

# Assessing economic inequality with tax data - Switzerland from 1945 to 2010

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## Abstract

*There is empirical evidence that economic inequality increased in the majority of western countries over the last decades (OECD, 2011; Gornick and Jäntti, 2013). In Switzerland, however, the development is unclear, as there is evidence for trends in both directions. Part of the inconclusive picture is due to different methodological approaches. In this paper we discuss the role of taxdata concerning the assessment of inequality in income. The focus of the discussion lays herein to show the benefits and shortcomings of tax data compared to current "state of the art" measurement concepts of economic inequality. We present common and new strategies to handle tax data specific methodological difficulties and compare results out of aggregated federal tax statistics to results from the Household Budget Survey (HBS). We can show to which extend survey data underestimate inequality in income. Following the results out of the taxdata Switzerland experienced in slight rise in inequality in recent years, similar to other western countries, but only because of rise in upper percentiles of the income distribution.*

## I. INTRODUCTION

Economic Resources can be seen as central indicator for life chances in general and a multitude of outcomes like physical and mental health, life expectancy and crime in particular (Wilkinson and Pickett 2009). While the study of social inequality can be considered as one of the core subjects of sociology in more recent years the concern about the widening gap was addressed by global leaders (WEF 2013) and scholars alike. Empirical evidence acknowledge the supposed trend that economic inequality increased in the majority of western countries over the last decades (OECD, 2008, 2011; Gornick and Jäntti, 2013; Salverda et al. 2014). Although the rise was not uniform, a common pattern seems to be identifiable, which can be referred to as the "hollowing of the the middle class" (Alderson and Doran

2013). Households are moving towards the top and the bottom of the distribution relative to the past, which is especially problematic as the middle class can be seen as the core of western democracies or as it is stated by Stiglitz (2012,117): "our democracy is being put at peril."

Given the importance of the subject a constant reflection about reliability of empirical data seems appropriate. Atkinson (2013:8) observes advances in technology and methodology which improves the core sources of inequality research, the household surveys. On the other hand the labor intensive and expensive surveys around the world are subject to budget cuts and the instrument itself faces problems in form of low response rates, which affects the assessment of inequality undisputedly. These concerns have led to the

search of alternative data sources, which can supplement the established survey data studies. Already Kuznet (1955) used tax data to examine the relationship between economic growth and personal distribution of income. Then it took several decades until Piketty (2001,2003) made the use of tax data fashionable again. Following his approach studies on several countries were conducted (Atkinson and Piketty 2007, 2010). Today, all existing top income tax statistics based time series are collected and accessible through the world top incomes database (Alvaredo et al. 2014).

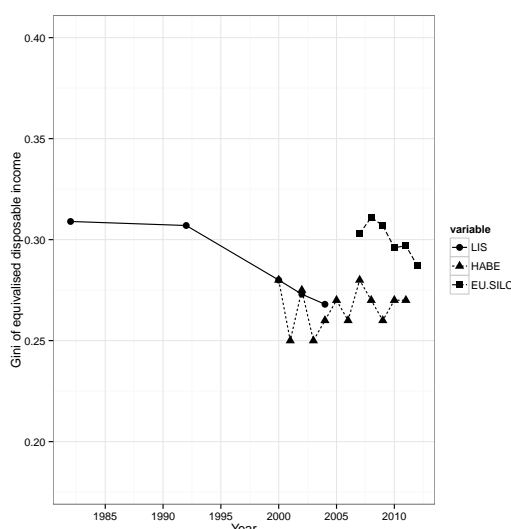
As we focus our paper on the case of Switzerland, it is important to embed our work in the context of given publications concerning inequality in income. What is known about Switzerland so far? Looking for official data, three main sources have to be mentioned, which can be considered as de facto official data sources: EU-SILC, HBS and LIS-data. Figure XY shows the results stemming from these three sources while looking at Gini of equivalised disposable income. Up to the day, EU-SILC or Statistics on Income and Living Conditions is the main source used for policy monitoring at EU-level. The main focus of EU-SILC is to collect data on a common “framework” to ensure comparability among EU-countries and countries living around or within the EU. As a Non-EU member Switzerland implemented the instrument not from the beginning (2004) but as from 2007. Therefore this time-series doesn’t cover timepoints before 2007. As graph XY shows, following the results from SILC income inequality decreased from 2007 to 2013.<sup>1</sup> The second important source concerning the distribution of income is the Household Budget Survey (HBS). The main focus of this survey

lays in providing detailed data on household budgets. This allows researcher to look at different income concepts like income before and after public transfers. Since 2000 the survey has been conducted on a continuous basis, which allows to look at a consistent time series from 2000 to 2011. As it can be seen from graph XY the trend is rather stable.<sup>2</sup> Both time-series (SILC and HBS) cover a relatively short time period. A longer period is covered in the LIS-Data-set (1982-2004). Data-provider for the LIS Data is the Swiss Federal Statistical Office too. In contrast to the aforementioned surveys the LIS-data is harmonized out of three surveys: Swiss Income and Wealth Survey (1982), Swiss Poverty Survey (1992) and the Income and Consumption survey (2000,2002,2004). All in all the LIS dataset contains the longest time series on inequality for Switzerland. Analyzing this data Gornick and Jäntti (2013) found for Switzerland a quite substantially decrease in income inequality, contradictory to the development in most other western countries. This result is supported by Grabka and Kuhn (2012) analyzing the Swiss Household Panel (2000-2009).<sup>3</sup>

<sup>1</sup>Data shown in the graph was downloaded from the Eurostat Metadata-portal [http://epp.eurostat.ec.europa.eu/cache/ITY/DDS/EN/ilc\\_sms.html](http://epp.eurostat.ec.europa.eu/cache/ITY/DDS/EN/ilc_sms.html) last accessed 21.Mai.2014.

<sup>2</sup>figures shown in the graph were calculated out of the original datasets, which were kindly provided by Swiss Federal Statistical Office.

<sup>3</sup>A further official database for income distribution is the OECD-Database. It includes measures from Income and Consumption survey as well. Additional data for 2008 is available from EU-Survey of Income and Living Conditions (EU-SILC). But this change in survey is considered as a strict break. Comparison before and since 2008 is not recommended (OECD 2012:315). A further important database on inequality is the GINI database which has been derived from the GINI Country Reports (Nolan et al.,2014). But this dataset doesn’t cover Switzerland.



Whereas the aforementioned publications focused on disposable household income from survey data, the revival of tax-data-inequality studies lead to fruitful insights for Switzerland as well. Dell et al. (2007) used tax data from the Federal Tax Administration to assess the development of concentration of the highest incomes and wealth (top-shares). In contrast to most other examined countries, Switzerland did not experience a reduction in income and wealth concentration from the pre-First World War period to the decades following the second World War (up to 1996). Using the same approach Foellmi and Martinez (2013) expand the Dell et al. timeline to 2008 finding that the share of top income has risen, the top 0.01% share even doubled in the last observed 20 years. A result which opposes the outcome of official data published by the Swiss Federal Statistical Office.<sup>4</sup>

Divergence can be explained with several factors. First of all, different data sources were used. The official data providers trust on survey data, whereas the later mentioned publications use tax data. It is assumed that the coverage of top incomes is better in tax data than it is in survey data (non-respondent bias), which

is a crucial issue concerning inequality. On the other hand the focus on top income neglects other changes in the distribution of income as it is not possible to see, whether newer concerns like the “hollowing of the middle class” occurred in Switzerland or not, which leads to the second point. Different measure of inequality hampers the comparability. Third, different income concepts and different units of analysis were used. As it is shown by Modetta and Müller (2012) income distribution is strongly affected by governmental redistribution, reducing inequality substantially. With the focus on tax data the change in institutional settings is not covered. Also neglected is the household structure, whereas it is unclear how inequality is affected whether one looks at household income or at income of tax units. It can be assumed, that inequality corresponding to different concepts react differently on demographic change (change in household structure).

Up to the day, Switzerland can be situated according to the actual level of income inequality in western societies as there is a huge effort to collect data which can be harmonized to comparable measures (see Luxembourg income study, EU-SILC). However, it is unclear how the bias through non-response affects the overall measure of inequality. Likewise a long and consistent time-series allowing to identify and explore development patterns on every point of the distribution (not only the top-shares) and a time series for inequality of wealth is missing. Building on recent developments in the field of inequality research, we assess the suitability of the publicly accessible tax data to report inequality and its changes over time. First of all this includes a discussion of the accessible measures in context of a reflection about the state of the art conceptualization of economic resources as an indicator for economic well-being. Second, we summarize and apply tax data specific technics to construct suitable measures of inequality. We expand the

<sup>4</sup>There are other studies on Switzerland covering different periods but not the recent years. Flückiger et al. (2007) and also Jeitziner and Peters (2007,2009) report constant inequality from 1960-1996 respectively from 1995 to 2003. Covering a similar time period Bauer and Spycher (1994) and Bolzani and Abul Naga (2002) found decreasing inequality. On the other hand Buchmann and Sacchi (1995) and Ernst et al. (2009) found an increase in the 1980s).

given set by an in depth discussion of a newly applied step to handle the incomplete coverage in tax data statistics. Third, we compare our results to results from a relevant Inequality-Survey in Switzerland (HBS) to assess the bias through datasource.

## II. DATA, MEASUREMENT CONCEPTS AND METHODS

Studies on inequality have to adress several thorny challenges. It starts with answering three crucial questions: First of all one has to define, which concepts should to be looked at. This refers to answering the question about inequality of what. Secondly one has to be clear about the unit of analysis. This refers to answering the question about inequality among whom. Thirdly, one has to choose an appropriate measure of inequality. All this questions are ideally answered considering theory and a given research question. Often it has to be answered in context of a given dataset. Therefore we start this section with a description of the FTA-Tax Data. Based on a review on the literature about the measurement concepts in an ideal world, we discuss the advantages and shortcomings of tax data compared to other data sources - namely survey data. Along with the despriction we explain the methods and thechnics we use to construct time-series of inequality-measure for income for Switzerland, which we will present in the result sections. By doing this, we demonstrate the suitability of the FTA Tax Data to assess the development of inequality in Switzerland

<sup>5</sup>Harmonisation with other international standards was an important objective that guided the work of the Expert Group in developing the ICW Framewrok presented in this publication. Considered main stadards were the System of National Accounts (SNA 2008), the canberra Group Handbook on Household Income Statistics (United Nations 2011), the final report of the 17th International Conference of Labour Statisticians (ILO 2004) and the UNECE/CES recommendations for the 2010 Censuses of Population and Housing (UNECE Eurostat 2006)

<sup>6</sup>The Luxembourg Wealth Study Database is currently facing this shortcomings by colecting and provding a database following ths broader concept of economic well-being. <http://www.lisdatacenter.org/our-data/lws-database/>

### I. Tax statistics in Swizterland

### II. Standards for measuring economic resources and inequality

#### *Concepts on measuring economic resources*

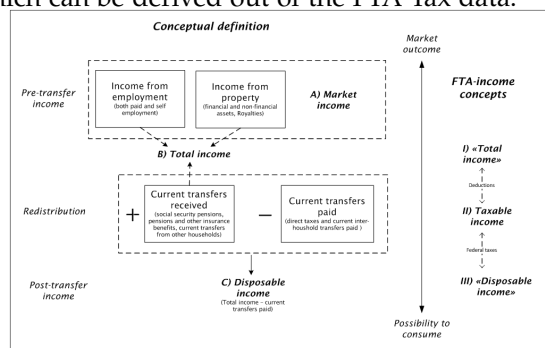
Most studies on inequality focus on income inequality solely. However, recent activities emphasize the need of a broader conceptualization. A recent publication from the oecd (2013) condense these ideas into the ICW framework (income, consumption and wealth), which is ment to be an internationally agreed framework on micro-level statistics.<sup>5</sup> According to the framework it is best to look at income, consumption and wealth as three separate but interrelated dimensions of people's economic well-being. To gain policy relevant insight, it is recomended to look at the distribution of all three distributions simultaneously. Some households with low income, for example, may report adequate levels of consumption expenditure or welth holdings, or vice-versa. But it is also stated (OED 2013:18): "[...] integrated analysis at the household level has significant data requirements that go beyond the measurement efforts currently undertaken in most countries."<sup>6</sup>

This last statment holds for Swizterland too, although the HBS study is strongly influced by the recommendations of the Canberra group handbook (United Nations, 2011), which concepts are part of the ICW framework. Albeit the awariness of an assessment of income, consumption and wealth simuntaneously is rising, we focus our analysis on income, which is undoubtedly a crucial indicator of economic wellbeeing. However, the Federal Tax Office publishes statistics on income and wealth . But it is not possible to analyse the jointly distribution on the individual or household level. Also mea-

asures of consumption are largely missing in tax data, albeit deductions can be understood as mandatory consumptions somehow.

### Defining income

The assessment of income inequality is influenced by the definition of the income itself. Market income or disposable income for example differ by substantial meaning and by the expected degree of inequality. Therefore the awareness of the analyzed concept is crucial. Terminology can slightly differ, while common concepts can be identified (for detailed discussion see: OECD (2013:44), Canberra group (2011:24)). Figure xy shows a stylized framework, which includes a distinction of common income sources<sup>7</sup> and shows the central steps of redistribution. Within this framework common income definitions are situated. These definitions are contrasted with income concepts, which can be derived out of the FTA Tax data.



The central income according to tax data is the taxable income. It includes all reported incomes (income from employment, income from property and received transfers<sup>8</sup>) minus several deductions. It is therefore neither a pre-transfer income nor a post-transfer income measure. It's rather something inbetween. As the FTA tax statistics include some but not all deductions<sup>9</sup> it is possible to calculate a sort of "total income". As some deductions can be interpreted as compulsory expenses similar to taxes the step towards Total income is a step

away from the income, which can be used for consumption. Similar when calculating the disposable income out of the taxable income through accounting the reported federal taxes, this is a step towards the income, which is left in the basket for consumption (disposable income). Again it is not a "pure" disposable income, because cantonal, municipal taxes and taxes from churches are missing.

If the goal is to catch the income, which shapes the possibility to consume, equivalence scale are implemented. Equivalence scale follow the idea, that persons living in the same household have the possibility to share costs. To compare the individual economic well-being equivalence scales adjust for different household sizes (see OECD 2013,173, Buhmann et al., 1998). Because it is neither possible to calculate the total household income nor the respective household size out of the FTA tax data, we put this in this paper outside the brackets. Although knowing, that with doing so we neglect a potential aspect, which is capable of shaping the development of inequality.

### Population Coverage

All Residents? Working Residents? Single Person vs household/family. Households without income

see for details: OCED Framework for Statistics on the Distribution of Household income, consumption and wealth (2013)

The income of the household generally plays the major role in the living standards attained by its members, so the way earners and non-earners grouped together in households, has to be incorporated into the analysis. Especially when the focus of interest lays in unrevealing the role of demographic factors.

### Measuring inequality and concentration

<sup>7</sup>Income from production of household services for own consumption is excluded because this income is hard to measure and not covered in the FTA tax data

<sup>8</sup>Mean-tested benefits are not taxed and therefore not included in Tax data. Income for low income groups are therefore underestimated.

<sup>9</sup>The difference between the real Total income and the taxable income are deductions. This includes: professional expenses, travel expenses, interest on debt, Alimonies, Training costs, two-earner deduction, Party Contributions, Payment into pillar 3a, purchases in the pension fund and sideline deductions

To be able to make qualifying statements about a distribution or to compare different distributions, the concept of inequality turned out to be the most appropriate and thus the most commonly used dimension. Vgl. Allison (1978), Engelhardt (2000), Cowell (2000) oder Hao/Naiman (2010)

neuerer Indikatoren; Polaritätsindex: relative distribution methods in the Social Sciences (Handcock/Morris 1999)

Gini is mainly used for international comparison. However, other measures are often reported along (gini is more sensitive to changes in the middle of the distribution than to changes in the tails (OECD, 2008:37). Newer branches of inequality studies emphasize the need for broader measures of inequality, which allow better analyses about the change of inequality and namely statements about the area of change (downgrading/upgrading) (Alderson and Doran 2013).

Alvaredo (2010) shows formally, how top incomes shares are related to the gini-coefficient. Following his argument, it is crucial to consider top incomes. Leigh (2007) also analyzed the relationship between the Gini (and further inequality measures) and top income shares in a panel of 13 countries (Switzerland is part of the studie).

### III. Comparison of tax data and other data sources - advantages and shortcomings

#### Summary of tax data drawbacks

- Misreporting of incomes (high earners have an interest in getting tax beneficial "income" see above)
- with aggregated data the adjustment for household members is not possible (no equivalization possible). This is a point, which is hardly mentioned in the "top-income" literature, albeit it is a crucial issue in "theorized" concepts of income.

To generalize one can say, that the concept of tax units (individuals and couples + no direct information about household members at least not in the aggregated tax tables) is not congruent with the concept of household. This might influence the overall inequality, taking into account the change from traditional household and family structures over the last century. This is an inequality related issue, where relevant studies are missing. What are the assumptions?

- the tax data income definition summarize labor income, capital income and taxable transfer payments (no means-tested benefits as welfare aid). Distinction between the different income sources is not possible, albeit the mechanisms of changes in the specific distribution can be very different.
- Some tax units are not included in the tax tables (see Foellmi and Martinez 2013:11f). (a) only taxed cases are included (partly a problem, for certain periods we know how many cases are excluded because of low or none income) - (b) cases tax at source (Quellenbesteuerung). Foreign nationals living in Switzerland but with a yearly or any other temporary resident permit only. In some border-cantons the share of this group is very high (20%) (c) staff of international organizations based in Switzerland - (d) non-fillers show up in the tables as long as they are registered. This persons get an imputed income (older tax return and information given by employers. Not registered non-fillers are not in the records. - (e) tax evasion. Feld and Frey (2007) report about tax evasion in Switzerland, it should be somewhat above 20 percent on average. With the (strong) assumption that the pattern of tax evasion over time is stable, this is a minor problem for inequality measures over time.

#### Problems with household income surveys

- Sample data (bias)
- comparability between countries and over time (depends on income definition)
- short time series

Atkinson et al. (2009) estimate that CPS survey data fail to capture about half of the overall increase in inequality measured by the Gini coefficient, a result confirmed by Alvaredo (2010).

See for other countries: Siminski et al 2003 (Australia), Brewer et al 2008, UK, Burkhauser et al. 2009, US) The discussion about problems with reporting income is fairly exhaustive. What about wealth?

It is well recognized that the traditional sources of wealth distribution data are unlikely to provide an accurate picture of wealth ownership in the top-tail of the distribution. Credit Suisse (2011) makes use of the information in the "Rich Lists" published by Forbes Magazine to adjust the wealth distribution pattern in the highest wealth ranges.

Additionally the Credit Suisse Reports states (2011:8) that these data may be less subject to response bias, but may be more prone to valuation problems, especially in connection with pension assets and debts.

#### IV. Tax data published by the Swiss Federal Tax Administration

- Datengrundlage: 1947/48 bis 1981/1982 Eidg. Wehrsteuer. 1983/1984 bis 2010 direkte Bundessteuer. Zugänglich über [estv.admin.ch](http://estv.admin.ch)
- Special feature Switch from bi-annual taxation to standard annual tax-system (1995/1996 bis 2003)
- Tabulation by size of income and statistical measures from individual tax records (Brühlhart-Daten)
- Income after deductions-; taxable income (employment income, business income

and capital income). Is income definition stable over time? Yes it should. Realized capital gains are excluded from the definition. It includes income from employment, self-employment, capital income and taxable transfer payments. Plus Eigenmietwert,

- Reported on national and cantonal level

#### V. Ways to tackle FTA-tax data specific problems

**Incomplete coverage of the population (left censored data.)** What can be done about the not-taxed? Del et al. (2007) impute for non-fillers the 20 percentage of the annual average income. This flattens the distribution on the left side, which is not a problem if you are interested in the top income shares, but it would surely affect overall measures of inequality. Furthermore Del et al. calculate the proportion of non-fillers by estimating the total of tax units out of the population records.

**changes in taxation system (switch from annual to biannual taxation)** In the mid-1990s a fundamental change in the Swiss tax system took place by switching from the two-years based *praenumeralando* taxation to the one-year based *postnumerando* taxation. This change was enacted with a transitional period of several years, during which each canton could choose when to adopt the new system. This is why during the transitional period from 1995 to 2003 there is no uniform tax data published on the Swiss level but only data on the cantonal level (Foellmi and Martinez:8f).

**Estimating percentiles from bracket income tabulation** Pareto interpolation

**Missing of mean-tested benefits as part of the income** -; imputation with recommendation for minimum level for basic needs defined by the SKOS.

**deductions** Del et al. (2007:477):" we can check with statistics for 1971-72 (as well as later

years) presented both by size of income before deductions and income after deductions that adding back deductions does not introduce any significant error in our estimates.” Gorgas and Schaltenegger (2011:5): “..., information on [...] deductions is provided in the tax statistics, thus, we could add the personal deductions to the income data to obtain a consistent series over time”. Können wir das auch? Zumindest für gewisse Zeiträume? Das wäre noch gut.

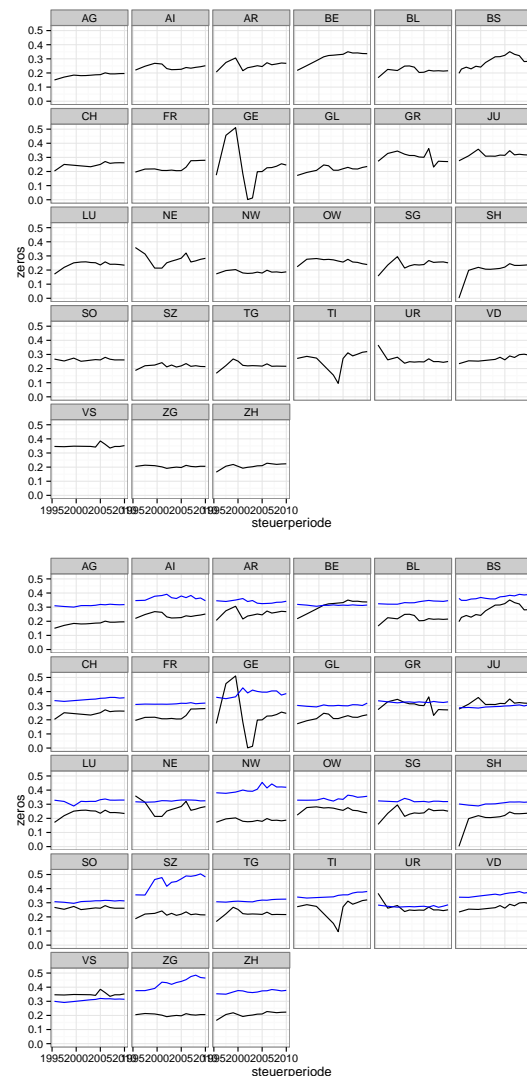
Studies on income try to focus on the disposable income, which subtracts certain expenditures from the primary income. Deductions reflect somehow compulsory expenditures and thus taxable income can be seen as a sort of pseudo disposable income. On the other hand deductions can affect the distribution. There are recent studies about the correlation of progressivity and deductions in Switzerland, which examines if deductions have a “perverse redistribution” effect by redistributing income from the lower middle class to the upper middle class (vgl. Peters 2011 and Interpellation Barbara Gysel (2009).

### V.1 Estimating the bias

For most of the observed range (1941 to 2010) we do not have any information how many tax units fall into the category of having income that is not zero but is too little to qualify for federal taxation (lets call those “zeros” for convenience) . However starting 1995, the FTA provides exactly this information for each canton. This enables us to estimate the bias we introduce for each canton and each period between 1995 and 2010. Consequently we can obtain information whether the bias is stable over time (which makes it possible to safely interpret the changes of inequality over time) and whether the bias is different for each canton. **Unterschiede zwischen Kantonen wären gut um zu argumentieren, dass andere Länder auch davon betroffen sind, in etwa sowas wie “je höher der Steuerfreibetrag, umso stärker der Bias”. Länder de erst sehr spät besteuern (und über nicht Besteuerte dann**

**auch nicht Buch führen) haben einen krassen Bias. Wir könnten dann empfehlungen geben, ab welchem Perzentil man save interpretieren kann oder so.**

One can take a first look at the descriptives plotting the share of zeros over time separately for each canton.



We can see multiple things here:

1. There is a small overall upward trend which we assume to be the Federal Administrations inflation adjustments to the tax threshold.
2. Geneva and Tessin show wild changes but those might be explained by the tax



gap (“Bemessungslücke”) that people exploited when the cantons changed the tax system. It remains unclear however why we can’t see similar pattern within other cantons.

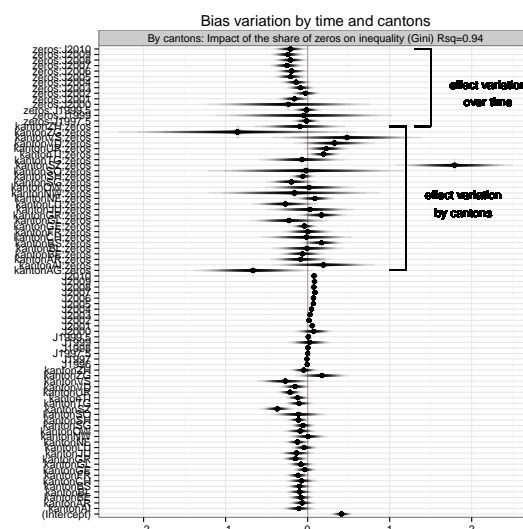
3. There is some variance and we see different patterns over time and cantons. When estimating gini coefficients or the like we must therefore assume that ignoring “the zeros” leads to a bias that is not stable over time.

We might try two strategies to moderate the problem:

1. Add the zeros as a separate group
2. Fit a model to predict the inequality measure (e.g. the gini coefficient) using the share of zeros as a predictor

By adding the zeros as a separate group we face several problems. With the exception of Geneva 1995/96 Pareto interpolation of percentiles p20 and above seems viable. Low percentiles however would need to be extrapolated so we might impose unrealistic assumptions. Even when estimating “safe” measures above p20 (better p50) or a gini coefficient we need to make an assumption about the income structure of that group (a distribution, a mean income or zero-income). To be consistent with the measure of “taxable income” we could assume an income of zero for that group, calculate gini coefficients and compare them with the original (uncorrected/plain) version. To get a rough number we could (cantonwise) check the squared correlation between plain and corrected gini.

The second approach however is more robust as we do not impose additional assumptions but instead exercise some curve fitting.



The model outputs a test statistic for each canton that tells us whether the variation of the zero-rate over time leads to a significant deviation from the typical “canton gini-level”. As the model has a decent fit we are not in great danger of omitted variable bias. Using a joint F-Test we can now test if all canton interactions are zero.

In our case we can clearly reject the hypothesis that all interactions are zero ( $p = 0$ ). This leads to the conclusion that gini coefficients are biased by the variation of the zero-share which is kind of obvious but at the same time we can use the model to report adjusted gini coefficients. For example one might be interested in how inequality would have developed if the zero-share would have been constant over time. (Note RF: predict all data point using canton, time and the initial OR final zero-share to homogenize the time series) Furthermore we can quantify how large the bias is and we can do this separately for tax periods or separately for cantons.

For all cantons:

We can see the the model fit reduces to explaining 61.5% of the gini variation versus 92.6% when the information from the zero-shares was used. Although this so some extent attributable to the additional 26 parameters: this is huge.

The model indicates some cases that deserve more attention: Schwyz (positive coef-

ficient) and Geneva (negative coefficient) and the tax period 2000 as well as the most recent periods.

A positive coefficient (e.g. Schwyz) can be read as follows: In periods with many zeros we measure higher gini coefficients. We can derive, that the distribution of income is more skewed for high incomes than for low incomes. Simply speaking, the contrast between low and middle class is less pronounced than the contrast between middle and high class. One possible explanation would be that incomes stem from two different populations: 1) the people of Schwyz who possibly follow a log-normal or gamma distribution and 2) particularly rich people who moved to Schwyz to avoid taxes.

A negative coefficient (e.g. Geneva) means the more zeros there are the smaller the gini measure was compared to other tax periods within that canton (remember this is a fixed-effects model). This is the case we would usually expect: more zeros mask inequality that arises from the bottom.

What can we conclude from that analysis? First one must notice that aggregate measure like the gini (or others) do not always react in the same way when we cut off one part of the distribution, therefore the measures calculated from tax data is biased. On the other hand, the model coefficient of Switzerland as a whole is not significant suggesting that the cantonal biases cancel out each other. This seems plausible. Most of the “tax optimization” happens within Switzerland so the rich people who moved to Schwyz are now missing at another canton.

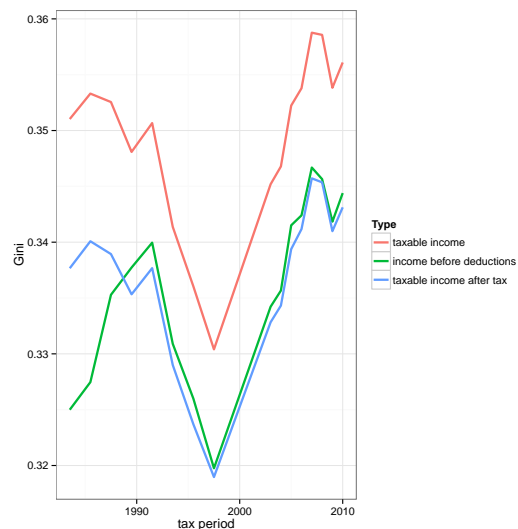
We can even see more from the model coefficients. The period dummies indicate how the distribution of incomes has changed: compared to 1995, the subsequent periods have a negative coefficient, i.e. the bias we introduce by omitting the zeros increased, especially from the mid nineties to the mid 2000s. To simplify: cutting off zeros more and more seems to lead to an underestimation of our inequality measure, probably because the skewness in the left part of the distribution increased pointing to an increased pauperization that is

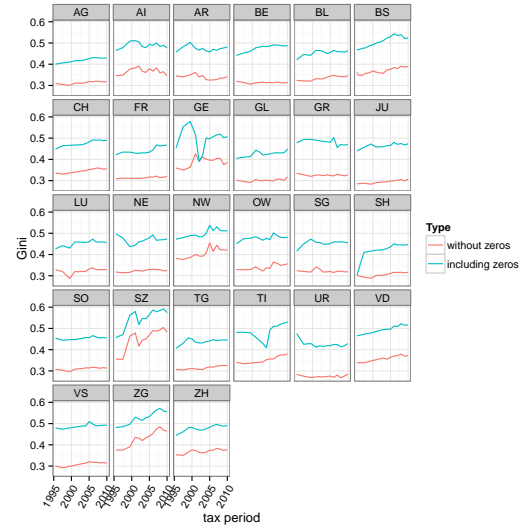
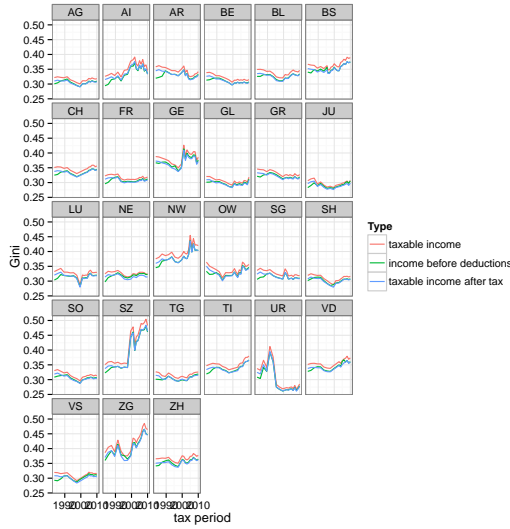
masked by omitting the left tail of the income distribution.

### III. RESULTS

Gesamtschweizer Grafik (mit imputierten Daten) einmal eine Linie mit Bias, einmal ohne Kantonsweise Grafiken Kuznets / U-Turn, Test der Hypothesen mit den final Daten. Der link zwischen rein deskriptiv und Theorie plus Modell ist aktuell noch ein krasser Drahtseilakt...

#### I. Gini coefficients for taxable income, income before deductions and taxable income after tax



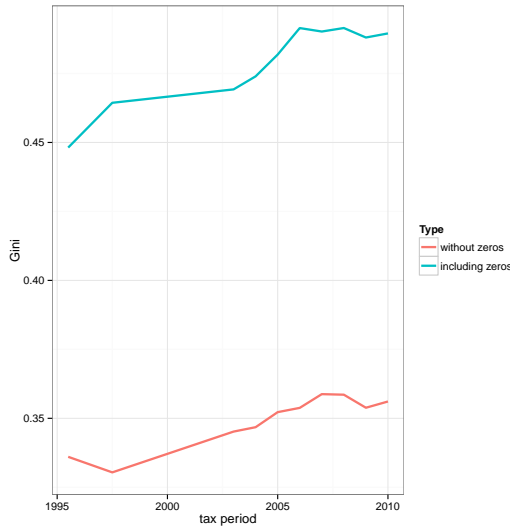


## II. Zero share

Estimation using population statistics (1945/46-1993/94) and official tax administration statistics (1995/96 and later)

## III. Income measures with and without zeros

taxable income with and without zeros



Including zeros leads to significantly higher gini coefficients. However we must keep in mind, that these might be artificially high values as we assume zero income for everyone in the zero group. We can conclude more from the graphic: the ratio between both measures seems to be quite constant although for aggregate Switzerland but there are minor deviations for multiple cantons as well as strong deviations for the cantons Geneva and Tessin. However the problems seem not to result from a shift in the zero-share over time but they are specific for the time-period when the tax system changed.

## IV. DISCUSSION

## V. ACKNOWLEDGEMENTS

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## VI. APPENDIX