{just}})^{\delta} \text{ if } c_{i*} > c_i^{\text{just}}, \\
&\gamma > 1, \delta \leq 1
\end{aligned}
\tag{3.14}
$$

and the relative one is

$$
\begin{aligned}
F_i &= -\left(\frac{c_i^{\text{just}} - c_{i*}}{c_{i*}}\right)^{\gamma} \text{ if } c_i^{\text{just}} \geq c_{i*}, \\
F_i &= \left(\frac{c_{i*} - c_i^{\text{just}}}{c_{i*}}\right)^{\delta} \text{ if } c_{i*} > c_i^{\text{just}} > 0, \\
&\gamma > 1, \delta \leq 1.
\end{aligned}
\tag{3.15}
$$

The parameters are calibrated as for the tax burden exercise. In the 2015 wave, the SOEP introduced new questions that ask what amount of income respondents would consider just in their current occupation. In particular, individuals state how high their gross income and net income would have to be in order to be just. A screenshot of this part of the questionnaire is provided in Appendix B.[20] Only the currently employed are asked questions about what income they would consider as just.[21]

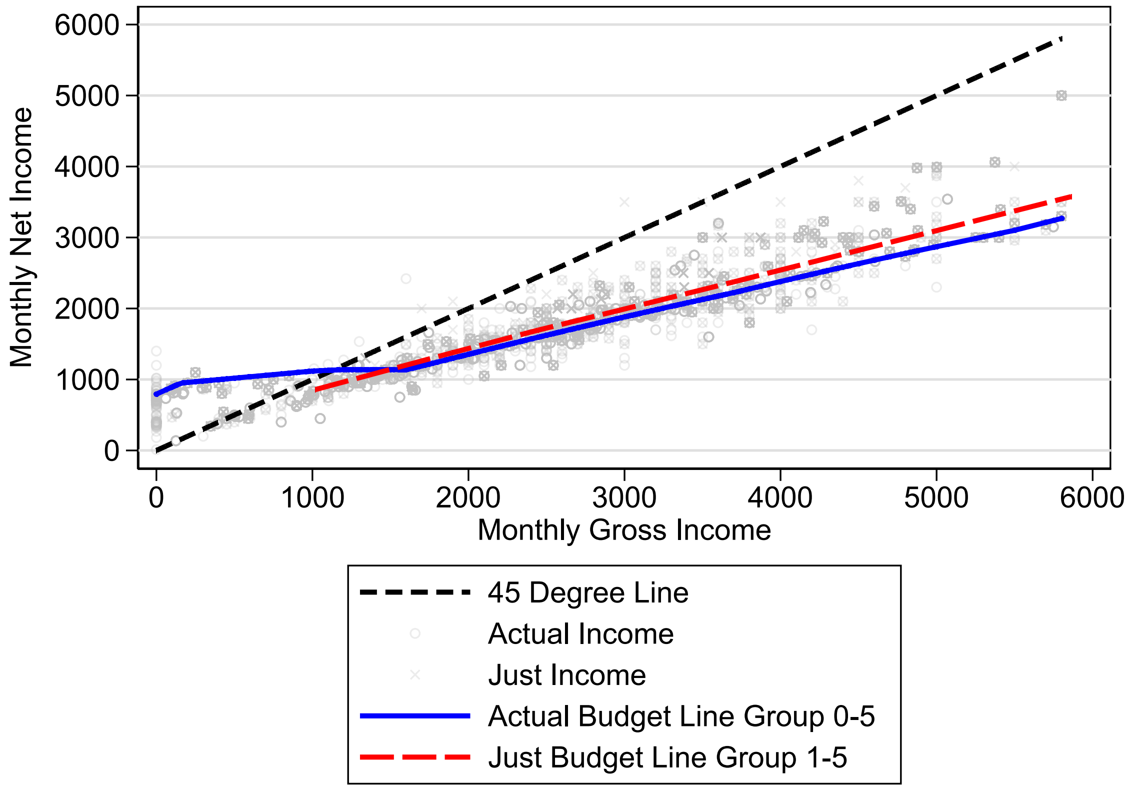
Compared to other approaches to obtain information about individuals' ideas of justness, the advantage of the question is that individuals do not need to have a worked out theory of just taxation in mind to answer the question. Moreover, interviewees do not need a thorough understanding of tax schedules.

Figure 3.1 shows the status quo of the German tax and transfer system and the just tax and transfer system based on our sample. The first segment of the actual budget line is almost horizontal at a net income of about 600 Euro due to the high transfer withdrawal rate. The slope of the budget line is steeper further to the right, representing individuals who do not receive transfers, but pay income taxes and social security contributions.

Gray circles represent the actual net incomes for given gross incomes. Some circles are crossed by x. This means either that an individual considers his or her actual income

[20] Since 2005 the SOEP includes a question on just income "Is the income that you earn at your current job just, from your point of view?". If respondents answer "No", they are asked "How high would your net income have to be in order to be just?" and since 2009 additionally "How high would your gross income have to be in order to be just?". The introduced justness question in 2005 was inspired by a perceived justness of earnings formula developed by Jasso (1978). In 2015 these questions are revised to allow for more research topics and now all respondents are asked about just gross and net income (see Appendix B).

[21] For the working poor, we add actual transfers to stated just net incomes, as these do not include transfers. Transfers include Unemployment Benefit II, housing benefits.



Source: SOEP v32 (own calculations).

Figure 3.1: Just net and gross incomes

just or the actual income of another person. The 45 degree line marks the points where no taxes are paid. Points above this line represent actual transfer recipients or those who deem receiving transfers as just. However, most individuals perceive net incomes to be just, where taxes have to be paid. It is likely that status quo bias explains this pattern. Nonetheless, the answers of the respondents reflect actual perceptions of just incomes. The solid blue and the dashed red lines summarize this information. The solid blue line depicts the average actual budget constraint for six income groups that we use in the main analysis. The dashed red line shows the just budget constraint for the same groups. The budget lines are based on averages for the groups. The *just* budget line is defined only for those with positive labor income and lies slightly above the actual budget line. This reflects the preferences for paying less taxes. The distribution of net incomes for a given value of gross income is skewed toward the no tax line. Deviations in this direction can be explained with allowances. The positive skew of just net incomes is due to more people perceiving substantially higher net incomes as just than substantially lower net incomes. The incidence of crossed circles, i.e., persons who perceive their current income as just is higher below and around the average budget lines.

As only employed persons respond to the SOEP question about just net income, just net income is set marginally above the actual average transfer income of group 0.[22]

Table 3.7: Resulting relative weights for subjective justness

	I	II	III	IV	V	VI	VII
Group	Net Income	Just Net Income	Difference	η	ζ	Subjective Justness Abs.	Subjective Justness Rel.
0	779	784*	5			1	1
1	1,024	1,036	12	0.08	0.08	0.15341	0.26369
2	1,420	1,461	41	0.10	0.07	0.05241	0.17035
3	1,741	1,778	37	0.09	0.07	0.06424	0.31620
4	2,195	2,243	48	0.07	0.07	0.05207	0.40717
5	3,317	3,415	98	0.05	0.08	0.02475	0.43868

Source: SOEP v32 (own calculations).
Note: German single households; own calculations based on the SOEP and the STSM. η presents the extensive and ζ the intensive mobility elasticity. Explicit weights e_i.
*Just net income for this group is set as explained in the text.

Table 3.7 shows social weights according to the absolute and relative subjective justness principles respectively. The sample—and thus means for current gross and net incomes—differs from the main one as only individuals who report that their current gross income is just are used. The subjective justness principle implies penalties for the deviation of net incomes from perceived just net incomes. As discussed above, there is no information on perceived just net incomes of the unemployed, so we focus on the interpretation of the social weights of working groups. For the absolute justness principle, the working poor have the highest social weights of the working population because their average net income deviates from just net income by only 12 Euros. Social weights are decreasing except for group 3, where the just net income is closer to actual net income than is the case for groups 2 and 4. When considering *relative* deviations from just net income, group 5 has the highest social weights of all working groups since the deviation from just income is small relative to the high consumption level of this group.

[22] We experimented with different values for this number. While changing the just net income of group 0 has a substantial impact on this group's subjective social justness weights relative to other groups, the weights of other groups relative to one another remain virtually the same.

Different reference points of justness functions

For the *subjective justness* approach, reference points of loss functions were taken directly from survey data. It is interesting to see how the resulting weights for reference points taken from the data compare with weights resulting from three classical scenarios of redistribution, where reference points of all income groups are higher than net income: First, the social planner assumes that low income groups ask for less redistribution relative to the status quo than the high income groups. Second, the low income groups ask for more redistribution than the high income groups. Third, each income group wants to keep up with the next higher income group and asks for redistribution to achieve the net incomes of the next higher group.

The absolute and relative loss functions are then given by

$$\begin{aligned} F_i &= -(c_i^{\text{ref}} - c_{i*})^{\gamma} \text{ if } c_i^{\text{ref}} \geq c_{i*}, \\ F_i &= (c_{i*} - c_i^{\text{ref}})^{\delta} \text{ if } c_{i*} > c_i^{\text{ref}}, \\ &\gamma > 1, \delta \leq 1 \end{aligned} \tag{3.16}$$

and

$$\begin{aligned} F_i &= -\left(\frac{c_i^{\text{ref}} - c_{i*}}{c_{i*}}\right)^{\gamma} \text{ if } c_i^{\text{ref}} \geq c_{i*}, \\ F_i &= \left(\frac{c_{i*} - c_i^{\text{ref}}}{c_{i*}}\right)^{\delta} \text{ if } c_{i*} > c_i^{\text{ref}} > 0, \\ &\gamma > 1, \delta \leq 1, \end{aligned} \tag{3.17}$$

where c_i^{ref} is a calibrated reference point. Tables 3.8-3.10 show results for this exercise for the three different cases.

In Table 3.8 the reference point is set 50 Euros above the actual net income for group 0 and the difference between actual income and the reference point increases by 50 Euros for every income group until it reaches 300 Euros for group 5. For the absolute loss function, this results in continuously decreasing social weights. In contrast, using the relative loss function, social weights are increasing starting from group 1 as the increase in the denominator of the loss function more than offsets the increase in the nominator with increasing net income. Nonetheless, the social weight of group 0 is highest because reducing transfers for this group would be associated with a substantial efficiency gain. Not reducing the transfer for this group is only reconcilable with a high social weight. The exercise reported in Table 3.8 is related to the tax burden principle; if the designer of the tax and transfer system followed this principle, implicitly an income-increasing difference between net income and reference point was chosen. Therefore, the pattern for the absolute tax burden case in Table 3.2 is similar to this stylized case.

Table 3.8: Case 1: Difference to reference points increasing with income

	I	II	III	IV	V
Group	Net Income	Reference Point	Difference	Abs.	Rel.
0	625	675	50	1	1
1	949	1,049	100	0.14534	0.32739
2	1,452	1,602	150	0.12576	0.66444
3	1,755	1,955	200	0.09335	0.71364
4	2,170	2,420	250	0.08180	0.95500
5	3,257	3,557	300	0.06447	1.73131

Source: SOEP v32 (own calculations).
Note: German single households; own calculations based on the SOEP and the STSM. Explicit weights e_i.

Table 3.9 is the counterpart of Table 3.8 and shows resulting weights, where the difference between actual net income and the reference points decreases with income. For group 0 this difference is set to 1000 Euro in order to obtain continuously increasing social weights. Again, the efficiency gain of reducing transfers for this group is very large and only when the reference point is far away from actual income would the increase in the loss function offset this efficiency gain. This results in a low relative social weight for this group. The relative loss function weights are increasing with income too—to a much stronger degree than in case 1.

Table 3.9: Case 2: Difference to reference points decreasing with income

	I	II	III	IV	V
Group	Net Income	Reference Point	Difference	Abs.	Rel.
0	625	1,625	1,000	1	1
1	949	1,119	170	1.70986	8.69247
2	1,452	1,612	160	2.35808	29.8062
3	1,755	1,905	150	2.48944	47.0166
4	2,170	2,310	140	2.92157	86.0196
5	3,257	3,387	130	2.97542	202.023

Source: SOEP v32 (own calculations).
Note: German single households; own calculations based on the SOEP and the STSM. Explicit weights e_i.

Finally, in Table 3.10, the net income of the next higher income group is taken as a reference point, except for the highest income earners, where we set the reference point 1500 Euro above the current net income. In this “Keeping up with the Joneses” scenario groups 2 and 3 have relatively high weights for both absolute and relative loss functions as their net income is close to that of the respective next higher income group.

Table 3.10: Case 3: Reference point next higher income group

	I	II	III	IV	V
Group	Net Income	Reference Point	Difference	Abs.	Rel.
0	625	949	324	1	1
1	949	1,452	503	0.18724	0.42840
2	1,452	1,755	303	0.40344	2.73546
3	1,755	2,170	415	0.29153	2.82285
4	2,170	3,257	1,087	0.12192	1.48678
5	3,257	4,757	1,500	0.08355	2.35881

Source: SOEP v32 (own calculations).
Note: German single households; own calculations based on the SOEP and the STSM. Explicit weights e_i.

Robustness

As for any loss function, results may differ depending on the properties of the function that is to be minimized. We analyze the robustness of the obtained social weights for the absolute tax burden principle to different values of γ and δ (Tables 3.11 and 3.12).

Table 3.11: Resulting relative weights for absolute tax burden for different values of γ ($\delta = 1$)

	I	II	III	IV
Group	$\gamma = 1.5$	$\gamma = 2$	$\gamma = 3$	$\gamma = 5$
0	1	1	1	1
1	0.01413	0.00077	2.74×10^{-6}	4.65×10^{-11}
2	0.01002	0.00030	3.17×10^{-7}	4.79×10^{-13}
3	0.00811	0.00020	1.40×10^{-7}	9.48×10^{-14}
4	0.00756	0.00016	8.04×10^{-8}	2.85×10^{-14}
5	0.00550	0.00009	2.66×10^{-8}	3.30×10^{-15}

Source: SOEP v32 (own calculations).
Note: German single households; own calculations based on the SOEP and the STSM. Explicit weights e_i.

The result that social weights decline with income is robust to a wide range of calibrations. This shows that the main result is not driven by the parameter choice. Second, we set the intensive and extensive elasticities of all groups to 0.1 and show the results for all concepts of justness (Table 3.D1 in the Appendix). The results are very close to the main results. This shows that slight variations in the elasticities do not change the results substantially.

Table 3.12: Resulting relative weights for absolute tax burden for different values of δ ($\gamma = 2$)

	I	II	III	IV
Group	$\delta = 0.1$	$\delta = 0.3$	$\delta = 0.5$	$\delta = 1$
0	1	1	1	1
1	2.35×10^{-7}	2.56×10^{-6}	1.55×10^{-5}	0.00077
2	9.12×10^{-8}	9.92×10^{-7}	5.99×10^{-6}	0.00030
3	6.04×10^{-8}	6.56×10^{-7}	3.96×10^{-6}	0.00020
4	4.78×10^{-8}	5.20×10^{-7}	3.14×10^{-6}	0.00016
5	2.68×10^{-8}	2.91×10^{-7}	1.76×10^{-6}	0.00009

Source: SOEP v32 (own calculations).
Note: German single households; own calculations based on the SOEP and the STSM. Explicit weights e_i.

3.5 Conclusion

In this paper, we reconcile a puzzling contrast between current tax transfer practice in many countries and the common approach in the optimal taxation literature. While the literature commonly assumes that the social planner values an additional unit of income for poor households more than an additional unit of income for higher income households, commonly observed high transfer withdrawal rates are only optimal if social weights of the working poor are very small. Therefore, we compare alternative approaches to welfarism and calculate the implied social weights. We formulate the problem of a social planner for two distinct concepts of justness: the welfarist approach, where the social planner maximizes the weighted sum of utility; alternatively, the tax burden concept where the social planner minimizes the weighted sum of increasing functions of absolute or relative tax liabilities. The latter concept formalizes the ideas that taxes for groups with already high tax liabilities should rather not be increased further. This point is often made in public debates but does not follow from classical welfarist considerations.

Moreover, we illustrate how subjective justness can be used in our model where the social planner minimizes absolute or relative deviations from perceived just net income. Of course, all approaches maintain budget neutrality and account for labor supply reactions.

Like the existing literature, we find that the 2015 German tax and transfer system implies very low social weights for the working poor according to the welfarist criterion.

The social planner values increasing the income for the working poor by one Euro 0.75 times as much as increasing the income of top earners by one Euro. This implies that an additional Euro of consumption for the working poor is valued less than marginal consumption of top income earners.

In contrast, the current tax-transfer practice can be reconciled as optimal and in line with decreasing social weights under the absolute tax burden criterion, under which the social planner minimizes a function that puts an increasing penalty on tax liabilities. In this case, the social planner is indifferent between a slight increase in the loss function for the working poor and imposing four times this additional increase in the loss function on the middle class.

Appendix

A Optimal tax formulae in the general model

Behavioral reactions imply that h_i changes in case of a change in T_i. Using the product rule and assuming that marginal movers do not impact the objective function, the first order condition with respect to T_i is obtained as

$$\int_M \mu_m f_m d\nu(m) = \lambda\left(h_i - \sum_{j=0}^{I} T_j \frac{\partial h_j}{\partial c_i}\right), \tag{3.18}$$

where λ is the multiplier of the budget constraint. The first order condition with respect to λ is the budget constraint. Assuming $f_i = f_m$, reorganizing (3.18), and defining the average explicit social weights as $e_i = \mu_i/\lambda h_i$ yields

$$\left(1 - e_i f_i\right) h_i = \sum_{j=0}^{I} T_j \frac{\partial h_j}{\partial c_i}. \tag{3.19}$$

The assumption of no income effects implies that only h_{i-1}, h_i, h_{i+1}, and h_0 change when T_i changes. If we assume that h_i can be expressed as a function depending on the difference to the the adjacent income groups and the unemployed $h_i(c_{i+1} - c_i, c_i - c_{i-1}, c_i - c_0)$, equation (3.19) simplifies to

$$\begin{aligned}\left(1 - e_i f_i\right) h_i \;=\;& T_0 \frac{\partial h_0}{\partial (c_i - c_0)} + T_i \frac{\partial h_i}{\partial (c_i - c_0)} - T_{i+1} \frac{\partial h_{i+1}}{\partial (c_{i+1} - c_i)} - T_i \frac{\partial h_i}{\partial (c_{i+1} - c_i)} \\ &+ T_i \frac{\partial h_i}{\partial (c_i - c_{i-1})} + T_{i-1} \frac{\partial h_{i-1}}{\partial (c_i - c_{i-1})}.\end{aligned} \tag{3.20}$$

Using the facts that $\frac{\partial h_i}{\partial (c_i - c_0)} = -\frac{\partial h_0}{\partial (c_i - c_0)}$, $\frac{\partial h_{i+1}}{\partial (c_{i+1} - c_i)} = -\frac{\partial h_i}{\partial (c_{i+1} - c_i)}$, $\frac{\partial h_i}{\partial (c_i - c_{i-1})} = -\frac{\partial h_{i-1}}{\partial (c_i - c_{i-1})}$, we can write after rearranging

$$\left(1 - e_i f_i\right) h_i = (T_i - T_0) \frac{\partial h_i}{\partial (c_i - c_0)} - (T_{i+1} - T_i) \frac{\partial h_{i+1}}{\partial (c_{i+1} - c_i)} + (T_i - T_{i-1}) \frac{\partial h_i}{\partial (c_i - c_{i-1})} \tag{3.21}$$

Using the definition of the elasticities (3.6) and (3.7), we obtain for each group after reorganizing

$$\frac{T_i - T_{i-1}}{c_i - c_{i-1}} = \frac{1}{\zeta_i h_i}\left\{(1 - e_i f_i) h_i - \eta_i h_i \frac{T_i - T_0}{c_i - c_0} + \zeta_{i+1} h_{i+1} \frac{T_{i+1} - T_i}{c_{i+1} - c_i}\right\}. \tag{3.22}$$

Note that, by setting $e_0 = e_i = 0$, we obtain the Laffer-condition

$$\frac{T_i - T_{i-1}}{c_i - c_{i-1}} = \frac{1}{\zeta_i} + \frac{\zeta_{i+1} h_{i+1}}{\zeta_i h_i} \frac{T_{i+1} - T_i}{c_{i+1} - c_i} - \frac{\eta_i}{\zeta_i} \frac{T_i - T_0}{c_i - c_0}. \tag{3.23}$$

Substituting the equivalent of (3.22) for the next group $i+1$ in (3.22) and simplifying gives

$$\begin{aligned}\frac{T_i - T_{i-1}}{c_i - c_{i-1}} = {} & \frac{1}{\zeta_i h_i}\Big\{\left(1 - e_i f_i\right) h_i + \left(1 - e_{i+1} f_{i+1}\right) h_{i+1} \\ & - \eta_i h_i \frac{T_i - T_0}{c_i - c_0} - \eta_{i+1} h_{i+1} \frac{T_{i+1} - T_0}{c_{i+1} - c_0} + \zeta_{i+2} h_{i+2} \frac{T_{i+2} - T_{i+1}}{c_{i+2} - c_{i+1}}\Big\}.\end{aligned} \tag{3.24}$$

Recursive insertion and simplifying gives the I formulae (3.8) that must hold if function (3.1) is optimized.

B Questionnaire

67. Is the gross income that you earn at your current job just, from your point of view?

No............................. ☐ ⇩ Yes .... ☐ ➡ *Question **69!***

68. How high would your gross income have to be in order to be just?

Gross: ☐ euros per month Don't know......... ☐

69. Is the net income that you earn at your current job just, from your point of your view?

No............................. ☐ ⇩ Yes .... ☐ ➡ *Question **71!***

70. How high would your net income have to be in order to be just?

Net: ☐ euros per month Don't know......... ☐

Source: SOEP v32 (own calculations).

Figure 3.B1: The question for justness.

C Optimal welfarist tax schedule

Table 3.C1 shows the optimal welfarist tax schedule, where, following Saez (2002), implicit welfare weights are set according to the formula

$$g_i = \frac{1}{\lambda c_i^{0.25}} \tag{3.25}$$

and the shares of income groups are determined endogenously by

$$h_i = h_i^0 \left(\frac{c_i - c_0}{c_i^0 - c_0^0} \right)^{\eta_i}, \tag{3.26}$$

where the superscript 0 denotes values in the status quo. The simulation was done achieving budget neutrality and setting net income of group 0 to the status quo, as a deviation from this is not politically feasible.

Table 3.C1: Optimal Welfarist Tax Schedule

Group	Gross Income	Net Income	Share	Optimal Net Income	Optimal Share	Relative Weight
0	0	625	0.11	625	0.09	1
1	1,137	949	0.19	1,260	0.20	0.84
2	2,082	1,452	0.17	1,629	0.17	0.79
3	2,697	1,755	0.19	1,837	0.19	0.76
4	3,472	2,170	0.17	2,047	0.17	0.74
5	5,458	3,257	0.18	2,826	0.18	0.69

Source: SOEP v32 (own calculations).
Note: German single households; own calculations based on the SOEP and the STSM.

D Further sensitivity checks

Table 3.D1: Resulting relative weights for different justness concepts with elasticities set to 0.1

	I	II	III	IV	V
Group	η	ζ	Welfarist	Tax Burden	
				Abs.	Rel.
0	—	—	1	1	1
1	0.1*	0.1*	0.22027	0.00059	0.22027
2	0.1	0.1	0.33434	0.00027	0.33454
3	0.1	0.1	0.31926	0.017	0.35851
4	0.1	0.1	0.33459	0.00013	0.45050
5	0.1	0.1	0.30932	0.00007	0.60882

Source: SOEP v32 (own calculations).
Note: German single households; own calculations based on the SOEP and the STSM.
*Overall elasticity of group one is 0.2.

4 Do justice perceptions support the concept of equal sacrifice? Evidence from Germany?[1]

4.1 Introduction

How we devise a fair tax schedule? According to Adam Smith (1776) the tax burden should depend on two principles of fairness: On the one hand, the tax burden should be calculated based on the benefits receivned - the so called *benefit principle*. People who benefit more from negative externalities, like pollution from their cars, should also pay more tax e.g. a fuel tax. On the other hand, the tax burden should also depend on the *ability-to-pay principle*: individuals with high ability should pay higher average tax rates than individuals with low ability.

Mill (1848) defined on the basis of the ability-to-pay approach the Equal Sacrifice principle. People with the same ability-to-pay should pay the same amount of taxes (horizontal equity) and the tax payment should rise with income (vertical equity). This raises the question of how the sacrifice should be measured. Three principles were therefore defined (see Musgrave and Musgrave (1973); Richter (1983); Young (1988)): (1) Absolute Equal Sacrifice (AES) is satisfied if everyone gives up the same amount of utility in remitting taxes. (2) Relative Equal Sacrifice (RES) is satisfied if everyone sacrifices the same percentage of utility in remitting taxes. (3) Marginal Equal Sacrifice (MES) is satisfied if the first derivative of the utility in paying taxes is the same for everyone.

Researchers, such as Young (1990); Weinzierl (2014), or Jessen et al. (2017a), use the Equal Sacrifice or Minimum Sacrifice criteria to define the objective function of the social planner as an alternative to welfarism (Mirrlees, 1971).[2] For instance, Young (1990) finds that the U.S. tax schedule is in line with the absolute Equal Sacrifice principle, whereas, for Germany, Jessen et al. (2017a) show that the minimum absolute sacrifice principle is in line with social weights that decrease with net income.

[1]This chapter is based on Metzing (2018).

[2]In the literature, optimal tax theory commonly assumes a utilitarian objective function (Mirrlees, 1971). However, a number of alternative approaches are proposed in the literature: the Rawlsian Criterion, the Libertarian Principle, and Equal Opportunity (see Piketty and Saez (2013); Weinzierl (2014); Saez and Stantcheva (2016); Jessen et al. (2017a)).

But what do individuals consider fair when it comes to income taxation? When asked U.S. individuals directly, many prefer tax schemes that fit the Equal Sacrifice principles. Weinzierl (2014) let individuals choose between different taxation alternatives. Most respondents preferred a tax schedule that confirms either an absolute Equal Sacrifice or a mixture of absolute Equal Sacrifice and Utilitarianism.

Existing studies used U.S. data, so that I am the first to employ German data.

In this paper, I examine a related research question: Do stated preferences on fair net and fair gross income confirm one of the three Equal Sacrifice principles?[3] To identify if individuals' preferences are in line with one of the three Equal Sacrifice principles, I impose the CRRA (constant relative risk aversion) utility function to structure individuals' and check against the three sacrifice theorems. As the ability-to-pay differs for different household types, the CRRA utility function here depends on the *equivalized* gross and net income (Ebert and Moyes, 2000). For the analysis, cross-sectional data on fair gross and net income is required. Therefore, I use question items from the German Socio-Economic Panel (SOEP) on fair perceived gross and net income in order to construct a social security and (income) taxation schedule on the basis of three Equal Sacrifice principles. One huge advantage is that respondents do not need any information or knowledge on optimal taxation theory. They only answer about what they think is a fair gross and a fair net income. A function of this difference is interpreted as the fair sacrifice and can be checked against the Equal Sacrifice principles.

Which of the Equal Sacrifice principle fits best is defined by the R^2 of the Equal Sacrifice tax schedule and its Mean Square Error (MSE), which indicates the deviation between the fitted and observed data points. I find that none of the Equal Sacrifice principles fit perfectly with the survey data. However, the principle of AES and RES yield the best fit by the fit statistics and, graphically, a remarkable fit is obtained. I also find that a fair tax schedule should be progressive.

The paper is structured as follows. Section 4.2 describes the theoretical framework, Section 4.3 gives an overview about the data and provides further statistics. In Section 4.4, I test AES, RES, and MES theories, while Section 4.5 concludes.

4.2 Theoretical framework

4.2.1 Equal Sacrifice principles

On the basis of the ability-to-pay principle, Mill (1848) defined the rule of Equal Sacrifice, which imposes that all taxpayers have to bear the same sacrifice or the same reduction in welfare. The loss in welfare is related to a reduction in income and, hence, the welfare function depends on incomes in this context. If the level of welfare - as a function of

[3] Since studying how well a utilitarian approach would fit requires a fundamentally different approach and is beyond the scope of this study.

income - is the same for all taxpayers, the Equal Sacrifice rule requires that individuals with the same ability-to-pay have to pay the same taxes.

To apply this, Equal Sacrifice requires two main assumptions: Firstly, utility is cardinal, so that the absolute value and relative differences between the utilities are measurable. This assumption is indispensable for the interpretation of the sacrifice that is calculated in terms of utility. Secondly, the utility function of equivalized incomes is identical for all individuals. People with the same ability-to-pay have the same utility and therefore, should pay the same amount of taxes (horizontal equity). Moreover, the tax payment should rise with the ability-to-pay (vertical equity). The statement of vertical equity is subject to controversial discussions because it is not clear how high the tax burden for those with high earnings should be. Therefore, the definition of Equal Sacrifice is important as well as the function of the utility of income. Firstly, I discuss three concrete definition of Equal Sacrifice and secondly, I define the utility function of income (see Subsection 4.2.2).

As described above, in the literature three Equal Sacrifice principle are discussed: absolte Equal Sacrifice (AES), relative Equal Sacrifice (RES), and marginal Equal Sacrifice (MES). Sidgwick (1883), defines the tax burden as the absolute level of sacrifice: every tax payer has to bear the same absolute sacrifice meaning that the loss in utility is equal for all individuals.

To reach the same absolute loss in utility for all individuals, the government revenue is divided as long as the utility loss due to taxation for all types is equal. The size of the tax burden depends on the assumption of the marginal utility of income. Having constant marginal utility leads to the same tax burden for all individuals, whereas decreasing marginal utility leads to a tax schedule increasing in income. Richter (1983) formally denotes AES as:

$$U(Y_i) - U(Y_i - T_i(Y_i)) = s \qquad \forall i \in \{1, ..., N\} \tag{4.1}$$

where the absolute difference between the utility before $U(Y_i)$ and after tax $U(Y_i - T_i)$ is equal to the sacrifice s. s is constant for all taxpayers. Y_i represents gross income, T_i the tax burden and $Y_i - T_i$ net income for individual i. Whether a tax schedule is regressive, proportional or progressive depends on the elasticity of the marginal utility of income with resepct to the income. An elasticity above one indicates a regressive, equal to one a proportional, and below one a progressive tax schedule.

In contrast to AES, RES is defined as a sacrifice concept that is proportional to the taxpayers' gross income. The government revenue is divided as long as the relative utility loss is equal between all individuals. Richter (1983) formalizes RES as:

$$\frac{U(Y_i)-U(Y_i-T_i(Y_i))}{U(Y_i)}=s \qquad \forall i \in \{1,...,N\} \tag{4.2}$$

and sacrifice s is the difference between the relative utility functions of gross and net income proportional to the gross income. As for AES, taxation can be regressive, proportional, or progressive for RES. Constant marginal utility leads to a proportional tax schedule, whereas decreasing linear marginal utility leads to a progressive tax schedule. A generalization for a marginal utility function with a decreasing rate is difficult. The result depends on the level and slope of the marginal utility function, the initial income level, and the intended government revenue.

While AES and RES do not result from the maximization of the social welfare function, Musgrave (1959, 2005) argues that these types of sacrifice do not fit with traditional economic theory. Traditional economic theory focuses on the overall welfare that depends on the utilities of all individuals and not on justice of fairness. With regard to the traditionl economic theory, Edgeworth (1897) formalized the social welfare function where all individuals have the same concave increasing utility function and income is fixed. The government chooses the tax burdens T_i to maximize the utilitarian social welfare function W subject to the budget constraint $\sum_i T_i = R$. The government revenue is now divided as long as the marginal sacrifice, or marginal utility of income, for all individuals is equal. The assumption of the same utility function for all individuals leads to $U_i'(X_i)=U'(X_i)$ and results in the same income after tax X_i for all individuals in the optimum i.e. for all non-linear utility functions applies $Y_i-T_i = Y_j-T_j, \forall i,j$.[4] To sum up, social welfare is maximized if net income have the same size for all individuals and total sacrifice is minimized.[5] As a result, a decreasing function of marginal utility of income[6] that requires the same sacrifice leads to a maximal progressive tax schedule - a marginal tax rate of 100 %. In this case, performance would never be rewarded and regardless of individual performance, income is equal for all. This is not a realistic case and assumes that MES is presumably not considered fair. Richter (1983) denotes MES by

[4]Consequently, an average earner is taxed to the necessary extend to finance government revenue by $T_i(\overline{Y})=\delta*\overline{Y}$ where δ describes the rate of government revenue. For all others, the tax is calculated by the deviation from the average income plus the tax burden of the average income type: $T_j(Y_i)=(Y_j-\overline{Y})+\delta*\overline{Y}$.

[5]The leveling of income starts at the top until the needed government revenue is reached. For illustration, two tax-payers, 1 and 2, where 2 earns twice as much as 1. If 1 pays 100 Euro, 2 pays 200 Euro tax and the MES for 2 is much lower than for one. In that case we reduce the tax amount of 1 by 10 Euro and increase it with the same amount for 2. The reduction of equal sacrifice is much greater for 1 than the increase for person 2. With the same amount of taxes collected, we have a decreased sum of MES.

[6]The rate of the decreasing marginal utility is not important.

$$U'(Y_i - T_i(Y_i)) = s \qquad \forall i \in \{1,...,N\} \tag{4.3}$$

describing the marginal utility function of net incomes.

To sum up, MES produces the highest tax burden for the high income earner and the lowest tax burden for low income earner if utility is decreasing. If AES or RES rule is better (inferior) then the RES for the low (high) income type, depends on the definition of the utility function, the initial income level, and the intended government revenue. However, AES and RES create more realistic tax schedules than MES.

4.2.2 Utility function of income

To calculate the sacrifice, the utility function has to be defined. In the literature, the function of constant relative risk aversion (CRRA) is the most common utility function (Young, 1988; Berliant and Gouveia, 1993; Weinzierl, 2014). Constant relative risk aversion entails that one would spend the same share in risky assets with increasing available money.[7] Researchers as Friend and Blume (1975) or Chiappori and Paiella (2011) show that CRRA is a good approximation as utility function for individuals. Thus, I define:

$$U(Y_i) = \frac{Y_i^{1-\varepsilon} - 1}{1-\varepsilon} \text{ so that } \varepsilon = -\frac{Y_i U''(Y_i)}{U'(Y_i)} \qquad \forall i \in \{1,...,N\} \tag{4.4}$$

where ε stands for relative risk aversion, also known as Arrow-Pratt measure, and is constant (Pratt, 1964; Arrow, 1971). For ε=1, CRRA is defined as:

$$U(Y_i) = ln(Y_i). \tag{4.5}$$

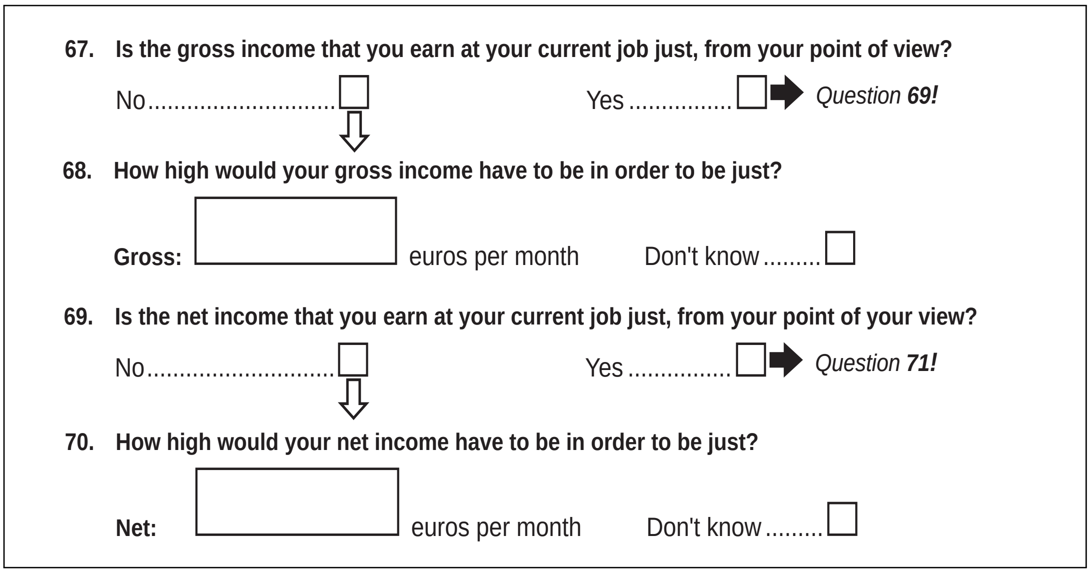
Furthermore, the risk aversion parameter ε can be also interpreted as an inequality aversion parameter (Atkinson, 1970). The preference for redistribution is increasing in ε.

[7] Other utility functions can belong to the classes: IRRA (increasing relative risk aversion), DRRA (decreasing relative risk aversion), IARA (increasing absolute risk aversion), DARA (decreasing absolute risk aversion), and CARA (constant absolute risk aversion).

4.3 Data

4.3.1 Questionnaire

To examine if individuals in Germany prefer a tax schedule according to one of the Equal Sacrifice principles, I use a newly introduced question asked since 2015 on the German Socio-Economic Panel (SOEP) (Goebel et al., 2018), where respondents are asked whether they consider their individual gross and net labor incomes to be fair.[8] The detailed questions are:



67. Is the gross income that you earn at your current job just, from your point of view?

No............................ ☐ Yes .... ☐ ➡ *Question **69!***

68. How high would your gross income have to be in order to be just?

Gross: ☐ euros per month Don't know .... ☐

69. Is the net income that you earn at your current job just, from your point of your view?

No............................ ☐ Yes .... ☐ ➡ *Question **71!***

70. How high would your net income have to be in order to be just?

Net: ☐ euros per month Don't know .... ☐

Source: SOEP v32 (own calculations).

Figure 4.1: Questionnaire

With regard to the data, there is one major limitation. The wedge between fair gross and net income includes both social security contributions and income taxes. As a consequence, it is impossible to identify which share of the total tax burden would be apportioned to income taxes alone by the respondent. Therefore, I refrain from separating these two components.

Firstly, I will give some informations on the sample and summary statistics (see Subsection 4.3.2) and secondly, I discuss how respondents have linked the answers on fair gross and net income to their tax burden (see Subsection 4.3.3).

[8] A question on fair income was asked from 2005 to 2013 (every second year) in the SOEP questionnaire and was inspired by a perceived justness of earnings formula developed by Jasso (1978). Only respondents who think that their gross income is not fair were asked these questions. In 2015, this question was modified into four more specific questions that specifically ask if individuals are satisfied with their gross and their net incomes. Therefore, I only use the 2015 question.

4.3.2 Sample and summary statistics

A total of 27,183 individuals who responded the personal questionnaire in the 2015 wave. Since only working respondents were interviewed, only 16,361 individuals answered the question about fair gross income, 16,304 about fair net income and 16,274 both. While individuals who do not work in the survey year 2015, the calculations do not include the whole population, e.g. pensioners, the unemployed, or school children are not included; thus nothing can be said about their preferences. Conditioning on respondents giving an amount and having valid cross-section weights 15,245 individuals are still available. The main analysis builds upon these observations. In Germany, the tax system allows income splitting, therefore the answers of the respondents might be motivated by higher tax burdens for the spouse with the lower income. This may be especially relevant for females who frequently are not the main breadwinner. Therefore, I construct tax units and identified 10,243 tax units. As argued before, the ability-to-pay may differ between household types. Therefore, I use equivalized incomes for all taxunits where the composition of individuals is clearly determinable (N=8,099). Furthermore, I create an indicator for five different household types: single households without children (N=2,988), single households with one child (N=372), married couples without children (N=1,326), married couples with one child (N=743), married couples with two children (N=1,138).

Table 4.1: Summary statistics

	Net labor income (X) is... fair	unfair	Total
Gross labor income (Y) is fair	59 %	6 %	65 %
Gross labor income (Y) is unfair	1 %	34%	36 %
Total	60 %	40 %	

Source: SOEP v32 (own calculations).
Note: Observations are weighted by the cross-sectional survey weights provided by the SOEP.

Table 4.1 presents descriptive statistics for the main sample (N=15,245). Around 59 % of the respondents think that their personal gross (Y) and net income (X) is fair, whereas 34 % of the respondents think that their gross and net incomes are unfair. Only 1 % of the respondents think that their net income is fair but their gross income is unfair, whereas 6 % of the respondents think that their gross income is fair but their net income is unfair. Compared to their 2015 SST burden, 41 % would like to have a different gross, net, or both (gross and net) income.

Table 4.2 presents the summary statistics of the relevant variables. Fair gross and net income is, on average, greater than current gross and net income. In addition, Table 4.2 presents the average tax rate (ATR) that is calculated by:

Table 4.2: Additional summary statistics

Variable	Mean	Std. Dev.
Gross labor income (Y)	2683.77	2297.78
Net labor income (X)	1762.81	1340.16
ATR	0.29	0.14
Fair gross labor income (Y^{fair})	2993.15	2607.46
Fair net labor income (X^{fair})	2022.28	1592.37
ATR^{fair}	0.26	1.32

Source: SOEP v32 (own calculations).
Note: Observations are weighted by the cross-sectional survey weights provided by the SOEP. ATR denotes average tax rate.

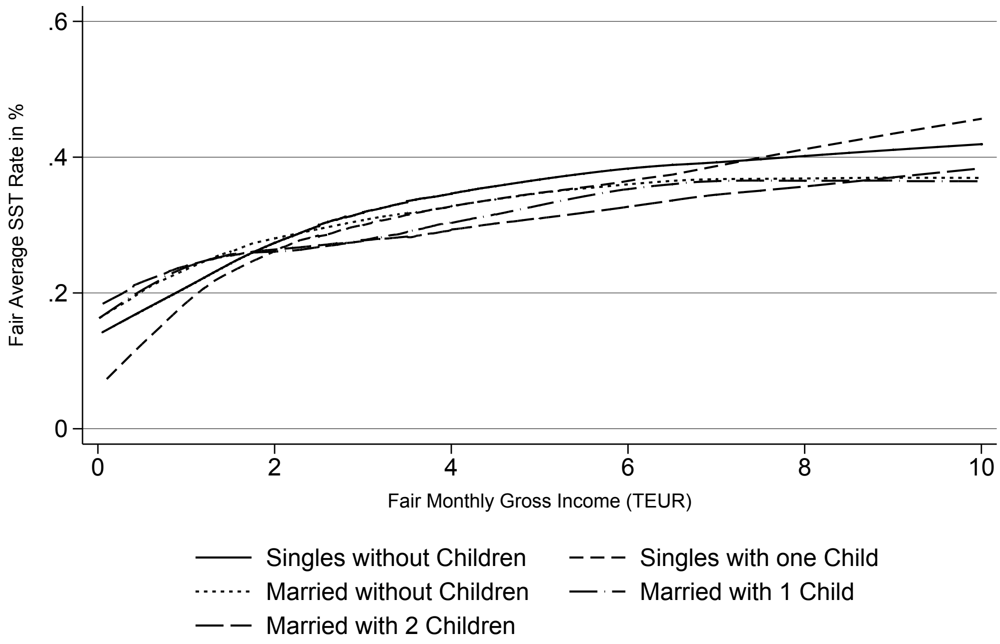
$$ATR_i = \frac{T_i(Y_i)}{Y_i}, \tag{4.6}$$

where Y_i is gross labor income of individual i. The variable T_i is the SST burden that is defined by the difference between Y_i and X_i, the net labor income of individual i. Therefore, ATR is the average tax rate and a relative measure. The ATR is significantly lower than this quotient in the German 2015 tax schedule, thus indicating that individuals prefer reduced taxation. Furthermore, the standard deviation of ATR^{fair} is much higher, implying a broad range of answers in regard to fair gross and net income.

Figure 4.2 presents the ATRs of the fair perceived monthly gross income for five different household types. For all household types, the tax schedule is progressive. With a gross income of around 2000 Euro, the ATRs of all household types are in the same range around 0.3. For high income households with a gross income around 10,000 Euro, the fair perceived ATR is between 0.37 to 0.43: single households have the highest and maried couples the lowest ATRs. For low income below 2,000 Euro the picture is the other way around: highest ATRs for married and lowest ATRs for singles. This indicate that different houdsehold with a differen ability-to-pay prefer different tax schedule. Therefore, I will use equivalized income for my analysis.

4.3.3 Evidence for (un)fair perceived tax burden

The questions of Figure 4.1 do not directly ask for the level of a fair tax burden and respondents who read the question on their fair gross income may think about just earnings. Therefore, these questions are often used for research on justice of earnings (see e.g. Jasso and Webster (1997); Liebig et al. (2010, 2012)). However, asking about fair



Source: SOEP v32 (own calculations).
Note: For plotting, a lowess (locally weighted least square regression) regression is used.

Figure 4.2: ATR of the fair perceived income for different household types

gross and net incomes at the same moment implies a fair social security and tax (SST) schedule.

Respondents who answered that gross (net) income is fair but net (gross) is unfair are not satisfied with their SST burden in 2015 and answered these question to give a fair SST. With regard to Table 4.1, these are 7 % of the respondents.

For respondents who answered that gross and net income is unfair (around 34 % of the respondents), it is not clear if they think that their wage or the tax schedule is unfair. Therefore, I plot the fair perceived and the 2015 average tax rates (ATR) and marginal tax rates (MTR). The scatter plots of ATR and MTR[9] (see Appendix Figure 4.B1 and 4.B2) show a wide spread, thus indicating that many respondents prefer a different SST schedule compared to the actual tax schedule in 2015 and not only on (un)fair income.

Furthermore, respondents who answered that their gross and net income is fair (around 59 % of the respondents), may connect this question only to their earnings and not to the tax burden. To check whether this is the case, I use a different fairness question

[9]While ATR is calculated as tax burden divided by gross income (see equation 4.6), MTR is the tax rate that is paid for the last earned Euro. The MTR is calculated by: $MTR_i = \frac{T_{p+1} - T_p}{Y_{p+1} - Y_p}$, where p defines the percentile in the distribution, T the tax burden und Y the labor gross income.

from the SOEP Innovation sample questionnaire (not part of my main sample). In 2015, the question on fair gross and net income was also asked in the innovation sample. In addition, respondents were also asked about their opinion on income redistribution.[10] Respondents who think that their gross and net income are both fair, are satisfied with their current taxation. For these respondents, there should be no relation with the statement that rich or poor people should be taxed higher or lower. By using a χ^2-Test and Cramer's V,[11] this hypothesis is not rejected, which means that I cannot find a significant relationship. However, I find a significant effect for people who think that their (gross and net) income is unfair and the preference for redistribution (see Table 4.B1 in Appendix) indicating a relation between unfair income and the statement that rich or poor people should be taxed higher or lower. These results underpin that respondents, if they perceive their income as fair or not, also understood the question in the sense of a sacrifice through taxation. For this purpose, I use all combinations of answers for my analysis.

4.4 Testing Equal Sacrifice principles

4.4.1 Defining the risk aversion parameter ε

I now test if one of the theories of Equal Sacrifice is in line with individuals' preferences for the data and if one of the principles could serve as objective function for a fair tax schedule. As described in Section 4.2, I use the CRRA utility function (equation 4.4 and 4.5) to permametrize the three sacrifice definitions (equation 4.1,4.2 and 4.3). To use the CRRA utility function, ε, the measure of relative risk aversion, has to be calculated or estimated. Chetty (2006) argues that an ε under or equal 2 is reasonable. Furthermore, for risk aversion, a broad range of values has been estimated. Gourinchas and Parker (2002) estimate a relative risk aversion parameter between 0.51 to 1.39, whereas Kaplan (2012) estimates a value around 1.6 to 1.65 for the USA. For Germany, Dohmen et al. (2011) argue that relative risk aversion parameters between one and five are realistic and above 10 are unrealistic. With the lack of data on consumption for Germany and therefore no opportunity to estimate, it is also common to set the value for risk aversion (see e.g. Haan and Wrohlich (2010) set the relative risk aversion parameter to 1.5).

Therefore, I use three different ε for each of the Equal Sacrifice principles: I set ε to 1 and 2; the bounds derived by Chetty (2006) and estimate an ε that fits well for AES, RES, and MES separately.

[10] The statements respondents were supposed to evaluate "Persons with high income should have an increase in the tax rate in the future" and "Persons with low income should have more transfers in the future".

[11] Cramer's V is a χ^2 based test and gives an association between two nominally scaled variables (here: between two dummies).

For AES and as explained in Young (1990), I estimate ε with the help of the mean value theorem (see Appendix A). This is done by the following OLS regression:

$$ln(T_i^{fair}) = \varepsilon * 0.5 * ln(Y_i^{fair} * (Y_i^{fair} - T_i^{fair})) + e_i, \tag{4.7}$$

where T_i presents the tax burden, ε the coefficient describing the risk parameter, $0.5 * ln(Y_i(Y_i - T_i))$ the independent variable including the gross income Y_i, and e_i the error term. The independent variable $0.5 * ln(Y_i(Y_i - T_i))$ defines the logarithm of the distance between the data points: U(Y) and U(Y-T). As a result, ε describes the slope of the utility function and can be used as the risk aversion parameter. Thus, I find an ε that is equal to 1.2 (see Appendix A). For RES and MES principle, and with regard to the mean value theorem, this strategy does not apply.

For RES, I calculate an ε with the help of the best numerical fit. I minimize the sum of all squared differences of the fair T_i^{fair} and new calculated T_i^{ES} for ε between 1 and 2 in 0.01 steps. Thus, the ε is equal to 1.013 for RES and slighly lower than the estimated ε for AES.

By using the same strategy for MES as for RES identifies an ε of 1 which is the bound. Therefore, I choose the middle of the bounds, an ε of 1.5, to have also three scenarios for MES.

4.4.2 Results of Equal Sacrifice principles

With the help of the estimated ε, I check whether one of the Equal Sacrifice principles is consistent with the fair perceived tax for the entire distribution. Therefore, I use the fair net and fair gross income within the three sacrifice theories to calculate the sacrifice s, take the mean of s, and calculate the tax schedules for all three sacrifice theorems. The SST schedule can be calculated by rearranging the specific Equal Sacrifice definitions (see equation 4.1, 4.2, and 4.3). Table 4.3 presents the formulas to identify the SST schedule T. Since ε of 1 requires a different utility function, I have six different tax formulas.

Table 4.3: Social security and tax (SST) formulas

	Equal Sacrifice principles		
	AES	RES	MES
$\varepsilon \neq 1$	$T_i = Y_i - (Y_i^{1-\varepsilon} - (1-\varepsilon) * s)^{\frac{1}{1-\varepsilon}}$	$T_i = Y_i - ((1-s) * (Y_i^{1-\varepsilon} - 1) + 1)^{\frac{1}{1-\varepsilon}}$	$T_i = Y_i - s^{\frac{1}{-\varepsilon}}$
$\varepsilon = 1$	$T_i = Y_i - e^{-s} * Y_i$	$T_i = Y_i^{1-s} * (Y_i^s - 1)$	$T_i = Y_i - \frac{1}{s}$

Note: The SST schedule can be calculated by rearranging the specific Equal Sacrifice definitions by plugging in the utility function (see equation 4.4 and 4.5) to identify the tax burden T. Y indicates gross income, s the sacrifice, and ε the risk aversion parameter.

Subsequently, I check which of the three sacrifice theorems and which risk parameter ε fits best with the data. Table 4.4 presents the results of each sacrifice definition: the mean μ of the sacrifice s, the standard derivation σ of s, and ATR for different income levels. The mean μ of the sacrifice s is calculated by plugging in the individual fair gross Y_i and fair net X_i incomes into the equation 4.1, 4.2, and 4.3. As explained before, for the definition of the utility functions I use CRRA (see equation 4.4 and 4.5). Out of all sacrifices s, I calculate the mean μ and σ. As assumed in the theoretical Section 4.2, the lowest average sacrifice s can be found for MES principle. However, with increasing ε, the average sacrifice s decreases.

Table 4.4: Equal Sacrifice and ATRs

	Equal Sacrifice principles								
	AES			RES			MES		
ε	1.000	1.200	2.000	1.000	1.013	2.000	1.000	1.500	2.000
μ(s)	0.355	0.088	$0.45*10^{-3}$	$0.49*10^{-1}$	$0.47*10^{-1}$	$0.44*10^{-3}$	$0.23*10^{-2}$	$0.24*10^{-3}$	$0.51*10^{-4}$
σ(s)	0.245	0.071	0.003	0.048	0.046	0.003	0.007	0.002	0.001
Y	**Average tax and social security rate=(T(y)+S(y))/y**								
500	0.30	0.26	0.18	0.26	0.26	0.18	0.15	0.49	0.72
1000	0.30	0.29	0.31	0.29	0.29	0.31	0.57	0.74	0.86
2000	0.30	0.32	0.47	0.31	0.31	0.47	0.79	0.87	0.93
4000	0.30	0.36	0.64	0.33	0.34	0.64	0.89	0.94	0.96
10000	0.30	0.41	0.82	0.36	0.37	0.82	0.96	0.97	0.99

Source: SOEP v32 (own calculations).
Note: Y indicates gross income, s the sacrifice, ε the risk aversion parameter, σ the is the coefficient of variation, and μ the mean.

The lower part of Table 4.4 presents tax schedule with ATR for all nine scenarios and different gross income levels. For calulating the ATR, I plug in the individual fair gross Y_i and fair net X_i incomes into equation 4.6. The ATR for AES and RES are very similar. Furthermore, with an increasing parameter of risk aversion (ε), I find a more progressive SST schedule, indicating a higher level of redistribution. In the case of MES, extremely high tax rates for the very rich and, therefore, the highest degree of progressively in the chosen scenarios.[12] These findings underpin the assumptions from Section 4.2 that the MES principle leads to an extremely high progressive tax schedule. Only for AES, with a risk aversion parameter ε equal to 1, I find a proportional tax schedule. In the other eight scenarios of Table 4.4, the tax schedule calculated by the three defined Equal Sacrifice principles are progressive. Table 4.3 explains this: if the relative risk aversion parameter ε is one, the tax function rearranges to $T = Y - e^{-s} * Y$ where e^{-s} is a constant and ends up in a linear tax schedule.

4.4.3 Graphical and numerical fit

If stated preferences on fair net and gross income confirm one of the three defined Equal Sacrifice principles will be discussed in this step. Therefore, I compare the new calculated

[12] In the case of MES, I also find transfers to the working poor.

tax (Equal Sacrifice SST) schedule with the original data (Fair SST). Figure 4.3 presents the tax rates of both schedules.[13] The MES differs most from the fair perceived SST; the AES and RES theories with the estimated and calculated ε (scenarios in the middle) have the best fit.

To test the numerical fit, I calculate the correlations between the Equal Sacrifice principles and the Fair SST schedule by an ordinary least square regression without a constant and in logs:

$$ln(T_i^{ES}) = \beta\, ln(T_i^{fair}) + e_i, \tag{4.8}$$

where T^{ES} presents the calculated tax burden of the three Equal Sacrifice principles, T^{fair} the tax burden that is considered as fair by the respondents, concrete, fair gross labor income minus fair net labor income, and e_i the error term. As Figure 4.3 shows an exponential course for the both tax schedules, I use the log form in the least square regression.

Table 4.5 presents the β, R^2 and Mean Square Error (MSE) for all three theories and risk aversion parameters. A β around one, a high R^2 and a low MSE indicate high consistence, a high level of explained variance and a small difference between the fitted line and the data points.

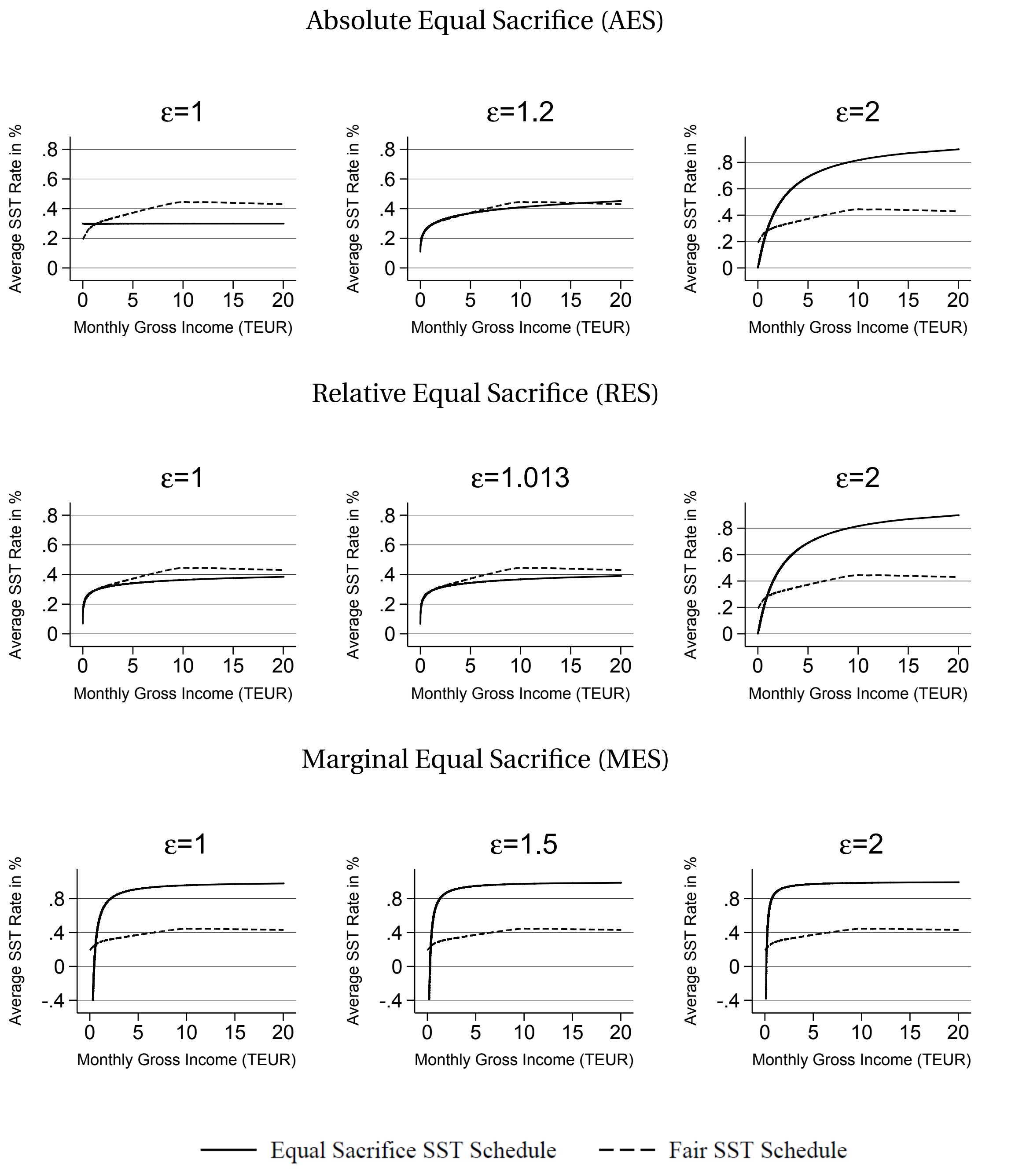
Table 4.5: OLS regression for the three Equal Sacrifice SST and Fair SST schedule (in logs and without a constant)

	ϵ=1			$\epsilon = \{1.2; 1.013; 1.5\}$			ϵ=2		
	β	R^2	MSE	β	R^2	MSE	β	R^2	MSE
AES	1.048	0.865	0.249	1.045	0.881	0.220	0.950	0.772	0.422
RES	1.034	0.880	0.222	1.035	0.880	0.222	0.946	0.772	0.422
MES	1.008	0.447	0.951	1.552	0.419	1.031	2.368	0.355	1.166

Source: SOEP v32 (own calculations).
Note: OLS estimation of equation 4.8. ϵ defines the risk aversion parameter and MSE the Mean Square Error.

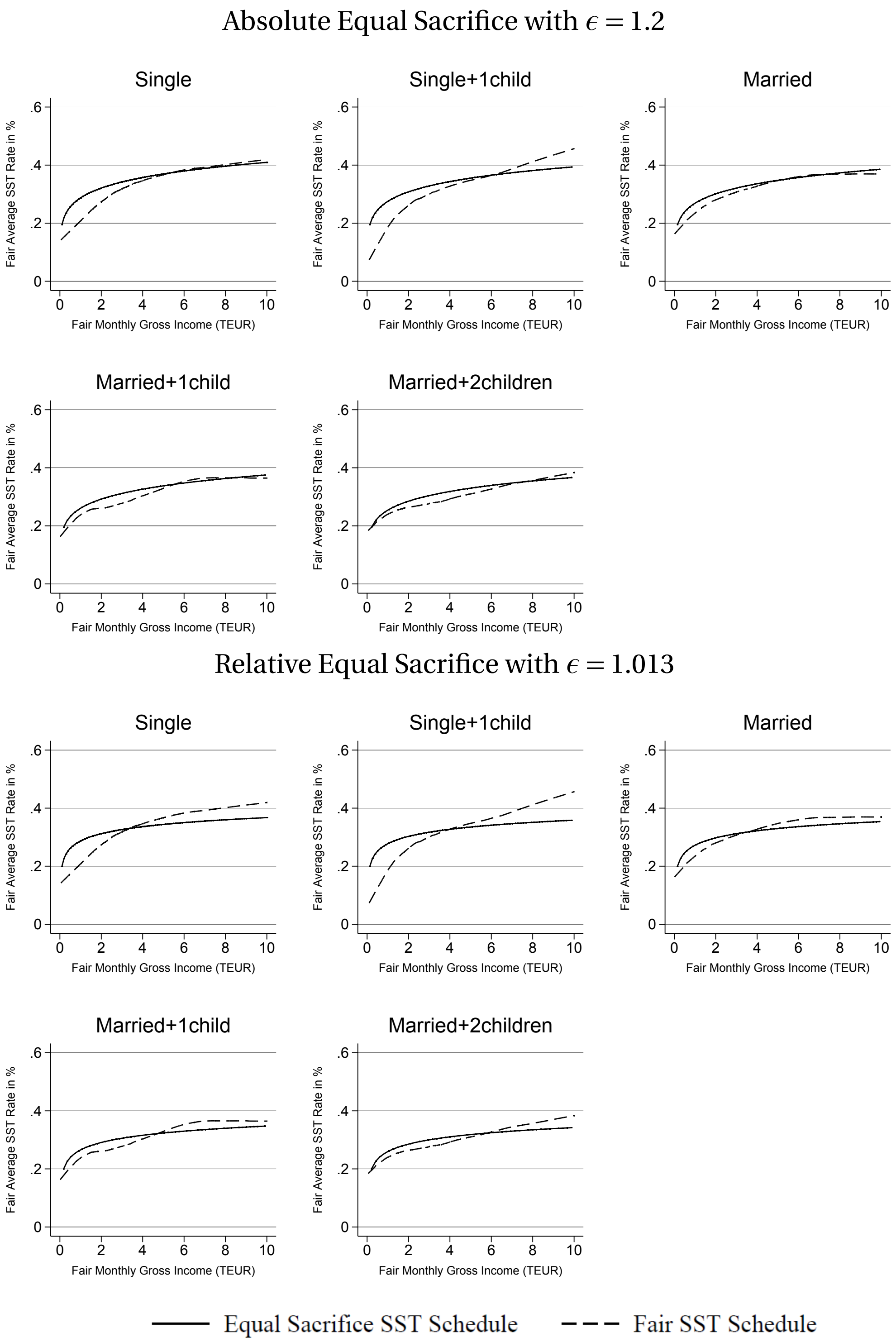
The highest R^2 can be observed for the AES and RES, especially for the estimated ϵ. The lowest R^2 can be found for the MES principle. In addition, the lowest MSE and, therefore, a small distance between the fitted line and the data points is found for AES and RES for the estimated ϵ. The MSE for RES is minimal smaller than for AES. These results confirm the graphical results. With regard to the risk aversion parameter ϵ, the parameter estimated by the method of Young (1990) for AES and the calculated ϵ for RES produces the lowest MSE indicating that these schedules are most similar compared to the fair tax data.

[13] For plotting the surveyed difference between gross and net income, a lowess regression is used. Lowess regression is a locally weighted least square regression and helps to smooth graphs.



Source: SOEP v32 (own calculations).
Note: The bounds for the ε are set to 1 (left graphs) and 2 (right graphs). The ε for scenarios in the middle differ: For AES ε is estimated by the Young (1990) method (see Appendix A) and is ε=1.2. MSE is reduced to 0.220 for ε=1.2 (MSE is 0.249 for ε=1 and 0.422 for ε=2). While the method for AES does not apply, I calculate an ε which has the best numerical fit for RES and ε is 1.013. MSE is 0.222 (MSE is 0.222 for ε=1 and 0.422 for ε=2). For MES the best numerical fit lies out of the bounds, I set ε to 1.5. MSE of 0.951 is lowest for ε=1 (MSE for ε=1.5 is 1.031 and for ε=2 is 1.166). For plotting, a lowess (locally weighted least square regression) regression is used.

Figure 4.3: Equal Sacrifice tax schedule vs. fair tax schedule



Source: SOEP v32 (own calculations).
Note: For plotting, a lowess (locally weighted least square regression) regression is used.

Figure 4.4: Equal Sacrifice tax schedule vs. fair tax schedule for different household types

Figure 4.3 and Table 4.5 show that AES and RES with the estimated ϵ (szenario in the middle) fits best with the fair perceived SST schedule. As agued before, the ability-to-pay for different household types may differ and therefore, income is equivalized in the estimations before. Figure 4.4 shows whether the calculated Equal Sacrifice SST schedules also agree with the preferences of different household types and presents the best fitting (see Figure 4.3 and Table 4.5 the szenario in the middle for AES and RES) Equal Sacrifice Schedule vs. the fair answered SST schedule for different household types. For household types with a married couple, the stated preferences on fair net and gross income confirm the AES and RES principle. In this case, the OECD equivalence scale seems to be in good agreement with the preferences. For singles, the fit is not quite as good, especially in the lower income ranges, respondents prefer a lower tax. This may indicate that the ratio of the currently selected equivalence scale does not necessarily coincide with the desired preferences with regard to taxation. As shown in van de Ven et al. (2017), empirical calulated tax implicit equivalence scales varies with gross income that may explain the relativly worse fit for the single household types. Nevertheless, for most parts of the income distribution, the fit seems to be good whereas the graphical fit for AES seems to be slightly better than for RES.

Overall, Table 4.4 and Figure 4.3 show that none of the three Equal Sacrifice principles fit perfectly with the data on fair perceived gross and net income, but, the principle of AES and RES have the best fit. As shown in Figure 4.3, there is almost no graphically difference between these Equal Sacrifice principles and Fair SST schedule. With regard to the risk aversion parameter ϵ, the parameter estimated by the method of Young (1990) for AES and the ϵ for RES produces an Equal Sacrifice tax that is most similar compared to the fair tax data. These results underpin that two of the defined Equal Sacrifice principles are in line with the fair perceived income taxation in Germany.

4.4.4 Government revenue

Besides a preference for an Equal Sacrifice principle it is also interesting to examine how much government revenue is generated compared to the 2015 tax schedule. To identify if one of the Equal Sacrifice tax schedules satisfy the 2015 budget constraint, Table 4.6 presents the rate of the government consumption level Δ compared to the level of the 2015 SST schedule that is calculated by:

$$\Delta = \frac{\sum_{i=0}^{N}(Y_i - X_i)}{\sum_{i=0}^{N}(Y_i^{ES} - X_i^{ES})} - 1$$

where X presents the net labor income, Y the gross labor income and the subscript ES presents the incomes within the Equal Sacrifice SST schedules. In the scenario of MES, the government consumption level is much higher with the Equal Sacrifice SST schedule compared to the 2015 SST schedule, where government consumption reduces in the first two scenarios of AES and RES tax schedules.[14] Therefore, the budget of the government expenditures would be reduced for the two best fitting scenarios (AES with ϵ=1.2 and RES with ϵ=1.013) indicating that the overall German working population would like to pay less tax.

Table 4.6: Equal Sacrifice and government consumption

	Equal Sacrifice principles								
		AES			RES			MES	
ε	1.000	1.2	2.000	1.000	1.013	2.000	1.000	1.500	2.000
δ G in pp	-0.19	-0.08	0.29	-0.13	-0.13	0.29	0.51	0.63	0.65

Source: SOEP v32 (own calculations).
Note: ε defines the risk aversion parameter and δ the governments consumption level G compared to the 2015 social security and tax schedule in percentage points (pp).

4.5 Conclusion

Commonly, the optimal tax literature assumes a utilitarian objective function. But it is unclear whether individuals believe that their criterion for a fair tax matches the Utilitarian criterion. Past research indicated that Equal Sacrifice can be an alternative to welfarism. This can be found for example in studies that focus on evaluating actual tax schedules or asking for individual preferences by choosing between different taxation schemes. This paper shows that absolute and relative Equal Sacrifice comply with a fair perceived social security and tax schedule.

The basic idea of this paper was to use two novel questions from the SOEP questionnaire on fair gross and net income and transform them into an indicator for a fair social security and income tax rate, which is then used to develop a fair social security and (income) tax scheme. While the ability-to-pay differs for different household types equivalized household income is used. The scheme is then compared for its fit with absolute, relative, and marginal Equal Sacrifice principles. Unique to the approach of this study is that respondents did not have to choose between given taxation scheme alternatives. Respondents were asked directly to determine their own fair gross and net incomes.

The general finding is that none of the three Equal Sacrifice principles fits perfectly with the survey data. However, the principle of AES and RES yield the best fit by numbers and, in the graphical plot, a remarkable fit is obtained. I also find that a fair tax schedule should be progressive. For optimal tax theory and also for the social planner, this result implies that two of the Equal Sacrifice principles qualify as an alternative to the utilitarian objective function.

[14]With an ε of 1.751 or 1.749, the budget constraint of the government is binding in the case of AES or RES. However, in this case, the fit is worse (see Figure 4.B3 in Appendix).

The related question of how well the optimal taxation schedule in accordance with Mirrlees (1971) fits would require a different approach however and exceeds the scope of this study. Also left for further research is the question whether the Equal Sacrifice principles even hold if respondents (including non-working) are asked explicitly about a fair taxation scheme.

Appendix

A Calculation of the risk aversion parameter by Young (1990)

As discussed in Section 4.2, I use the CRRA as utility function (see equation 4.4), plug it into equation 4.1 and now I follow Young (1990):

$$\frac{Y^{1-\varepsilon}-1}{1-\varepsilon}-\frac{(Y-T)^{1-\varepsilon}-1}{1-\varepsilon}=s \tag{4.9}$$

The SST burden T and the gross income Y is available but ε has to be estimated.

We know from the definition of ε of the CRRA function (see equation 4.4):

$$\varepsilon=-\frac{zU''(z)}{U'(z)}=-\frac{dU'(z)}{U'(z)}:\frac{dz}{z}=-\frac{d(-lnU'(z))}{d(lnz)}=\frac{-\%\Delta U'(w)}{\%\Delta w} \tag{4.10}$$

where the rate of change is described by $-lnU'(z)$ with respect to $ln(z)$. Thus, I need to calculate w which defines distance between U(Y) and U(Y-T) for estimating ε.

Therefore, the mean value theorem is used and helps to rearrange the equation:

$$\frac{U(Y)-U(Y-T)}{Y-Y+T}=U'(w)\Leftrightarrow\frac{\frac{Y^{1-\varepsilon}-1}{1-\varepsilon}-\frac{(Y-T)^{1-\varepsilon}-1}{1-\varepsilon}}{T}=w^{-\varepsilon} \tag{4.11}$$

to:

$$\frac{w}{Y}=\left(\frac{(\varepsilon-1)*\frac{T}{Y}}{(1-\frac{T}{Y})^{1-\varepsilon}-1}\right)^{\frac{1}{\varepsilon}} \tag{4.12}$$

The w and ε are unknown, but the relationship between T and Y can be defined. As starting point and done in Young (1990), I set $\frac{T}{Y}$=0.2 and plug this into equation 4.12. Now, I can identify an approximation for ε that is used to simplify equation 4.12:

ε	w/Y
3	0.893
2.5	0.894
2	0.894
1.5	0.895
1.1	0.896

$$\Rightarrow \varepsilon=2\Rightarrow w=\sqrt{Y(Y-T)}.$$

Thus the distance w is defined as:

$$w = \sqrt{Y(Y-T)}. \tag{4.13}$$

By using equation 4.9 and 4.11, we find following relationship:

$$\frac{U(Y)-U(Y-T)}{T} = U'(w) = \frac{s}{T}$$

Without loss of generality Young (1988) is taking s equal to 1 and the logarithm and yields in:

$$-lnU'(w) = -lnU'(\sqrt{Y(Y-T)} = -lnT \tag{4.14}$$

Remember equation 4.10 and I set them equal to:

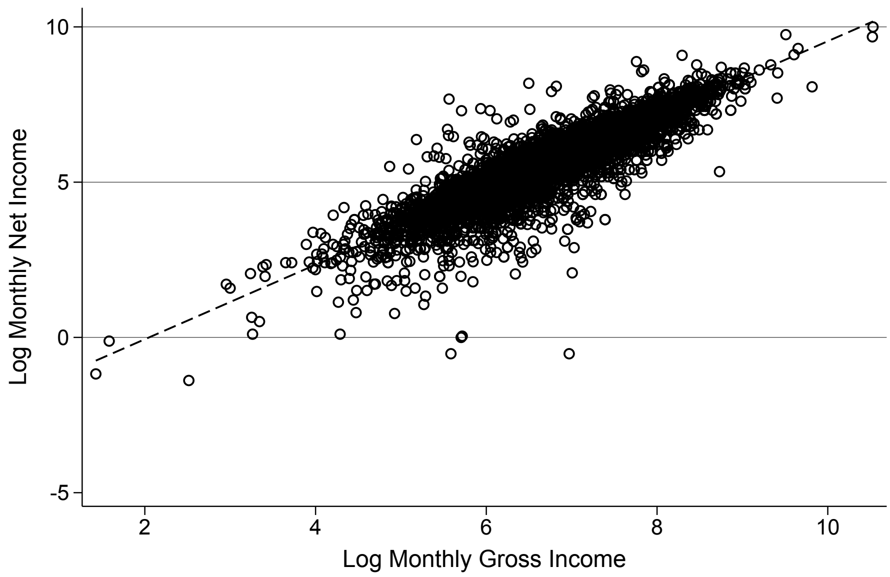
$$\varepsilon = -\frac{zU''(z)}{U'(z)} = -\frac{d(-lnU'(z))}{d(lnz)} = \frac{y}{x} \tag{4.15}$$

where this equation can be rearranged to the relationship: y=ε*x. The dependent variable y is described by $ln(T)$ (see equation 4.14) and x by $ln(w)$ that is equal to $ln(0.5 * ln(Y(Y-T)))$ (see equation 4.13). To identify ε, the following OLS regression is estimated:

$$ln(T_i) = \varepsilon * 0.5 * ln(Y_i(Y_i - T_i)) + e_i, \tag{4.16}$$

where $ln(T_i)$ is the dependent variable, ε the coefficient describing the risk parameter, $ln(Y_i(Y_i - T_i))$ the independent variable, and e_i the error term.

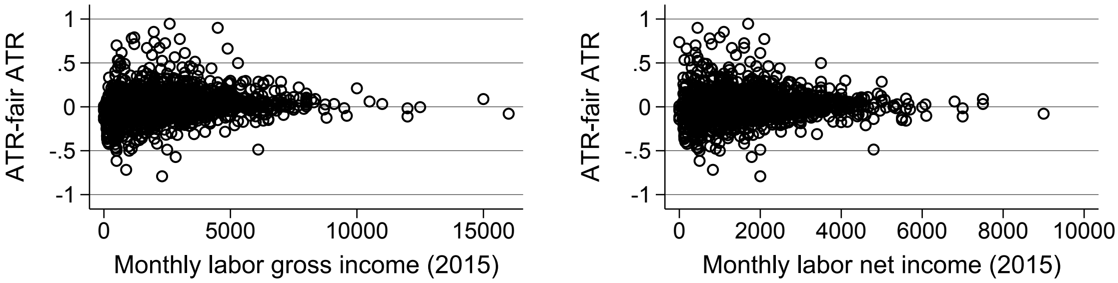
Figure 4.A1 presents the slope estimate for the utility function. The R^2 is equal to 0.73 meaning that 73 % of the variance can be explained by the linear model. The estimated risk aversion parameter $\hat{\varepsilon}$ is equal to 1.2.



Source: SOEP v32 (own calculations).
Note: The figure presents the slope estimate for the utility function and identify the risk aversion parameter ε where $\hat{\varepsilon}$=1.2 and R^2=0.73.

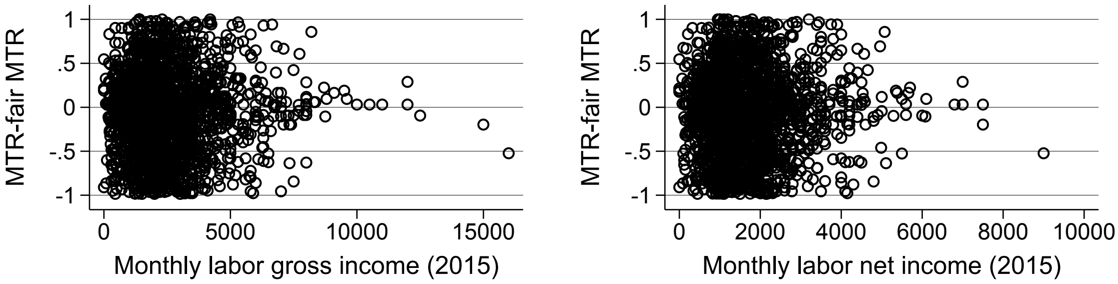
Figure 4.A1: Regression for estimating the risk aversion parameter ε by the method of Young (1990)

B Tables and Figures



Source: SOEP v32 (own calculations).
Note: ATR defines the average tax rate.

Figure 4.B1: Scatter plot of ATR-fair ATR over income



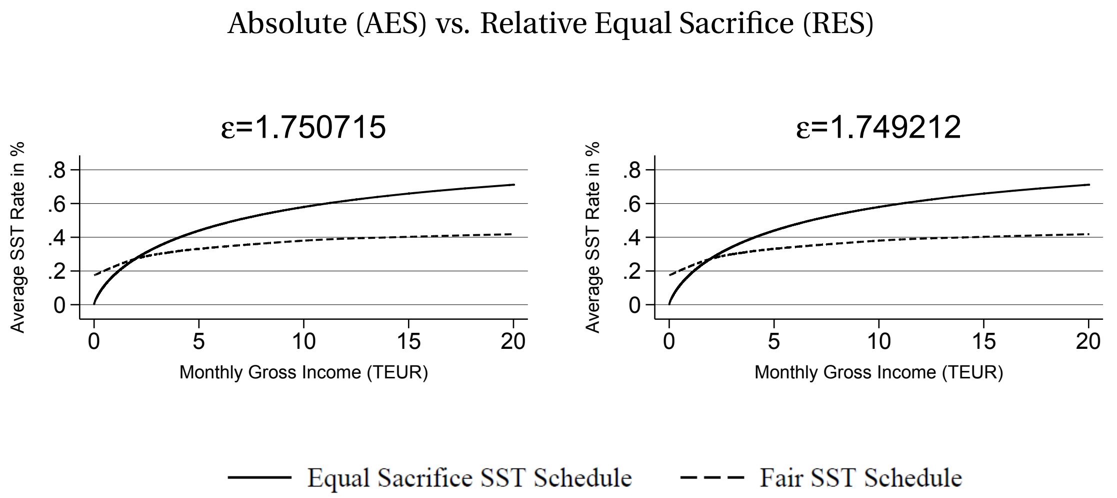
Source: SOEP v32 (own calculations).
Note: ATR defines the average tax rate.

Figure 4.B2: Scatter plot of MTR-fair MTR over income

Table 4.B1: Cramer's V

gross and net is ...	less: tax for rich	less: transfer for poor	higher: tax for rich	higher: transfer for poor
fair	-0.01	-0.02	0.03	0.01
unfair	0.07***	0.07***	-0.10***	-0.05***

Source: SOEP-IS v2015.1 (own calculations).
Note: This table contains the Cramer's V and checks the relationship between dummy variables. The dummy tax for rich/transfer to poor comes from the 5 point scale questions *Persons with high income should be taxed more in the future* and *Persons with low income should prospectively receive larger income.* *Higher* includes individuals that fully or rather disagree with the question and *less* includes individuals that completely or rather agree with the question.



Source: SOEP v32 (own calculations).
Note: ε defines the risk aversion parameter and SST, the social security and tax schedule.

Figure 4.B3: Absolute (AES) vs. Relative Equal Sacrifice (RES) when budget constraint is binding

5 Experienced well-being and labor market status: the role of pleasure and meaning[1]

5.1 Introduction

Subjective well-being (SWB) is a multidimensional concept that encompasses evaluative and experiential measures. While evaluative well-being measures (e.g. life satisfaction) ask people what they think about their life, experiential measures cover how people experience their life (Stiglitz et al., 2009; Fleurbaey, 2009). Both measures of well-being are used to explain the subjective quality of different labor market states. However, the comparisons of being employed and unemployed are mostly accomplished by evaluating *life satisfaction* based on questions that ask individuals how satisfied they are in life in general. The unemployed are detrimentally less satisfied with their life than employed persons (see, for instance, Kassenboehmer and Haisken-DeNew, 2009). One domain of life satisfaction is, at least for the employed, job satisfaction. As an evaluative measure, it asks if people are satisfied with their job, thus it is used as an empirical proxy of utility from one's job.[2] However, both evaluative measures are like snapshots in the moment of asking, neglecting that well-being is an enduring process. Here, we focus on the temporal component that is widely ignored when asking for evaluative outcomes. SWB also encompasses experienced well-being that combines well-being valuations over time. Being employed or being unemployed crucially shapes individual time use, such that experienced well-being is particularly important in this context. This study focuses on the process (dis-)amenities from working and its absence for the unemployed.

Empirical experienced well-being is based on the theoretical concept of experienced utility of Kahneman et al. (1997). It works out Bentham's idea that time comes with experiences of pleasure or pain in every instantaneous unit.[3] It is defined as the temporal integral of positive or negative valuations, i.e. time becomes the weighting factor for experiences of pleasure and displeasure (Kahneman et al., 2004b; Krueger et al., 2009b;

[1]This chapter is based on Wolf et al. (2019).

[2]This is validated as it is shown that actual labor market behavior is predicted sufficiently by job satisfaction (see, for instance, Green, 2010).

[3]Allocation of time was already introduced into economics in the mid-20th century (for a literature review see Juster and Stafford, 1991).

Diener and Tay, 2014). Experienced well-being aggregates such instantaneous experiences into one single measure and enables the comparisons of groups of individuals on an aggregate level (Kahneman et al., 2004a).

This paper uses the Day Reconstruction Method (DRM) module of the nationally representative innovation sample of the German Socio-Economic Panel Study (SOEP-IS), which was included in the annual survey from 2012 to 2015. We examine experienced well-being on labor markets and take standard evaluative SWB measures for life and job satisfaction - as quantities that in general are used to evaluate labor market states – as comparison measures. Namely, we investigate if being employed is valuable in terms of experienced well-being in comparison to being unemployed. Workers experienced well-being is expressed in terms of the P-index, which reports the share of pleasurable minutes a person experiences on the DRM day.

Two potential sources of (dis-)amenities from work beyond the monetary remuneration are examined: experiences of pleasure and experiences of meaning during working. The latter – meaning, a feeling that an activity has a deeper sense, – specifically needs more investigation. We hypothesize that working becomes a pleasurable activity due to the meaningful production it enables. A review suggests that workers strive for such experiences of meaning during work (Cassar and Meier, 2018). Methodologically, we shift the perspective from the outcome of experienced well-being for the whole day to examining only working episodes. We also ask if working becomes pleasurable because it provides a meaningful experience, further examining how pleasure and a meaningful experience affect experienced well-being and job satisfaction.

We contribute to the literature by comparing experienced well-being of the employed and the unemployed by accounting for unobserved individuals' heterogeneity with individual fixed effects. Representative SOEP-IS also allows for strengthening the external validity compared to prevailing experimental populations. Both aspects allow methodological progress to understand how workers experience both states. By integrating experienced meaning as a predictor for pleasure during work, we asses a central non-monetary determinant for utility from work. We find that, in contrast to income and working hours, perceiving meaningfulness enhances instantaneous pleasure at work. Consequently, total experienced well-being is increased by meaning. Nonetheless, on average, the unemployed experience more pleasurable time, which is mainly due to the absence of the working episodes in their daily life.

The rest of the article is organized as follows. Section 5.2 reviews the related literature and Section 5.3 describes the SOEP-IS DRM data. In Section 5.4, we describe the methodological aspects of experienced well-being and pleasure from job meaning. The results for experienced well-being are presented in Section 5.5, while Section 5.6 reports the findings regarding pleasure and well-being from experienced meaning. Finally, in Section 5.7, we sum up the findings and discuss implications.

5.2 Related literature

Beyond the shrinking financial abilities from a job loss, unemployment reduces *life satisfaction* (Winkelmann and Winkelmann, 1998; Kassenboehmer and Haisken-DeNew, 2009). This reduction is explained by a loss of non-pecuniary benefits from employment (Clark, 2003; Schöb, 2013; Hetschko et al., 2014). Obviously, the daily routine of employed and unemployed individuals differs fundamentally. The unemployed have more time discretion without the obligation to work. Measures of experienced well-being incorporate the valuation of elapsed time and allow us to incorporate it into labor market analysis. The few papers contrasting employment and unemployment by using experienced well-being measures arrive at ambiguous findings (Knabe et al., 2010; Krueger and Mueller, 2012; Tadic et al., 2013; Flèche and Smith, 2017).

In two female-only samples from Rennes (France) and Columbus (USA), the unemployed have lower experienced well-being (Krueger et al., 2009a). In contrast, results of a sample from Berlin and Magdeburg (Germany) show that the well-being of the unemployed does not significantly differ from that of the employed (Knabe et al., 2010). Krueger and Mueller (2012) examine reemployment of unemployed in New Jersey (USA), specifically tracking the emotions of happiness, sadness and stress. They find that reemployment increases the intensity of happiness while reducing stress and sadness. Surveying the frequencies of happiness, anxiousness, and sadness of the unemployed during a retrospective four week window shows a comparable pattern for the unemployed in Germany. They report more frequent feelings of sadness and anxiety, and less frequent feelings of happiness (von Scheve et al., 2017). Both results indicate that employment results in positive experiences in terms of specific emotions that enter positively into experienced well-being. In a study of the unemployed and employed in France, differences in experienced well-being is not significant, while the unemployed in the USA have reduced experienced well-being (Flèche and Smith, 2017). Taken together, it is not clear whether the employed and the unemployed differ in terms of experienced well-being. These ambiguous findings could result from the different locations, the selectivity of the survey populations, measurement issues, empirical approaches to experienced well-being, or the variances in the day-to-day time schedule of employed and unemployed.

Differences in time use are reported in all mentioned studies. At least for working days, activities like commuting and working exclusively shape the days of employees. The unemployed have more leisure time at discretion. It is remarkable that among the reported activities, 'working' ranks among the least pleasurable (Kahneman et al., 2004b; Bryson and MacKerron, 2017). A hypothetical *time composition effect* would lead to higher experienced well-being among non-working persons as they avoid unpleasant work. However, a counteracting *saddening effect* is also present: it reduces the intensity of positive valuations of leisure activities (potentially due to diminishing marginal returns from leisure time) such that the overall difference in experienced well-being depends on effect dominance between time composition and saddening effect (Knabe et al., 2010).

Two exceptions from harmful working experiences are ‘volunteer’ workfare participants (German ‘one Euro’ jobs) allowing for holidays from unemployment (Knabe et al., 2016) and US volunteers who enjoy their work (Gimenez-Nadal and Molina, 2015). Both groups experience greater well-being than those who are not working given their income level. We take this as a hint that pleasure from work depends not only on pecuniary aspects, but also that work becomes valuable by other distinct factors.

One under-investigated source for pleasurable experiences from work is experienced meaning. It is a feeling of purpose or a deeper sense in the actual situation or the whole life. Stated preference studies suggest that workers have such a preferences for a general sense of meaning in life (Benjamin et al., 2014; Adler et al., 2017). Among specific activities, working is described as an activity with a high level of perceived meaningfulness and rather low pleasure (White and Dolan 2009). Workers might obtain meaning from work for several reasons (for an overview see Cassar and Meier, 2018) that helps foster identity utility. Identity utility links own actions (like working in a specific job as well as the choice of an occupation or task) to a societal goal. Following a narrative of prescribed behavior, it allows for perceiving own work as meaningful. This is why workers prefer to act in a prescribed way of their own social category (Akerlof and Kranton, 2000; Schöb, 2013). Experienced meaning during work is an expression of identity utility production during work. However, meaning is also described as biologically determined human drive (Chater and Loewenstein, 2016) or as a vehicle to assertion own free will (Karlsson, Loewenstein, and McCafferty 2004). Organizational studies further suggest that each firm’s (perceived pro-social) mission allows for meaning during work (Cassar and Meier, 2018). While it is difficult to separate the correct channel for such non-monetary advantages from working, the conjecture that the reduced life satisfaction of the unemployed is partly due to a loss of the opportunity to experience meaning is plausible (Cassar and Meier, 2018).

Indeed, empirical studies suggest that meaning correlates positively with measures of well-being. For instance, feeling that ones’ job is socially useless (the opposite of a meaningful experience) correlates negatively with evaluative job satisfaction. Remarkable here is that those individuals who claim that meaning does not matter for them do not have reduced job satisfaction (Dur and van Lent, 2019).[4] This finding suggests that preference heterogeneity among workers matters a lot in terms of meaning (Bryce 2018). In line with the relevance of meaning, experimental work-effort studies suggest that exogenously increasing the meaning of tasks increases the work effort for this task. This does not hold for all subjects as some persons do not care about meaningfulness at all (Ariely et al., 2008; Chandler and Kapelner, 2013; Kosfeld et al., 2017). Thus, we expect that pleasure while working is positively associated with meaning.

[4]A comparable correlation is found for a flourishing scale that encompasses a question on meaning and evaluative life satisfaction (Clark and Senik, 2011; Clark, 2016).

5.3 Data

For our analysis, we use the German Socio-Economic Panel Innovation Sample (SOEP-IS). It contains a reduced form of the SOEP survey questionnaire and the representative sampling design of the SOEP household study (Goebel et al., 2018). A broad set of items, like socio-economic status, questions on life satisfaction and income information, are included. Moreover, the SOEP-IS enriches the SOEP household survey with supplemental modules, including experiments and additional questions within the SOEP survey design (Richter and Schupp, 2015). One of these modules is a survey-adapted version of the Day Reconstruction Method (Kahneman et al., 2004b). SOEP-IS DRM combines a time use assessment with self-reported well-being for episodes (Anusic et al., 2017).

The SOEP-IS DRM data were collected in 2012, 2013, 2014, and 2015.[5] The interviewer asks the respondents to report what time the respondent got up on the previous day. Subsequently, the respondents were asked episode-wise to choose one out of a set of 23 activities, followed by the question about what they did afterwards. This procedure was repeated until the person reports that she went to bed. Beside the listed activities, respondents could also use an open text field for activities. This open answer episodes are also part of our sample as they were manually categorized (Wolf, 2018). Every activity of the previous day is tracked with its exact timing (in 5 minutes increments) from the beginning to its end.[6] After finishing the diary, the respondents assessed each reported activity in their diary by answering the following question:

"Overall, was this episode [name of episode] from [episode begin] until [episode end] rather pleasant or rather unpleasant?"[7]

This binary measure of episode satisfaction reduces the (temporal) burden of assessing the whole DRM day for the respondents while still capturing the information for each episode of the previous day. In addition, three activities of each diary were randomly drawn and an additional battery of ratings for more detailed experiences were surveyed:

"On a scale from 1 (not at all) to 7 (very strongly) how strongly did you experience the following feelings during the listed activity?"[8]

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[5] More specifically, respondents from the former SOEP core samples E (initially drawn 1998) and I (initially drawn 2009) were asked to answer the DRM module. Respondents from refreshment samples of SOEP-IS were not part of the DRM module.

[6] The diary is complemented by asking for parallel activity spells.

[7] English translation of the German interview question "Insgesamt gesehen, war diese Episode [...] von [...] bis [...] eher angenehm oder eher unangenehm?"

[8] We use the 2012 English translation of the German interview question "Wie stark haben Sie auf einer Skala von 1 (gar nicht) bis 7 (sehr stark) die folgenden Gefühle bei der angeführten Aktivität empfunden?" The emotions are happiness (Glück), anger (Ärger), frustration (Frust), fatigue (Müdigkeit), mourning (Trauer), worries (Sorgen), pain (Schmerzen), enthusiasm (Begeisterung), satisfaction (Zufriedenheit),

Both the location of an activity and the presence of other persons were additionally asked for these random episodes. As we examine the role of work in detail (Section 5.6), we specifically make use of randomly chosen work episodes. The experience that we use for our analysis in Section 5.6 is the question on the intensity of *a deeper meaning* – the measure for experienced meaning.

Further, we take evaluative SWB measures as benchmarks: general life satisfaction and the domain of job satisfaction are both measured in SOEP-IS. While life satisfaction is surveyed by asking *"On a scale from 0 (completely dissatisfied) to 10 (completely satisfied), how satisfied are you with your life, all things considered?"*, for job satisfaction the response on the question *"On a scale from 0 (completely dissatisfied to 10 (completely satisfied), how satisfied are you with your job?"* is used.

We make use of all SOEP-IS 2012–2015 observations with at least one answered DRM diary per person.[9] During the survey period, 2,299 individuals answered 7,370 DRM diaries, with 1,409 persons surveyed in all four years, 301 persons answering three times, 242 persons answering two times, and 347 persons once. We distinguish between two employment states: employed and unemployed. *Employed* workers are individuals with information on the current occupational position (from untrained worker to executive civil service). We exclude persons working in sheltered workshops, in apprenticeship, traineeship, vocational training, or in (partial) retirement. *Unemployed* are individuals who are officially registered as unemployed on the interview day and do not report any working spell in their dairy.[10] Additionally, we drop nine respondents who do not give any information about their activities or pleasure.

Table 5.A1 presents an overview of the control variables we rely on: socio-demographic characteristics like gender, age, family status, educational attainment, number of adults, and children in household. As a proxy for consumption possibilities, we use individual disposable income, measured as net household income (equalized by the new OECD scale). Health status is measured by the number of doctoral consultations within the last three months. In addition, for the employed, we also use information on the job: monthly labor gross income, the occupational position (self-employed, white-collar worker, blue-collar worker, or civil service), company size, weekly working hours, tenure, and perceived autonomy at work as potential predictors for pleasure at work. On the work episode level, we use DRM questions on a possible second activity during work, the time of beginning and ending a work episode, the number of working spells on the day, the work spell duration, the place of work, and involved persons during work. The

boredom (Langeweile), loneliness (Einsamkeit), stress (Stress), and a deeper meaning (einen tieferen Sinn).

[9]Three respondents from the supplement samples (S1 Supplementary 2012 and S2 Supplementary 2013 Sample) accidently filled in the DRM and have been dropped for our analysis.

[10]In Germany, unemployed have the permission to work at maximum 15 hours (German Law: § 138 SGB III). The work spells of the unemployed can be informal work or studying episodes. To have a clear interpretation, we drop such cases. As a robustness check, we left these (marginally) working unemployed in the sample and find no different results (available on request).

experienced meaning of a working spell is necessary in order to use it as a predictor for pleasure at work. Given the reported restrictions and mission values on the covariates, the sample of work episodes contains 3,699 observations across 1,308 individuals.

5.4 Methods and hypotheses

5.4.1 Experienced well-being for group comparisons

Experienced well-being combines two aspects: time use and an accompanying experiential valuation of each temporal increment. It allows for aggregating such instantaneous experiences into a single measure. We employ the P-index to compare the daily valuation of experiences of the employed and the unemployed. It is a measure for experienced well-being across the entire DRM day based on episode wise and dichotomous valuations. Thus, person i in survey year t reports $\sum j_{it} = J_{it}$ episodes with specific duration s_{ijt}. The sum of all episode durations on a day is S_{it}. An episode is either reported as *rather pleasurable* ($p_{ijt} = 1$) or as *rather unpleasurable* ($p_{ijt} = 0$) such that experienced well-being denotes as following:

$$P_{it} = \frac{\sum_{j=1}^{J} s_{ijt} * p_{ijt}}{S_{it}} \tag{5.1}$$

P_{it} records the individual share of pleasurable time awake. In order to keep it comparable between persons, P_{it} is normalized by the total time a person is awake S_{it}. The maximum value of 1.00 characterizes a fully pleasurable day while $P_{it} = 0.00$ indicates a completely unpleasurable day.

While the cardinal time in minutes has clear and comparable meanings,[11] experiences raise methodological issues (for for detailed discussions see: Krueger et al., 2009b; Knabe et al., 2010). A main advantage of our study is that we leave the choice of the relevant adjectives for experiences to the respondents' introspection. Therefore, it is not necessary to select positive or negative emotions as a researcher.

In our analysis, we compare conditional group means of P_{it} to investigate difference in experienced well-being of employed and unemployed workers. The fixed-effects estimation equation has the following form:

[11] For the sake of simplicity, we circumvent for the theory of individual perceptions of timing and assume that the physical definition of a minute (or another quantity of timing) applies to all respondents the same way.

$$P_{it} = \gamma_0 + \gamma_1 es_{it} + \gamma_2 w_{it} + day_{it}\gamma_a + X_{it}^{'}\gamma_b + J_{it}^{'}\gamma_c + wave_{it}\tau_t + \alpha_i + \mu_{it},$$
$$where\ \gamma_0 \neq \gamma_1 \neq \gamma_2 \neq \gamma_a \neq \gamma_b \neq \gamma_c. \quad (5.2)$$

As the employed are the baseline, the γ_1-coefficient states whether unemployed experience more, equal, or less pleasurable time. While not all employed were working on the reported DRM day (e.g. at the weekend or on holidays), we control for the prevalence of a working episode on the DRM day $w_{it} = \{0;1\}$. In order to account for day-of-the-week effects, we integrate interview day controls as well as interview year fixed effects τ_t that capture business cycle aspects. To make both groups comparable, we also account for socio-demographic characteristics X, encompassing, for instance, income, workings hours, or family status (see for details Table 5.A1). As respondents are surveyed up to four times with an approximate temporal distance of 12 months, we address endogeneity issues arising from unobserved individual heterogeneity (like personality traits) with individual fixed effects α_i. Thus, γ_1 and γ_2 dummy coefficients are interpreted as average *within* individual change of P_{it} resulting from a labor market status change respective the prevalence of working on the DRM day. We further account for activity-specific fixed effects by the vector J_{it} containing information whether a person was engaged in this activity on the DRM day. Finally, we assume that the idiosyncratic error term ε_{it} is uncorrelated with the explaining variables of every wave within the same individual.

5.4.2 Pleasure and meaning from work

In the second step, we shift the analytical perspective and exclusively examine working episodes. We investigate the potential channels through which meaning could affect well-being. Therefore, we examine if meaning affects pleasure at work beyond income, working hours, and further standard job characteristics. In line with the literature, we hypothesize that the propensity of reporting work as *rather pleasurable* ($p_{ijt} = 1$) is positively associated with experienced meaning. We estimate the latent propensity of experiencing the working episode p_{it}^{*} pleasurable as follows:

$$p_{ijt}^{*} = M^{'}\delta_a + Y^{'}\delta_b + Z^{'}\delta_c + \varepsilon_{it}, \quad \varepsilon_{it} \sim NID(0,1)$$
$$p_{ijt} = 1 \quad if \quad p_{it}^{*} > 0 \quad and$$
$$p_{ijt} = 0 \quad if \quad p_{it}^{*} \leq 0 \quad and$$
$$\delta_a \neq \delta_b \neq \delta_c. \quad (5.3)$$

The measure for experienced meaning M is a vector that includes two different specifications. Firstly, using dummies for each category of an ordinal meaning scale allows the representations of non-linear associations. Specifically, persons reporting working as “not meaningful at all” should be controlled for separately as the literature suggests that some people do not value meaning at all. For them, indeed it is not clear whether they experience no meaning because their work experience is meaningless or they do not care about it. Secondly, we define M by a dummy that is equal to one if persons report working as “not meaningful at all” and zero otherwise (“extensive meaning scale”) and the other meaning values as a metric variable (“intensive meaning scale”). As pleasure at work is not only affected by meaning, we condition on a vector Y of socio-demographic and job characteristics. Further, vector Z characterizes the working spell (for details see Section 5.3 and Table 5.A1) e.g. for early beginning of work (or shift work), durations of each work spell or reporting behavior like more than one work spell at the DRM day due spell splits from breaks. Further, we assume a random error term ε_{it} with a mean of zero and a variance of one.

To clarify if meaningfulness of work has an overall effect on well-being and not just an effect on the pleasure of the work episode, we regress two general well-being measures on meaning. If meaning is associated with pleasure at work, experienced well-being (P-index) should also show an association. For instance, collecting pleasurable and meaningful episodes may increase experienced well-being. Since the day for employees is characterized by work, pleasure and meaning should have an effect on the general experiences of well-being measure (P-index). As a second indirect measure for the role of meaning, we employ the established job satisfaction measure. The association of experienced meaning to this standard measure for utility from work gives us an additional impression on the relevance of meaning.

5.5 Experienced well-being of employed and unemployed workers

5.5.1 Time use and pleasure during activities

The DRM sample comprises 3,384 employed and 315 unemployed respondents. Over the four years under study, 70 persons changed their labor market status. In order to portray representative characteristics of the German residential population, we apply population weights provided by the SOEP (Kroh et al., 2017) and compare the weighted socio-demographic characteristics with the unweighted. For a set of basic observable characteristics (age, gender, earnings, etc.) the application of population weights yields only marginal differences (see Table 5.B1). This suggests that the representative sampling procedure of SOEP-IS portraits the German residential population with sufficient precision. The distribution of the employed and the unemployed is roughly similar before and after weighting. The average age in our sample is about 44 years and gender is almost equally distributed. Unemployed persons have, on average, less disposable household income, while education levels are higher among the employed. On average, the respondents report about 12 episodes, such that the sample consists in total of 40,325 episodes.

Initially, we pool all episodes, comparing the employed and unemployed on the activity level. Not all employed worked on the DRM day (due to holidays, weekends, or part-time jobs).[12] The prevalence of most leisure activities is significantly higher for the unemployed (see Table 5.1). The unemployed more frequently report typical leisure activities (e.g. watching TV, browsing the internet), but they are also more often engaged with non-market work (e.g. doing housework, preparing meals). The only activities with higher frequencies among the employed are *commuting to/from work*, *working*, and *body care*. A diverse picture emerges by comparing durations of the specific activities. The unemployed report longer durations for almost all activities, both non-market work and leisure activities.[13] Differences on the activity level are not statistically significant for many activities due to low case numbers.

In general, experience during the activities are overwhelmingly reported as *rather pleasurable*. Even activities that rank among the least pleasurable like *working, commuting, housework,* or *renovation tasks* are rated as pleasurable in about 80 % of all reports. Only doctoral consultations are more often reported as *rather unpleasurable*. Differences between the employed and unemployed are small. However, the groups significantly differ for four activities. A large share of the unemployed find caring for children as pleasurable whereas the employed find watching TV, exercising, and strolling as pleasurable more often. These findings are in line with the idea of a ‘saddening effect’ from unemployment, as the unemployed engage in these latter activities more frequently and for longer times.

[12]Among the employed, about 65 % worked on the DRM day (for more details see Table 5.1).

[13]Unemployed report also more minutes of sleep, which we calculate as a residual of the time awake.

Table 5.1: Time use and pleasure by employment status

Activity	Reported spell (N=)		Reported (share of persons)			Total minutes (per day), unconditional			Total minutes (per day), unconditional on spell reported			Reported "rather pleasureable"		
	E	U	E	U	Diff	E	U	Diff	E	U	Diff	E	U	Diff
Way to/from work	3756	./.	0.64	./.	./.	48.37	./.	./.	75.33	./.	./.	0.88	./.	./.
Way to/from leisure activity	1367	141	0.26	0.24	0.020	20.34	29.13	-8.787**	78.66	122.33	-43.670***	0.93	0.94	-0.011
Working	3448	./.	0.71	./.	./.	322.65	./.	./.	451.92	./.	./.	0.86	./.	./.
Shopping	1045	134	0.29	0.40	-0.116***	23.03	39.05	-16.014***	80.19	96.85	-16.660***	0.90	0.86	0.044
Preparing food	2518	341	0.50	0.63	-0.128***	23.21	39.97	-16.756***	46.70	63.91	-17.208***	0.96	0.97	-0.010
Eating	6023	609	0.89	0.91	-0.023	60.41	74.21	-13.794***	67.78	81.16	-13.380***	0.99	0.99	-0.001
Washing oneself	4600	382	0.93	0.90	0.030**	29.65	28.89	0.757*	32.04	32.27	-0.229	0.95	0.97	-0.012
Doing housework	2356	292	0.47	0.61	-0.141***	50.30	73.62	-23.316***	107.47	120.78	-13.316	0.78	0.79	-0.010
Childcare	1507	233	0.23	0.28	-0.054	32.95	63.21	-30.256***	145.95	226.25	-80.301***	0.94	0.97	-0.032**
Meet friends	604	113	0.16	0.28	-0.114***	27.59	58.83	-31.235***	170.37	212.99	-42.614***	0.98	0.97	0.010
Resting/taking a nap	697	106	0.19	0.31	-0.124***	20.63	32.48	-11.842***	108.59	103.33	5.259	0.99	0.97	0.017
Relaxing	1051	111	0.26	0.29	-0.021	25.83	33.56	-7.722**	97.57	117.44	-19.877**	1.00	1.00	-0.004
Intimate relations	36	./.	0.01	./.	./.	0.55	./.	./.	53.14	./.	./.	1.00	./.	./.
Worship/meditation	59	./.	0.01	./.	./.	0.90	./.	./.	65.87	./.	./.	0.98	./.	./.
Watching TV	2720	384	0.68	0.83	-0.152***	99.97	173.56	-73.584***	147.03	208.66	-61.639***	0.99	0.98	0.012**
Reading	719	52	0.18	0.14	0.043	12.30	12.83	-0.526	67.24	91.82	-24.581**	0.99	1.00	-0.006
Computer/internet	939	130	0.23	0.33	-0.096*	24.17	53.41	-29.248***	104.44	163.35	-58.911***	0.97	0.95	0.013
On the phone	361	58	0.10	0.16	-0.058	3.76	11.13	-7.371***	38.52	71.53	-33.015***	0.93	0.90	0.034
Exercising	380	23	0.11	0.06	0.048	11.20	5.38	5.814**	103.23	89.21	14.018	0.98	0.83	0.153***
Visiting doctor	223	33	0.06	0.09	-0.029	6.30	11.37	-5.065***	99.16	123.45	-24.285*	0.58	0.52	0.068
Gardening	283	30	0.08	0.08	-0.007	9.21	12.90	-3.700	121.68	156.35	-34.666**	0.93	0.97	-0.041
Keep oneself busy with pets	600	119	0.13	0.22	-0.094**	7.11	22.86	-15.747***	56.88	104.35	-47.468***	0.97	0.99	-0.023
Have a coffee/tee	350	47	0.09	0.12	-0.033	3.50	6.25	-2.758**	38.66	50.51	-11.853	0.99	1.00	-0.011
Listen to radio/music	29	./.	0.01	./.	./.	0.61	./.	./.	79.23	./.	./.	1.00	./.	./.
Care giving to relatives	32	12	0.01	0.02	-0.008	0.80	4.68	-3.879***	97.14	295.00	-197.857***	0.84	1.00	-0.156
Volunteering	31	./.	0.01	./.	./.	1.11	./.	./.	124.83	./.	./.	1.00	./.	./.
Walking/stroll	67	14	0.02	0.04	-0.023	1.97	3.22	-1.248	106.03	78.08	27.955	1.00	0.93	0.071**
Job search/job center	8	14	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.
Meeting/talking to partner or relatives	175	16	0.05	0.05	0.001	4.83	9.46	-4.627**	99.73	198.67	-98.941***	0.95	1.00	-0.051
Artisitc activity	58	./.	0.02	./.	./.	1.88	./.	./.	113.75	./.	./.	1.00	./.	./.
Service of hairdresser, manicure, pedicure, cosmetician	36	./.	0.01	./.	./.	0.80	./.	./.	75.56	./.	./.	0.97	./.	./.
At party/events/going out	23	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.
Doing DYI, handicrafts, renovate	108	10	0.03	0.03	0.000	4.84	7.05	-2.207	170.63	246.67	-76.042	0.87	0.70	0.170
Playing (board) games, solving quizzes	12	14	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.
Drinking alcoholic drinks, smoking	12	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.

Source: SOEP-IS v2015.1, 2012-2015 (own calculations)
Note: E denotes employed, UE unemployed and Diff denotes the difference between employed and unemployed. *** Significant on a 1 % level, ** significant on a 5 % level, * significant on a 10 % level. ./. Values from cells with N < 30 in total or N < 10 for the distinct labor market status are truncated by the authors due to low case numbers.

5.5.2 Experienced well-being

The comparison of the aggregate experienced well-being measures is reported in Table 5.2. Experienced well-being of the unemployed is higher than the experienced well-being of the employed. The employed spend on average 91.3 percent of their time awake in *rather pleasurable* activities whereas the unemployed experience 94.2 percent of their time in a subjectively *rather pleasurable* mood. Although both shares are rather high, we find that the difference is statistically significant ($p < 0.00$). For initial evidence on the role of working for experienced well-being, we calculate a hypothetical P-index. The hypothetical experienced well-being level is calculated such that it reports the values as if the working employed had not actually worked. Hence, the hypothetical P-index reports experienced well-being without the time of working episodes during the DRM day and its accompanying valuation.[14] A higher hypothetical experienced well-being compared to the actual experienced well-being indicates a negative impact from the work episodes. Comparing employed without any working episodes with unemployed shows that both groups have a similar experienced well-being of about 0.94 ($p < 0.31$). This finding suggests that working episodes of the employed particularly harm the overall experienced well-being.

Table 5.2: Measures of experienced well-being

Status	P-index	P-index (without work)	Life Satisfaction	N
Employed	0.91	0.95	7.45	3384
Unemployed	0.94	0.94	6.04	315
Difference: E vs. UE	p<0.00***	p<0.31	p<0.00***	3699

Source: SOEP-IS v2015.1, 2012-2015 (own calculations).

The 'P-index' reports the average share of pleasurable time awake on the DRM day (see Section 5.3). The 'P-index without work' reports this share of pleasurable time excluding working and commuting episodes. The time of these episodes are also excluded from the time weighting. Life satisfaction was taken from the respondents answer on the general life satisfaction question in SOEP-IS (scale: 0-10).

Contrasting experienced well-being with the general life satisfaction of the same respondents replicates a standard result that the unemployed are significantly less satisfied with their lives. Thus, experienced well-being and life satisfaction show opposite signs when comparing the employed and unemployed. While experienced well-being of the unemployed is higher, life satisfaction is lower for the unemployed. This is in line

[14]We exclude the *work* and *commuting to/from work* episodes.

with the "unemployed are dissatisfied with their lives, but having a good day" hypothesis of Knabe et al. (2010).[15]

In the next step, we run multivariate regressions on the P-Index controlling for individual fixed effects (see Table 5.3). We stepwise integrate controls for day and year effects (col. 1), control for the prevalence of work spells (col. 2), and, finally, integrating socio-demographic controls and the set of dummies for the prevalence of other activities on the DRM day (col. 3). The experienced well-being level increases when becoming unemployed and decrease when being reemployed. Due to low case numbers, this finding is statistically insignificant. The inclusion of a dummy variable indicating the prevalence of a working spell on the DRM day is associated with reduced experienced well-being of 3.8 percentage points less pleasurable time compared to a work-free day of the same person (col. 2). This indicate that working is, on average, detrimental for employed. Controlling for all other activities and socio-demographics slightly increases this effect to 4.5 percentage points less pleasurable time (col. 3). The prevalence of job search activities, visits to the job center, and visits to a doctor are also negatively associated with the P-index. Negative experiences are reduced by the prevalence of gardening or person to person services e.g. manicure or hairdresser. By far the most intensive positive association with experienced well-being is the prevalence of time spent on consuming alcohol and cigarettes.

In summary, daily experienced well-being is, on average, negatively associated with working given income, hours, and time-stable individual characteristics. There are only a few activities that yield the same negative impact on experienced well-being as working. As the unemployed do not report working spells, they, on average, experience more well-being. However, while visits to a doctor (due to illness) or the job center (looking for a job) are not at the discretion of the respondents, working has a substantially choice component. As most workers report their working spells as rather pleasure, we attempt to understand which non-pecuniary aspects of work episodes (given hours and earnings) predict (un-)pleasant experiences. One under-investigated factor that can be obtain from work is experienced meaning. Therefore, we shift the perspective of analysis towards the working spells.

[15] In order to test the validity of the findings, we use alternative experienced well-being measures. Based on positive and a negative affect scales, we find that the unemployed also experience significantly more positive moods ($p < 0.02$) and less negative moods (see Appendix Table 5.B2).

Table 5.3: Within variation of experienced well-being of employed and unemployed workers

	(1)		(2)		(3)	
Dependent variable (P-index)	Coef.	SE	Coef.	SE	Coef.	SE
Labor market status: Unemployment	0.026	0.029	0.028	0.029	0.033	0.030
Reported: Work Spell			-0.038***	0.008	-0.048***	0.012
year (Reference: 2012)						
2013	0.003	0.007	0.019	0.016	0.017	0.016
2014	-0.006	0.008	0.027	0.030	0.020	0.030
2015	0.009	0.008	0.060	0.046	0.052	0.045
DRM day (Reference: Wednesday)						
Sunday	-0.008	0.012	-0.008	0.012	-0.007	0.013
Monday	-0.006	0.009	-0.006	0.009	-0.005	0.009
Tuesday	-0.008	0.010	-0.007	0.010	-0.003	0.010
Thursday	-0.011	0.011	-0.009	0.011	-0.008	0.011
Friday	0.013	0.013	0.014	0.013	0.015	0.013
Saturday	0.001	0.021	0.002	0.021	0.001	0.023
HH income (log)					0.017	0.016
Age					-0.012	0.018
Age (sq)					0.000	0.000
Family Status (Reference: Single)						
Married					-0.026	0.029
Divorced/Seperated					-0.009	0.034
Widowed					-0.142	0.090
Number of doctural consultations (last 3 month)					0.001	0.001
Number of Persons in HH					-0.023**	0.009
Number of Children in HH					0.017	0.013
Way to/from work					0.013	0.011
Way to/from leisure activity					-0.001	0.008
Shopping					0.008	0.008
Preparing food					0.009	0.008
Eating					-0.005	0.012
Washing oneself					-0.012	0.015
Doing housework					-0.007	0.009
Childcare					0.016	0.012
Meet friends					0.009	0.008
Resting/taking a nap					0.006	0.009
Relaxing					-0.004	0.007
Intimate relations					-0.016	0.039
Worship/meditation					-0.011	0.024
Watching TV					0.013	0.009
Reading					0.002	0.009
Computer/internet					0.007	0.009
On the phone					-0.006	0.010
Exercising					0.029***	0.010
Visiting doctor					-0.062***	0.015
Gardening					0.031**	0.012
Keep oneself busy with pets					0.004	0.011
Have a coffee/tee					0.020*	0.010
Listen to radio/music					0.011	0.032
Care giving to relatives					-0.027	0.028
Volunteering					0.040	0.027
Walking/stroll					-0.034**	0.017
Job search/job center					-0.066*	0.036
Meeting/talking to partner or relatives					-0.001	0.013
Artisitc activity					0.011	0.029
Service of hairdresser, manicure, pedicure, cosmetician					0.048**	0.023
At party/events/going out					0.020	0.021
Doing DYI, handicrafts, renovate					-0.029	0.025
Playing (board) games, solving quizzes					0.037	0.035
Drinking alcoholic drinks, smoking					0.087**	0.041
Constant	0.941***	0.010	0.939***	0.029	0.930***	0.036
Number of observations	3699		3699		3699	
Number of persons	1308		1308		1308	
R^2 within	0.014		0.019		0.046	

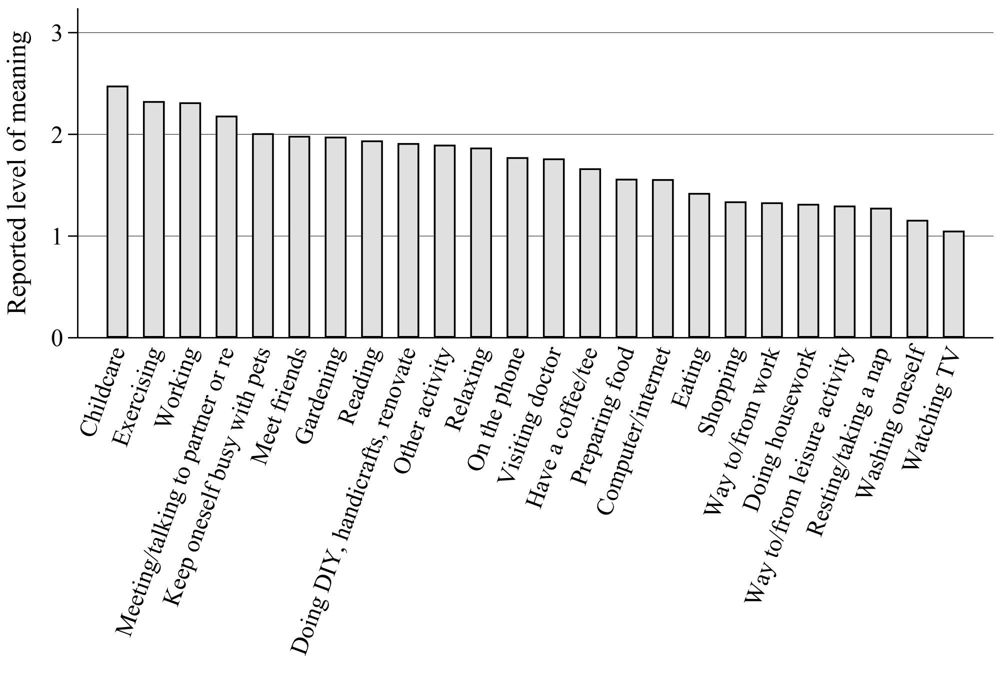
Source: SOEP-IS v2015.1, 2012-2015 (own calculations).
Note: *** significant on a 1 % level, ** significant on a 5 % level, *significant on a 10 % level.

5.6 Pleasure and meaning during work

5.6.1 Does experienced meaning explain pleasure at work?

Working is one of the activities that most harms experienced well-being. However, most respondents report that their working episodes are overall valued *rather pleasurable* and working is a widespread activity. Therefore, we further investigate the sources of pleasure from work. In this section, we examine if pleasure is affected by meaning during work (5.6.1) and overall experienced well-being and job satisfaction (5.6.2) are influenced from experienced meaning.

Initially, we rank the reported experienced meaning between activities during each episode (see Figure 5.1). The ranking of average valuations shows almost a reversed picture in comparison to pleasure (see Table 5.1). While working ranks very low in terms of pleasure, the opposite pattern emerges when looking at meaning. Only taking care of children and exercising rank higher in terms of experienced meaning. This indicates that meaning could be a highly relevant predictor for pleasure during these activities.



Source: SOEP-IS v2015.1, 2012-2015 (own calculations).
Note: Graph depicts the average level of experienced meaning on a scale from 1-7 for different activities. Calculations based on three random episodes from each DRM interview with a question on experienced meaning during this activity. Activities with fewer than 30 observations are dropped. The total case numbers are N = 10.668 episodes.

Figure 5.1: Average level of experienced meaning by activity

To understand whether meaning also affects experienced pleasure at work, we estimate a probability model for all observed work episodes. When focusing on randomly drawn episodes with information on experienced meaning (see Section 5.3), the sample of working spells shrinks to 849 episodes. Table 5.4 depicts the resulting average marginal effects in four specifications. In columns 1 and 2, we integrate experienced meaning as dummies variables for each category (scale from 1 ‘not at all’ to 7 ‘very strongly’). We use the scale category two as reference since it represents the lowest value on the “intensive meaning scale.” We stepwise integrate controls for survey effects (col. 1) and socio-demographic factors, job characteristics, and DRM-specific characteristics (col. 2). To account for non-linear associations (col. 3 and col. 4), we repeat the previous regressions and use a modified experienced meaning control. Instead of dummies for each category, we distinguish between an extensive and intensive meaning scale. Therefore, we integrate a dummy for workers reporting that work is *not meaningful at all* (“extensive meaning scale”) and zero otherwise (the scales two to seven are recoded to zero). In addition, we introduce a metric variable for meaning including all categories. In column 4, we add an interaction term of meaning with males (0/1) in order to investigate gender differences.

Table 5.4: Meaning as predictor for pleasure at work?

Dependent variable	(1) Pleasure=1		(2) Pleasure=1		(3) Pleasure=1		(4) Pleasure=1	
	AME	Std. Err.	AME	Std. Err.	AME	Std. Err.	AME	Std. Err
Meaningful (Ref: 2)								
Meaningful 1 -Not at all	0.130**	0.053	0.129**	0.051				
Meaningful 3	0.022	0.070	0.041	0.066				
Meaningful 4	0.089	0.058	0.076	0.056				
Meaningful 5	0.106*	0.060	0.119**	0.057				
Meaningful 6	0.090	0.061	0.089	0.059				
Meaningful 7 -Very strongly	0.152**	0.063	0.165***	0.058				
Meaningful Dummy -Not at all					0.125***	0.033	0.186***	0.048
Meaningful (1-7)					0.026***	0.009	0.047***	0.015
Meaningful -Not at all * male							-0.146	0.103
Meaningful (1-7) * male							-0.034*	0.019
Labor Income (log)			0.060***	0.022	0.058***	0.022	0.057**	0.022
Weekly working hours			-0.002	0.003	-0.002	0.003	-0.003	0.003
Weekly working hours (sq.)			0.000	0.000	0.000	0.000	0.000	0.000
Survey Effects	X		X		X		X	
Socio-demographic factors			X		X		X	
Job specific characteristics			X		X		X	
DRM specific characteristics			X		X		X	
Number of observations	849		849		849		849	
Pseudo R^2	0.025		0.160		0.158		0.162	

Source: SOEP-IS v2015.1, 2012-2015 (own calculations).
Note: The analysis comprises all working spells reported by employed individuals. Survey effects: year and DRM day; socio-demographic factors: age, male, family status, number of doctoral consultations, education, number of persons in household, number of children in household; job specific characteristics: tenure, tenure (sq.), duration in work spell, duration in work spell (sq.), occupation position, autonomy, company size; DRM specific characteristics: second activity, begin and end of the work spell, place of work, involved person.

We find that working is perceived as pleasurable if no meaning is experienced at all or the meaning score is high. This non-linear association suggests that a group of workers sees working as completely meaningless but experiences working as pleasurable while other groups have an increasing propensity for pleasure with increasing experienced meaning. Including all controls (col. 2) does not change this finding. Accounting for the non-linearity in meaning yields a positive association between meaning and pleasurable working episodes. Again, the only exception is the dummy-indicator for *not meaningful at all*. The positive coefficient indicates that compared to the baseline probability of all other persons, workers experiencing *no meaning at all*, also report a higher probability of pleasure at work. Column 4 shows that this holds mainly for women as the ordinal meaning coefficient for males has the opposite sign and magnitude canceling the overall effect almost out.

5.6.2 Relevance of meaning for experienced well-being and job satisfaction

Perceived meaning at work is associated with a higher propensity to experience working pleasurable for some workers. In this section, we examine how meaning influences overall experienced well-being of the DRM-day. In order to fit this result into the labor market literature, we validate this finding by regressing it on evaluative job satisfaction. As a standard measure for utility from work, we examine if job satisfaction is also affected by experienced meaning.

Table 5.5 presents the results. Meaning is significantly positive associated with experienced well-being (col. 1). The higher experienced meaning during the work episode is, the higher is the share of pleasurable time for the respondents, given income, working hours, socio-demographic controls, job characteristics, and other controls (entire table in Appendix 5.B4). Again, the dummy-indicator for *not meaningful at all* shows that, compared to the average level of meaningful work, individuals experiencing more pleasurable time. Hence, the association of experienced meaning with pleasurable working episodes is also reflected in the experienced well-being of the whole day.

Further, in cols. 2 and 3, we regress experienced meaning on job satisfaction, measured on a 0 – 10 scale (for details see Section 5.3). Experienced meaning is positively associated with job satisfaction. The higher the experienced meaning during a work episode, the higher is job satisfaction. As before, the positive coefficient of the *not meaningful at all*-indicator has a substantially higher level of job satisfaction. In contrast to experienced well-being, labor income and working hours per week are associated with job satisfaction. In column 3, we add a dummy indicating that working episodes are pleasurable (1 if the episode was pleasurable, 0 otherwise). The positive association of experienced meaning with job satisfaction becomes only slightly weaker while the other coefficients remain qualitatively the same. Pleasure during work increases, *ceteris paribus*, job satisfaction. Experienced meaning is also a positive predictor of job satisfaction, given that the group of individuals with *no meaning at all* are also more satisfied with their jobs.

Experienced meaning and experienced pleasure both come along with higher experienced well-being, indicating more pleasurable time on an average day. Experienced meaning qualitatively has a similar association with job satisfaction as does experienced well-being. Hence, the evaluative measure job satisfaction is also positively affected by experienced meaning (of a work episode of the DRM day). Further, the non-linearity of this meaning association is also similar: those workers who experience *no meaning at all* (about 30 % of the workers report *no meaning at all*) also report higher job satisfaction. Comparing the impact of the income coefficient with the meaning and pleasure coefficients suggest that, in terms of job satisfaction, a pleasurable working episode is worth about three log-points of income. Or, in other words: A more than 300 percent increase in income could compensate for unpleasant work episode. Experienced meaning is also valued relatively high with a positive coefficient such that a 60 percent increase in income would buy a meaning point in order to keep job satisfaction constant.

Table 5.5: Meaning, experienced well-being and job satisfaction

	(1)		(2)		(3)	
Dependent variable	P-index		Job Satisfaction		Job Satisfaction	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Meaningful Dummy -Not at all	0.082***	0.025	0.641***	0.237	0.512**	0.236
Meaningful (1-7)	0.016***	0.006	0.185***	0.054	0.161***	0.053
Pleasure					0.900***	0.194
Labor income (log)	0.012	0.012	0.316**	0.126	0.269**	0.125
Weekly working hours	0.002	0.002	-0.044**	0.020	-0.042**	0.020
Weekly working hours (sq.)	0.000	0.000	0.001**	0.000	0.001**	0.000
Survey Effects	X		X		X	
Socio-demographic factors	X		X		X	
Job specific characteristics	X		X		X	
DRM specific characteristics	X		X		X	
Number of observations	849		849		849	
Pseudo R^2	0.025		0.160		0.190	

Source: SOEP-IS v2015.1, 2012-2015 (own calculations).
Note: The analysis comprises all working spells reported by employed individuals. Survey effects: year and DRM day; socio-demographic factors: age, male, family status, number of doctoral consultations, education, number of persons in household, number of children in household ; job specific characteristics: tenure, tenure (sq.), duration in work spell, duration in work spell (sq.), occupation position, autonomy, company size; DRM specific characteristics: second activity, begin and end of the work spell.

5.7 Conclusion

To our knowledge, we are the first to examine experienced well-being for a nationally representative population with a uni-dimensional measure for episode pleasure and with individual fixed effects. We find that experienced well-being for the unemployed in Germany is higher than for the employed. Thus, the unemployed experience more pleasurable minutes awake. This paper shows that this is due to the given non-prevalence of working episodes for unemployed and not dependent on the employed or unemployed status. This difference holds after controlling for income and other covariates as well as, in particular, after introducing person fixed effects controlling for person-inherent traits. Thus, evaluative life satisfaction and experienced well-being differ substantially. The incorporation of individual time use with valuations of time renders being unemployed less detrimental then just focusing on evaluative life satisfaction.

A substantial minority of employees experiences unpleasant working episodes that harm their overall experienced well-being. This relatively high share of unpleasant experiences during work compared to other activities confirms the findings obtained for work experiences in the UK, France, and the US that examine the intensity of pleasure (Bryson and MacKerron, 2017; Flèche and Smith, 2017). Our simple pleasure (vs. no pleasure) indicator seems sufficient to identify reasons for work misery while reducing costs (survey time). Beyond other factors, like wage, working hours, or episode-timing, experienced meaning is a significant predictor of pleasure during work. The higher is experienced meaning during work, the higher is the propensity to report a pleasurable working episode. However, this association is non-linear, as persons reporting *no meaning at all* also have a higher (than average) propensity to report a pleasurable work episode. One potential explanation for this finding suggests that meaning depends on preference heterogeneity. Not all persons wish to experience a meaningful job. They still report *no meaning at all,* even if working is pleasurable for them. This explanation is in line with evidence from the lab showing that endogenous meaning variations of specific tasks affect only specific individuals (Fehrler and Kosfeld, 2014). One source for such a heterogeneity are gender differences. We find that the positive association of meaning and pleasure during work is due to the women in sample. For men, we hardly find any positive association. As experienced meaning is positively associated with pleasure during work, it is not surprising that we find the same association for daily experienced well-being. Evaluative job satisfaction, however, measures completely different components of SWB, but still it shows the same association with experienced meaningfulness. In line with Kahneman and Deaton (2010), we find that earnings only matter for evaluative measures.

Our results have implications for personnel economics and labor market policy. On the firm level, it seems clear that worker heterogeneity in terms of a “taste for meaning” makes it necessary for the management to know the underlying structure of its workforce’s preference structure. Indeed, an incentive compatible contract for such workers is feasible (Besley and Ghatak, 2017) – and gains more relevance with an increasing share of female workers who prefer meaning during work.

In a labor supply framework, a preference for meaning helps to explain the intensive margin. Excessive extra hours with a low marginal monetary return (workaholic behavior) might come along with experienced meaning that intrinsically generates pleasure. Further, more pleasure then expected are generated from relatively low paid jobs are also the case, if they offer meaning beyond monetary remuneration. Occupational choice might also be affected by the search for meaning. For instance, women’s occupational choices may differ from men’s choices.

Appendix

A Description of covariates

Table 5.A1: Description of covariates

Variable	Description
Survey effects	
Year	Year defines the year of the interview using four dummies: 2012, 2013, 2014 and 2015.
DRM day	DRM day describes the day the respondent reports about using 7 dummies (Monday to Sunday). The DRM dataset is the base to generate this variable.
Socio-demographic characteristics	
Age	The survey year minus year of birth defines the age of the respondent.
Male	This variable is a dummy taking the value '1' if respondent is a male.
Disposable income (Household)	The variable hginc in dataset hgen is the base to generate the disposable household income.
Disposable income (Household, equival. OECD)	This variable uses hginc, hgnrpers and hgnrkid14 from the dataset hgen to generate the equivalized disposable household income. It divides hghinc by 1+0.5*(number of persons in household - number of children (below 14) in household - 1) + 0.3* number of children (below 14) in household).
Labor income (log)	This variable presents the logarithm of the gross labor income. The variable pglabgro from the dataset pgen allows to generate the gross labor income of the respondent.
Education level	Three dummies describe education: low, middle and high. These dummies take the value '1' if respondent highest education level is primary or secondary (low), upper secondary or post-secondary non-tertiary (middle) or short-cycle tertiary or tertiary (high) education. The variables pgisced from the dataset pgen are the base to generate these dummies.
Family status	Four dummies describe the family status: single, married, and divorced/seperated/widowed. The variable pgfamst from the dataset pgen is the base to generate this variable.
Number of Persons in Household	The number of persons in the household is a variable from the dataset hgen.
Number of Children in Household	This variable comprises the number of children (below 18 years) in the household. The dataset h and hgen provide the information to generate this variable.
Number of doctoral consultations (last 3 month)	The dataset p provides counts the number of doctoral consultations in the last three months and is provided in the dataset p.
Job specific characteristics	
Labor market status: unemployed	This dummy describes the labor market status and takes the value '1' if the respondent is unemployed. 'Unemployed' characterizes persons who are officially registered as unemployed and report no weekly working hours (pgtatzt). 'Employed' characterizes individuals with a current occupational position (from untrained worker to executive civil service) working full-time or part-time, including marginal or irregular employed people. The variables pgstib and empl from the dataset pgen provide this information.
Weekly working hours	The weekly working hours base on a generation using the variable pgtatzt in the dataset pgen.
Tenure	The job tenure of a person.
Occupational Position	Four dummies describe the occupational position: worker, self-employed, employee and civil servant. The variable pgstib from the dataset pgen provides the information to generate the occupational position.
Autonomy	Five dummies describe autonomy: low, low-middle, middle, middle-high and high. The generation uses pgautono from the dataset pgen that has this five expressions.
Company Size	Three dummies describe company size: below 200, 200-2000, >2000. The dataset pgen provides this information.
DRM specific characteristics	
Number of episodes per DRM day	This variable counts the number of episodes per reported DRM day and is generated from the information in the DRM dataset.
Reported activity	The respondents were asked episode-wise to choose activities out of a set of 23 and one open answering option. In the second wave, the activities were extended to 25. In addition, we recoded open answering options into activities as advised in Wolf (2018).
Reported second activity while working	The respondents were asked episode-wise to choose activities out of a set of 23 and one open answering option. Until the second wave, the activities were extended until 25. In addition, we recoded open answering options into activities as advised in Wolf (2018).
Begin to work of first spell	12 dummies for every two hours describe the begin to work of the first spell,e.g. start work between 0 to 2 am.
Finish with work of last spell	12 dummies for every two hours describe the end of work of the last spell,e.g. finish work between ten to 12 pm.
Duration in work spell	This variable describes the duration of the reported work spell.
Break during work	Three dummies describe a break during work: no break, 1 break or >1 break.
Involved person	Eight dummies describe the involved persons: no one, partner, children, colleagues, clients, parents, boss or other.
Place of work	Three dummies describe place of work: at work, at home or elsewhere.

B Further Tables

Table 5.B1: Pooled sample of DRM respondents by employment status

	unweighted		population weight	
	Employed	Unemployed	Employed	Unemployed
Age	44.88	44.67	43.61	44.48
Female (share)	0.50	0.51	0.48	0.54
Disposable income (Household)	3336.95	1442.91	3248.12	1467.74
Disposable income (Household, equival. OECD)	1930.20	875.00	1932.12	919.53
Earnings (gross labor income)	2642.94	./.	2704.29	./.
Education level (share)				
Low (ISCED 1-2)	0.09	0.24	0.09	0.22
Middle (ISCED 3-4)	0.57	0.63	0.59	0.66
High (ISCED 5-6)	0.34	0.13	0.32	0.12
Marital status (share)				
Single	0.24	0.35	0.25	0.38
Married	0.60	0.34	0.57	0.35
Divorced	0.14	0.29	0.15	0.25
Widowed	0.02	0.03	0.03	0.03
Number of Person in Household	2.71	2.49	2.62	2.36
Number of Children in Household	0.67	0.63	0.64	0.59
Weekly working hours	36.58	./.	37.38	./.
Tenure	12.00	./.	11.26	./.
Occupational Position (share)				
Worker	0.18	./.	0.20	./.
Self-employed	0.10	./.	0.10	./.
Employee	0.65	./.	0.64	./.
Civil Servant	0.07	./.	0.07	./.
DRM day (share)				
Sunday	0.10	0.11	0.11	0.12
Monday	0.24	0.24	0.25	0.23
Tuesday	0.21	0.25	0.19	0.22
Wednesday	0.18	0.20	0.17	0.22
Thursday	0.14	0.13	0.14	0.15
Friday	0.11	0.06	0.11	0.06
Saturday	0.02	0.01	0.02	0.01
Number of episodes per DRM day	11.88	12.17	11.45	12.21
Number of observations (= DRM interviews)	3384	356	./.	./.

Source: SOEP-IS v2015.1, 2012-2015 (own calculations)
Note: ./. denotes not available or missing information. The used population weights are provided by the SOEP-IS and calculated as in the SOEP. For further information see Kroh et al. (2017).

Table 5.B2: Positive and negative affect as measures for experience well-being

Status	Positive affect	Negative affect	P-index	P-index (without work)	N
Employed	2.78	0.64	0.91	0.95	3383
Unemployed	2.95	0.61	0.94	0.94	315
Difference: E vs. UE	p<0.02**	p<0.61	p<0.00***	p<0.37	3698

Source: SOEP-IS v2015.1, 2012-2015 (own calculations)
Note: Positive affect was generated from the equally weighted averages for happy, satisfaction, enthusiasm (scale 1-7). The negative affect scale was generated from equally weighted averages for anger, frustration, mourning, worries, and stress. For each person in each year only three episodes contain this information (see Section 5.3). The t-tests for mean equivalence of employed and unemployed are reported in the bottom line.

Table 5.B3: Meaning as predictor for pleasure at work (full table)?

Dependent variable	(1) Pleasure=1		(2) Pleasure=1		(3) Pleasure=1		(4) Pleasure=1	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Meaningful (Ref: 2)								
Meaningful 1 - Not at all	0.130**	0.053	0.129**	0.051				
Meaningful 3	0.022	0.070	0.041	0.066				
Meaningful 4	0.089	0.058	0.076	0.056				
Meaningful 5	0.106*	0.060	0.119**	0.057				
Meaningful 6	0.090	0.061	0.089	0.059				
Meaningful 7 -Very strongly	0.152**	0.063	0.165***	0.058				
Meaningful Dummy -Not at all					0.125***	0.033	0.186***	0.048
Meaningful (1-7)					0.026***	0.009	0.047***	0.015
Meaningful -Not at all * male							-0.146	0.103
Meaningful (1-7) * male							-0.034*	0.019
Labor Income (log)			0.060***	0.022	0.058***	0.022	0.057**	0.022
Weekly working hours			-0.002	0.003	-0.002	0.003	-0.003	0.003
Weekly working hours (sq.)								
Tenure			-0.003	0.004	-0.003	0.004	-0.003	0.004
Tenure (sq.)			0.000	0.000	0.000	0.000	0.000	0.000
duration in work spell			-0.016	0.023	-0.014	0.023	-0.014	0.023
duration in work spell (sq.)			0.002	0.001	0.001	0.001	0.001	0.001
Occupational Position (Ref: Blue-collar worker)								
Self-Employed			0.064	0.062	0.066	0.063	0.071	0.063
White-collar worker			0.021	0.050	0.023	0.051	0.028	0.051
Civil Service			-0.014	0.074	-0.013	0.074	-0.008	0.074
Autonomy (Ref: Middle level)								
Low			0.109**	0.055	0.111**	0.054	0.110**	0.054
Low-Middle			0.113***	0.031	0.113***	0.031	0.113***	0.031
Middle-High			0.007	0.038	0.005	0.038	0.005	0.038
High			-0.044	0.082	-0.05	0.082	-0.051	0.082
Company Size (Ref.: below 200)								
200-2000			0.032	0.029	0.032	0.029	0.031	0.029
>2000			-0.052	0.034	-0.051	0.034	-0.047	0.034
Male			0.038	0.028	0.037	0.028	0.038	0.034
age			-0.004	0.009	-0.005	0.008	-0.005	0.009
age (sq.)			0.000	0.000	0.000	0.000	0.000	0.000
Family Status (Ref: Single)								
Married			0.062	0.039	0.063	0.039	0.063	0.039
Divorced/Seperated			0.131***	0.041	0.130***	0.042	0.133***	0.042
Number of doctoral consultation (last 3 months)			0.001	0.004	0.001	0.004	0.001	0.004
Education (Ref: middle)								
Low			0.006	0.044	0.007	0.044	0.016	0.042
High			-0.020	0.033	-0.017	0.033	-0.014	0.033
Number of Persons in HH			-0.004	0.017	-0.006	0.017	-0.005	0.017
Number of Children in HH			-0.017	0.023	-0.016	0.023	-0.017	0.023
year (Ref: 2012)								
2013			0.025	0.031	0.026	0.031	0.027	0.031
2014			-0.010	0.033	-0.009	0.034	-0.007	0.033
2015			0.016	0.034	0.015	0.034	0.016	0.034
DRM day (Ref: Wednesday)								
Sunday			-0.065	0.065	-0.059	0.065	-0.069	0.065
Monday			0.041	0.035	0.043	0.036	0.037	0.035
Tuesday			0.012	0.038	0.013	0.038	0.007	0.037
Thursday			0.025	0.039	0.026	0.040	0.023	0.039
Friday			-0.020	0.047	-0.016	0.047	-0.019	0.047
Saturday			0.119**	0.053	0.124**	0.051	0.127***	0.048
Second activity:								
Eating			0.110***	0.025	0.110***	0.025	0.112***	0.025

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	(1)		(2)		(3)		(4)	
Dependent variable	Pleasure=1		Pleasure=1		Pleasure=1		Pleasure=1	
	AME	SE	AME	SE	AME	SE	AME	SE
Childcare			-0.810***	0.015	-0.810***	0.015	-0.810***	0.015
Computer/internet			0.029	0.100	0.023	0.105	0.029	0.100
On the phone			0.069	0.083	0.073	0.082	0.073	0.082
Radio			-0.035	0.139	-0.039	0.140	-0.038	0.142
Care giving to relatives			-0.080	0.215	-0.070	0.212	-0.106	0.227
Begin to work (Ref: 8-10 am)								
2-4 am			-0.336**	0.162	-0.319**	0.16	-0.318**	0.160
4-6 am			-0.171***	0.064	-0.164***	0.063	-0.166***	0.063
6-8 am			-0.075**	0.032	-0.073**	0.032	-0.075**	0.032
10-12 am			0.010	0.049	0.009	0.050	0.002	0.05
0-2 pm			-0.093	0.074	-0.095	0.076	-0.095	0.076
2-4 pm			0.082***	0.030	0.083***	0.03	0.080**	0.031
4-6 pm			0.044	0.070	0.042	0.074	0.038	0.077
6-8 pm			-0.294	0.236	-0.316	0.241	-0.296	0.238
8-10 pm			-0.026	0.124	-0.023	0.123	-0.017	0.118
Finish with work (Ref: 4-6 pm)								
6-8 am			-0.398	0.284	-0.378	0.286	-0.374	0.284
8-10 am			0.079	0.110	0.073	0.116	0.068	0.116
10-12 am			0.097*	0.054	0.099*	0.053	0.096*	0.053
0-2 pm			0.081**	0.040	0.078*	0.041	0.079**	0.040
2-4 pm			0.000	0.037	-0.006	0.037	-0.010	0.037
6-8 pm			-0.096**	0.049	-0.096**	0.049	-0.095**	0.048
8-10 pm			-0.059	0.069	-0.056	0.068	-0.061	0.068
10-12 pm			0.032	0.057	0.034	0.056	0.033	0.055
Break during work (Ref.: No)								
1 break			0.072**	0.032	0.074**	0.032	0.073**	0.032
>1 break			0.060	0.038	0.059	0.038	0.060	0.038
involved person (Ref.: no one)								
partner			0.041	0.081	0.035	0.081	0.043	0.081
colleagues			0.078**	0.033	0.080**	0.032	0.083***	0.032
clients			0.027	0.036	0.027	0.035	0.023	0.036
children			0.920***	0.120	0.927***	0.118	0.930***	0.123
parents			0.047	0.145	0.054	0.145	0.088	0.140
boss			-0.039	0.040	-0.038	0.040	-0.040	0.039
other			0.069	0.048	0.063	0.048	0.068	0.047
place of work (ref.: at work)								
at home			0.027	0.040	0.026	0.041	0.027	0.041
elsewhere			0.059	0.046	0.061	0.045	0.062	0.044
Number of observations	849		849		849		849	
Pseudo R^2	0.025		0.160		0.158		0.162	

Source: SOEP-IS v2015.1, 2012-2015 (own calculations).
Note: The analysis comprises all working spells reported by employed individuals. Duration in work spell in hours. Additionally, second activities as on the way to work, shopping, preparing food, washing oneself, doing housework, resting, relaxing, meditation, watching TV, exercising, taking care of pets, other activities, drinking coffee/tea or drinking alcoholic drinks/smoking and starting to work between 0-2 am or 10-12 pm and finish with work as finish between 0-4 am or 4-6 am and widowed are automatically dropped by only a small number of observations and no variation with these variables.

Table 5.B4: Meaning and experienced well-being (full table)

Dependent variable	(1) P-index Coef.	SE	(2) Job Satisfaction Coef.	SE	(3) Job Satisfaction Coef.	SE
Meaningful Dummy -Not at all	0.082***	0.025	0.641***	0.237	0.512**	0.236
Meaningful (1-7)	0.016***	0.006	0.185***	0.054	0.161***	0.053
Pleasure					0.900***	0.194
Labor income (log)	0.012	0.012	0.316**	0.126	0.269**	0.125
Weekly working hours	0.002	0.002	-0.044**	0.020	-0.042**	0.020
Weekly working hours (sq.)	0.000	0.000	0.001**	0.000	0.001**	0.000
Tenure	0.001	0.002	-0.021	0.022	-0.019	0.022
Tenure (sq.)	0.000	0.000	0.000	0.001	0.000	0.001
duration in work spell	-0.003	0.011	-0.051	0.121	-0.046	0.120
duration in work spell (sq.)	0.001	0.001	-0.003	0.007	-0.003	0.007
Occupational Position (Ref: Blue-collar worker)						
Self-Employed	0.048	0.038	0.462	0.351	0.397	0.351
White-collar worker	0.043	0.030	0.093	0.281	0.062	0.281
Civil Service	-0.035	0.047	-0.214	0.408	-0.204	0.397
Autonomy (Ref: Middle level)						
Low	0.045	0.051	-0.246	0.432	-0.375	0.422
Low-Middle	0.061***	0.021	0.212	0.222	0.087	0.221
Middle-High	0.017	0.019	0.086	0.176	0.076	0.173
High	0.025	0.031	0.022	0.346	0.050	0.339
Company Size (Ref.: below 200)						
200-2000	0.003	0.019	0.001	0.194	-0.026	0.190
>2000	-0.034*	0.019	0.100	0.198	0.142	0.196
Male	0.036**	0.017	-0.062	0.161	-0.104	0.157
age	-0.003	0.005	-0.056	0.050	-0.053	0.049
age (sq.)	0.000	0.000	0.000	0.001	0.000	0.001
Family Status (Ref: Single)						
Married	0.012	0.021	0.177	0.194	0.114	0.192
Divorced/Seperated	0.038	0.024	0.785***	0.268	0.652**	0.264
Number of doctoral consultation (last 3 months)	0.000	0.002	-0.080***	0.027	-0.082***	0.027
Education (Ref: middle)						
Low	0.015	0.028	0.253	0.295	0.265	0.298
High	0.009	0.020	-0.056	0.178	-0.049	0.173
Number of Persons in HH	-0.006	0.009	0.053	0.095	0.056	0.094
Number of Children in HH	-0.004	0.013	0.023	0.133	0.043	0.132
year (Ref: 2012)						
2013	-0.007	0.019	-0.202	0.190	-0.227	0.188
2014	-0.019	0.019	-0.354*	0.181	-0.338*	0.178
2015	0.017	0.018	-0.332*	0.199	-0.349*	0.197
DRM day (Ref: Wednesday)						
Sunday	-0.033	0.036	-0.719**	0.342	-0.654**	0.327
Monday	0.019	0.021	-0.157	0.205	-0.196	0.202
Tuesday	-0.002	0.022	0.205	0.207	0.196	0.200
Thursday	0.031	0.021	-0.056	0.208	-0.074	0.203
Friday	0.010	0.024	-0.114	0.279	-0.089	0.284
Saturday	0.064	0.041	-0.522	0.815	-0.632	0.766
Reported second activity while working (Ref: no second activity)						
Eating	0.049**	0.020	0.032	0.175	-0.069	0.176
Childcare	-0.088*	0.052	-1.111	1.144	-0.651	1.334
Computer/internet	-0.001	0.050	-1.148	0.943	-1.131	0.851
On the phone	0.019	0.044	0.187	0.533	0.153	0.521
Radio	-0.053	0.079	0.126	0.472	0.152	0.432
Care giving to relatives	-0.041	0.166	-0.741	0.477	-0.659	0.406
Begin to work of first spell (Ref: 8-10 am)						
2-4 am	-0.176	0.110	-1.205*	0.727	-0.969	0.652
4-6 am	-0.072**	0.036	-0.165	0.321	-0.034	0.312
6-8 am	-0.013	0.020	-0.023	0.185	0.044	0.180

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	(1)		(2)		(3)	
	P-index		Job Satisfaction		Job Satisfaction	
Dependent variable	Coef.	SE	Coef.	SE	Coef.	SE
10-12 am	0.035	0.033	0.235	0.326	0.242	0.323
0-2 pm	-0.037	0.050	0.358	0.393	0.479	0.383
2-4 pm	0.118***	0.043	-0.402	0.548	-0.534	0.549
4-6 pm	0.092**	0.046	0.359	0.622	0.307	0.606
6-8 pm	-0.030	0.113	-2.502**	0.985	-2.223**	0.943
8-10 pm	0.085	0.070	0.417	0.657	0.437	0.651
Finish with work of last spell (Ref: 4-6 pm)						
6-8 am	0.082	0.082	-1.977	1.309	-1.566	1.207
8-10 am	0.141*	0.076	1.160	0.782	1.063	0.783
10-12 am	0.107**	0.042	-0.216	0.567	-0.319	0.556
0-2 pm	0.070**	0.033	-0.064	0.326	-0.140	0.322
2-4 pm	0.006	0.022	0.175	0.214	0.192	0.210
6-8 pm	-0.027	0.023	0.202	0.226	0.279	0.220
8-10 pm	-0.043	0.036	0.779***	0.282	0.818***	0.278
Break during work (Ref.: No)						
1 break	0.036*	0.020	-0.027	0.188	-0.088	0.188
>1 break	0.057**	0.022	-0.127	0.217	-0.178	0.214
Constant	0.709***	0.067	7.627***	0.618	7.082***	0.619
Number of observations	849		849		849	
Pseudo R2	0.025		0.160		0.190	

Source: SOEP-IS v2015.1, 2012-2015 (own calculations).
Note: The analysis comprises all working spells reported by employed individuals. Duration in work spell in hours. Additionally, second activities as on the way to work, shopping, preparing food, washing oneself, doing housework, resting, relaxing, meditation, watching TV, exercising, taking care of pets, other activities, drinking coffee/tea or drinking alcoholic drinks/smoking and starting to work between 0-2 am or 10-12 pm and finish with work as finish between 0-4 am or 4-6 am and widowed are automatically dropped by only a small number of observations and no variation with these variables.

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English Summary (Abstracts)

This dissertation focuses on three dimensions of inequality: income, (just) taxation, and well-being. All chapters focus on a similar time horizon (2000 to 2015) and essentially on the same geographical area, Germany. The chapters are organized in four parts, each examining a specific research question and based on evidence from microdata - the German Socio-Economic Panel (SOEP). The analysis of chapter 2 is additionally based on European Union Statistics on Income and Living Conditions (EU-SILC).

Chapter 2 develops a new method to obtain top-corrected income distributions by combining easily available information from tax and survey data. The benefits of the two data sources are combined by imputing top incomes in survey data using the information on top income distribution from tax data. In detail, the integrated approach replaces the top 1% of the survey income distribution with Pareto-imputed incomes using the information on the top incomes' distribution from the World Wealth and Income Database (WID). This approach is easily applicable by relying on information publicly available from the WID for the upper tail of the distribution and easily accessible survey data, such as the German SOEP or EU-SILC, for the middle and bottom of the distribution. Neither access to tax record microdata, which is limited and difficult to obtain in many countries, nor record linkage, which is often not allowed, is needed. Furthermore, this integrated approach allows for producing inequality measures for a variety of income definitions and for the entire population of a country, e.g., analyzing inequality in households' needs. We apply our approach to German SOEP and European EU-SILC survey data which in some countries include administrative data and find higher inequality in those European countries that exclusively rely (Germany, UK) or have relied (Spain) on interviews for the provision of EU-SILC survey data as compared to countries that use administrative data.

Chapter 3 uses the optimal taxation framework by Saez (2002). A common assumption in the optimal taxation literature is that the social planner maximizes a welfarist social welfare function with weights decreasing with income. However, high transfer withdrawal rates in many countries imply very low weights for the working poor in practice. We reconcile this puzzle by extending the optimal taxation framework by Saez (2002) to allow for alternatives to welfarism. In an exercise of positive optimal taxation, we calculate weights of a social planner's function as implied by the German tax and transfer system based on the concepts of welfarism and alternative principles, where the social planner minimizes the weighted sum of increasing functions of absolute or relative tax burdens. This reflects the idea that the total tax liabilities of specific groups matter for the design of the tax system and very high tax liabilities should be avoided *per se*. While this point is often made in public debates, it does not follow from welfarist considerations. We find that the *absolute tax burden principle* is in line with social weights that decline with net income. Moreover, we illustrate how the model can be used with survey data

using a novel question from the German Socio-Economic Panel on perceived just net income.

While chapter 3 evaluates the German tax and transfer system and finds that the absolute tax burden principle is in line with the German tax schedule, chapter 3 does not consider individuals' preferences of the German population.

In chapter 4, I examine if individuals in Germany prefer Equal Sacrifice. The ability-to-pay approach assesses taxes paid as a sacrifice by the taxpayers. This raises the question of how to define and how to measure it: in absolute, relative, or marginal terms? U.S. respondents prefer a tax schedule that is either a pure (absolute) Equal Sacrifice or a mixture of Equal Sacrifice and Utilitarianism (Weinzierl, 2014). To determine whether Germans prefer absolute, relative, or marginal Equal Sacrifice principle, I use a question item from the German Socio-Economic Panel (SOEP) to obtain information on the level of taxes individuals consider as fair. I estimate tax and transfer schedules with regard to three Equal Sacrifice definitions and analyze which one of the three best fits the data. The absolute and relative Equal Sacrifice principle are the dominant candidates in terms of fit.

Chapter 2, 3, and 4 focuses on monetary indicators of inequality. Chapter 5 uses well-being as a non-monetary indicator for inequality.

Chapter 5 examines experienced well-being of employed and unemployed workers. We use the survey-adapted Day Reconstruction Method (DRM) of the Innovation Sample of the German Socio-Economic Panel Study (SOEP-IS) to analyze the role of the employment status for well-being, incorporating complete time use. Summarizing the average share of pleasurable minutes, we generate the P-index. We show that - in contrast to evaluative life satisfaction - the average unemployed experiences more pleasurable minutes due to the absence of working episodes. Hence, we examine working episodes in depth. While working is among the activities with the highest propensities for an unpleasant experience, it is also among the most meaningful activities. We show that meaning is a central non-monetary determinant for a pleasurable work episode and find that pleasure during work and job satisfaction, in general, have the same association with meaning.

Deutsche Zusammenfassung

Diese Dissertation konzentriert sich auf drei verschiedene Dimensionen von Ungleichheit: Einkommen, (gerechte) Besteuerung und Wohlergehen. Alle Kapitel beziehen sich auf einen ähnlichen Zeithorizont (2000 bis 2015) und im Wesentlichen auch auf das gleiche geografische Gebiet, und zwar Deutschland. Die Dissertation ist in vier Teile gegliedert, die jeweils eine spezifische Forschungsfrage behandeln. Alle Kapitel verwenden das Sozio-oekonomische Panel (SOEP) für die empirischen Analysen. Die Analyse von Kapitel 2 basiert zusätzlich auf den Mikrodaten der Europäischen Union über Einkommen und Lebensbedingungen (EU-SILC).

Kapitel 2 entwickelt eine neue Methode, mit der Einkommensverteilungen aus Umfragedaten um die Top-Einkommen korrigiert werden können. Mit Hilfe der Pareto-Verteilung werden hierbei Top-Einkommen in Umfragedaten unter Verwendung von Informationen zur Einkommensverteilung aus Steuerdaten ersetzt. Weder der Zugang zu Steuer-Mikrodaten, die in vielen Ländern begrenzt und schwierig zu erhalten sind, noch die Verknüpfung von Umfrage- und Steuerdaten (was oft nicht erlaubt ist) sind erforderlich. Darüber hinaus ermöglicht dieser Ansatz die Erstellung von Ungleichheitsmaßen für eine Vielzahl von Einkommensdefinitionen und für die gesamte Bevölkerung eines Landes. Wir wenden unseren Ansatz auf die SOEP- und die europäischen EU-SILC-Erhebungsdaten an. Die EU-SILC-Daten erhalten in einigen Ländern administrative Daten. Im Vergleich zu Ländern, die administrative Daten verwenden, stellen wir eine höhere Korrektur der Ungleichheit in jenen europäischen Ländern fest, die sich ausschließlich auf Interviews stützen (Deutschland, UK).

Kapitel 3 verwendet das optimale Steuermodell von Saez (2002). Eine häufige Annahme in der Literatur der optimalen Besteuerung besteht darin, dass der soziale Planer die Wohlfahrtsfunktion maximiert, wobei die sozialen Gewichte mit steigendem Einkommen abnehmen. In vielen Ländern bedeuten hohe Transferentzugsraten in der Praxis jedoch sehr niedrige Gewichte für Geringverdiener. Um dieses Rätsel zu lösen, testen wir weitere Alternativen. Wir berechnen Gewichte der sozialen Wohlfahrtsfunktion, basierend auf den Konzepten von Saez (welfarist approach) sowie Funktionen bei denen die absolute (*absolute tax burden*) oder relative Steuerbelastungen (*relative tax burden*) minimiert wird. Dies entspricht der Vorstellung, dass die Gesamtsteuerschulden bestimmter Bevölkerungsgruppen für die Gestaltung des Steuersystems von Bedeutung sind und demzufolge sehr hohe Steuerschulden *per se* vermieden werden. Dieser Punkt wird zwar oft in öffentlichen Debatten angesprochen, folgt aber nicht aus welfaristischen Überlegungen. Wir finden, dass das Prinzip der absoluten Steuerbelastung (*absolute tax burden*) im Einklang mit abnehmenden sozialen Gewichten steht. Darüber hinaus veranschaulichen wir, wie das Modell mit Hilfe einer neuartigen Frage des Sozio-oekonomischen Panels nach dem wahrgenommenen fairen Nettoeinkommen verwendet werden kann.

Während Kapitel 3 das deutsche Steuer- und Transfersystem evaluiert und zeigt, dass das Prinzip der absoluten Steuerbelastung (*absolute tax burden*) im Einklang mit abnehmenden sozialen Gewichten steht, lässt Kapitel 3 die individuellen Präferenzen der deutschen Bevölkerung offen.

In Kapitel 4 untersuche ich, ob Individuen in Deutschland eines der Opfertheorien bevorzugen. In Bezug auf die Opfertheorie werden Steuern als Opfer gesehen. Dies wirft die Frage auf, wie das Opfer definiert und gemessen wird: in absoluten, relativen oder marginalen Einheiten? US-Amerikaner bevorzugen ein Steuersystem, welches entweder auf der absoluten Opfertheorie oder aus einer Mischform von absolutem Opfer und Utilitarismus (Weinzierl, 2014) basiert. Um festzustellen, ob die Deutschen das absolute, relative oder marginale Prinzip der Opfertheorie bevorzugen, verwende ich eine Frage des Sozio-oekonomischen Panels. Auf diese Weise erhalte ich Informationen über die Höhe der Steuern, die von den Menschen als gerecht angesehen werden. Mit Hilfe dieser Daten, schätze ich verschiedene Steuer- und Transfersysteme in Bezug auf drei verschiedenen Opfertheorien. Im Anschluss analysiere ich, welche der drei Theorien nummerisch und grafisch am Besten mit den Daten konform gehen. Das absolute und das relative Opferprinzip zeigen die beste Übereinstimmung.

Die Kapitel 2, 3 und 4 konzentrieren sich auf monetäre Indikatoren für Ungleichheit. In Kapitel 5 wird das Wohlergehen als nichtmonetärer Indikator für Ungleichheit verwendet. Kapitel 5 untersucht das erlebte Wohlbefinden von Erwerbstätigen und Arbeitslosen. Mit der Day Reconstruction Method (DRM), enthalten in der Innovationsstichprobe des Sozio-oekonomischen Panels (SOEP-IS), analysieren wir - unter Einbeziehung der gesamten Zeitverwendung - die Rolle des Beschäftigungsstatus in Bezug auf das Wohlbefinden. Wir entwickeln den P-Index, der den durchschnittlichen Anteil an angenehmen Minuten zusammenfasst und zeigt, dass - im Gegensatz zur Lebenszufriedenheit - Arbeitslose durch das Fehlen von Arbeitsepisoden mehr angenehmere Minuten erleben. Auf Grund des überraschenden Ergebnisses, beschäftigen wir uns im nächsten Schritt intensiver mit den Arbeitsepisoden. Während die Arbeit zu den Aktivitäten mit der höchsten Neigung zu einer unangenehmen Erfahrung gehört, ist sie auch eine der sinnvollsten Aktivitäten. Wir zeigen, dass Sinnhaftigkeit eine zentrale nicht-monetäre Determinante für eine angenehme Arbeitsepisode ist. Des Weiteren zeigen wir, dass Sinnhaftigkeit in Bezug auf Freude an der Arbeit und allgemeiner Arbeitszufriedenheit die gleiche positive Assoziation aufweist.

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Eidesstattliche Erklärung

Wie bereits eingangs in der Dissertation dargestellt: Kapitel 2 basiert auf einem Artikel der zu gleichen Teilen mit Charlotte Bartels verfasst wurde. Kapitel 3 basiert auf einem Artikel der zu gleichen Teilen mit Robin Jessen und Davud Rostam-Afschar verfasst wurde. Kapitel 4 wurde eigenständig verfasst und Kapitel 5 basiert auf einem Artikel der zu gleichen Teilen mit Richard E. Lucas und Tobias Wolf verfasst wurde.

Gemäß §4 Abs.2 Promotionsordnung zum Dr. rer. pol. des Fachbereichs Wirtschaftswissenschaften der Freien Universität Berlin vom 13. Februar 2013 erkläre ich hiermit, dass ich mich noch keinem Promotionsverfahren unterzogen oder um Zulassung zu einem solchen beworben habe, und die Dissertation in der gleichen oder einer anderen Fassung bzw. Überarbeitung einer anderen Fakultät, einem Prüfungsausschuss oder einem Fachvertreter an einer anderen Hochschule nicht bereits zur Überprüfung vorgelegen hat.

(Unterschrift, Ort, Datum)

Gemäß §10 Abs.3 der Promotionsordnung zum Dr. rer. pol. des Fachbereichs Wirtschaftswissenschaften der Freien Universität Berlin vom 13. Februar 2013 erkläre ich hiermit, dass ich für die Dissertation folgende Hilfsmittel und Hilfen verwendet habe:

- Statistiken und Regressionen: Stata
- Simulationen: MATLAB, Mathematica
- Schriftsatz und Formatierungen: LaTeX, TeXstudio, JabRef

Auf dieser Grundlage habe ich die Arbeit selbstständig verfasst.

(Unterschrift, Ort, Datum)