

Income redistribution through taxation – how deductions undermine the effect of taxes

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This paper shows the potential of administrative data to grant us a more complete picture of the redistributive effects of the visible (tax rates) and hidden (tax deductions) instruments of the fiscal welfare state. Based on administrative tax data from a large Swiss canton, we apply a gini-based redistributive effect decomposition to demonstrate how several taxes and deductions impact the post-tax income distribution. We show that tax deductions drastically reduce the redistributive effect of taxes because lump sum deductions in a progressive tax system lead to greater tax relief for higher income earners. Moreover, high income earners have additional options to claim deductions such as real-estate expenses or extra-mandatory payments to the pension scheme. Comparison over time furthermore shows that the role of deductions for real-estate expenses decreased. All in all, because deductions reduce the redistributive effect of taxes, they lead to higher post tax income inequality compared to a hypothetical system without deductions. The redistributive effect of the tax system should therefore be studied, not only with respect to tax rates, but also with respect to deductions.

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Introduction

Redistributing economic resources is an important tool for the welfare state to reduce market inequalities. In this context, the OECD (2011, 2015) points out that the recent increase in disposable income inequality has been caused less by escalating markets but rather by a retreat of government. Therefore, it is important to fully understand the redistribution mechanics of a welfare state. Redistribution occurs due to social transfers and taxes. The degree of redistribution through taxes is usually attributed to the progression of tax rates, which is a key element of redistribution relied upon by welfare states. Yet many countries also provide options for claiming deductions that alter the redistributive effect of taxes. This latter aspect is often neglected since common survey data only reports the amount of taxes paid. Administrative tax data offers a good opportunity to analyze the visible (taxes) and hidden (deductions) instruments of the welfare state in detail, as it contains complete information of the tax assessment. Another advantage of administrative tax data is that it does not suffer from sampling bias, which is a common problem with analyses based on survey data; e.g., especially high incomes are appropriately covered (Hümbelin & Farys, 2016). Tax data can therefore precisely depict pre-tax income distributions and it is possible to estimate redistribution effects more accurately.

The present study uses Swiss individual tax data from the canton of Aargau as an exemplar to analyze visible (taxes) and hidden (deductions) instruments of the welfare state. As the study is based on tax data, it is possible to replicate the actual tax system. This permits us to evaluate every instrument of the fiscal welfare state (different taxes and deductions) with regard to its impact on income inequality. We implement a Gini coefficient based decomposition of redistributive effects by creating counterfactual “what-if” scenarios that allow us to analyze the effect of taxes if the deductions under scrutiny are included or excluded. While the main contribution of this paper is to shed light on the hidden component of the fiscal welfare state - deductions - the tax data at hand additionally provides us the opportunity to gain insight into the sometimes subtle changes of tax systems over time and how these changes affect the potential redistributive role of taxes. These insights are based on comparing the results from 2011 to those of 2001. During the intervening period, Switzerland experienced fierce tax competition between the Swiss sub-states, the cantons, which resulted in financial relief for high income earners.

The paper is structured as follows: The following section reviews the literature on the redistributive effects of the tax system. Subsequently, the section "Data and Methods" gives an overview of the data being used, defines incomes, taxes, and deductions, and lays out the methodology used for the effect decomposition. The section "Redistributive effects within the tax system" reports the results for the canton of Aargau in 2001 and 2011 in three steps. First, the redistributive effect

of Aargau's tax-transfer system as a whole is compared to other studies' estimates for Switzerland, showing that the tax-transfer system of Aargau is a representative example for the Swiss case. Second, the redistributive effects of income and wealth taxes are quantified for the federal, cantonal and municipality levels, with the comparison over time showing the subtle changes that may occur as part of tax competition. Third, we elaborate how different tax deductions mitigate the redistributive effect of taxes. The final section concludes with a discussion of the findings and their implications for future research.

Redistribution through the tax system

Taxes and deductions can not only reduce but also intensify income inequality. As long as taxes are designed *progressively*, they equalize disposable income. This means that the tax burden needs to increase over-proportionally for higher incomes. On the other hand, the tax system is *regressive* if taxes are designed to place more of the burden on lower incomes. Examples for the latter case are lump-sum or poll taxes, which demand equal amounts of tax from all citizens. With regard to redistribution via income and wealth taxes, two mechanisms need to be distinguished. First, the design of the tax rate, i.e. its level and progressivity. Second, the deductions that are allowed to be made, which decrease the tax burden and therefore also increase disposable income. There have been several studies regarding the effect of progressive taxes, the results of which are summarized below. However, it is important to notice that these studies are static in their nature as they analyze the difference between income distributions including or excluding taxes or deductions. Such static analyses are therefore always incomplete since taxes can also have indirect effects that are caused by incentivizing behavioral responses, which leads to a different pre-tax income distribution (e.g., optimizing employment level with respect to taxes). Studies which take behavior adaption into account are rare.¹

The redistributive effect of taxes

Scholars usually classify all payments which are used to finance public goods as taxes. The redistributive effect of taxes then depends on the design of several tax components:

- Measured by volume, the most important tax is the *direct tax on income* (Immervoll & Richardson, 2011; Wang, Caminada, & Goudswaard, 2014). Tax rates define which proportions of the market income are paid as taxes. The degree of redistribution depends on the mean tax rate and the progressivity. According to the OECD (2015), tax rates were lowered in most OECD countries in recent years. This tax relief was most pronounced for the high-

est incomes. At the same time, the top-income shares increased (Matthews, 2011).

- Taxes on wealth as well as taxes on income from wealth are assumed to decrease income inequality as wealth is more unequally distributed than income, so high net-worth individuals are taxed over-proportionally. While only a minority of the OECD countries actually tax wealth, taxes on wealth are often promoted as a key element to reduce economic inequality (Piketty, 2014).
- Social security contributions, which are usually not designed to be progressive but flat as a percentage of market income, are another important kind of tax. Social security contributions lead to increased inequality because only market incomes are affected and wealth is not. In sum, this leads to an over-proportional burden for lower income filers (Engler, 2011).
- Indirect taxes such as *consumption taxes* often lead to increased inequality because lower income taxpayers need to spend over-proportional shares of their income on essential goods in comparison to those of higher income (Figari & Paulus, 2012). This effect cannot be depicted accurately in most distributional studies because complete information on individual consumption is missing in the data. Then there exist differences with regard to specific consumption taxes. For example, special taxes on luxury goods have a greater impact on the high-income earners.
- Studies often point out that infrastructure that was financed by taxes (e.g., schools, hospitals, roads) has to be taken into account when doing distributional analyses. Yet most studies ignore this aspect, as it requires making strong assumptions about the individual utilization of this infrastructure. It can, however, be assumed that publicly financed infrastructure leads to an equalization of welfare. The OECD (2008) estimates the resultant reduction of inequality at 12.5% to 15%.

The effect of deductions: the hidden welfare state

While the effects of taxes on the distribution of disposable incomes is well covered in the literature, the impact of deductions has seldom been studied because this information is usually not included in the data that is used. In general, tax deductions can be thought of as a form of welfare benefit (Howard, 1999). As tax relief leads to an increase in the disposable income of individuals while at the same time reducing the public budget, its nature is comparable to that of social transfers. They can pursue social aims, such as when deductions for children or costs of illness or disability are granted. However, in many countries deductions exist that do not

pursue aims of social policy and are available for all income classes. While social transfers are a clearly visible and measurable result of a political process, the fiscal and general welfare effects brought about by deductions are difficult to trace and remain hidden. In his pioneering essay “The social division of welfare“, Titmuss (1958) however pointed out that the tax system takes on welfare state functions. He reminds us that when the tax system is not taken into account, important developments are not recognizable. Titmuss is considered to be the founder of the fiscal welfare school, which is committed to analyzing the significance of the tax system as a “hidden welfare state” and has gained in importance in recent years (Morel, Zemmour, & Touzet, 2016).

In a broader sense, deductions can be seen as an instrument of the fiscal welfare state that aims to provide tax relief to specific groups. The OECD (2010) distinguishes between distinct kinds of tax relief that have to be judged differently from a perspective of redistribution:

- *Tax exemptions*: One possibility is to exclude incomes from taxation if they fall below a certain threshold. As part of a poverty policy, e.g., incomes below the poverty line could be exempted. Another is to exclude certain sources of income from taxation, such as means-tested social transfers.
- *Privileged tax rates*: Authorities also have the option to apply different tax rates for different situations (one example being tax privileges for single parents).
- *Tax credits*: Tax credits lead to a direct reduction of tax burden and are therefore one efficient tool to reduce inequality because they can be used in a targeted manner.
- *Tax deductions*: These comprise amounts that are deductible from taxable income, which accordingly lead to a lower tax rate and tax burden. While some deductions relate to certain expenses (e.g., interest costs), standard deductions are granted based on predefined situations (e.g., child deductions).

Regarding the redistributive impact of tax deductions, one must bear in mind that their effect on post-tax income inequality is not direct but indirect. Deductions alter taxable income and tax rates, but the actual effect on the after-tax income distribution is complex and depends on the particular constellation. Theoretically, three situations can be distinguished:

- *Deductions are made equally across all income groups*. As tax rates are usually progressive, a flat deduction, however, over-proportionally favors high income filers, thus leading to an increase in inequality.

- *Deductions are more frequently used by high income filers.* Therefore, higher income taxpayers profit more and an increase in inequality is to be expected.
- *Deductions are over-proportionally used by lower income filers.* In this situation, inequality can decrease if the tax relief effect outweighs the effect of lowered tax rates.

In summary, redistributive effects are highly dependent on the specific design of the tax and deduction system as well as the pre-tax income distribution, emphasizing the need for empirical studies. To our best knowledge, there are only few studies that quantified the effect of deductions so far. Verbist & Figari (2013) showed that deductions are pro-poor in Finland, Germany, Portugal, Spain and Sweden. In Germany, for example, the deductions are aimed at pensioners who are relatively more strongly located in the lower part of the distribution. Deductions are rather pro-rich in Denmark, Ireland, the Netherlands and the UK, where either private pension contributions are deducted (Ireland, UK) or mortgage interest tax relief (Netherlands). Matsaganis & Flevotomou (2007) also showed that tax deductions in connection with mortgage interest rates lead to an increased inequality, because high income filers use these types of deductions more frequently and on a larger scale. While these studies provide first valuable insights on aggregate effects of deductions in different countries, our analysis complements these studies with detailed information on various types of deductions, as Switzerland uses a fairly complex system with numerous different deductions which is further outlined in the data and methods section.

Behavioral responses

As mentioned above, taxes also induce behavioral responses. First, tax rates are one factor that influence the decision of where to live, especially for wealthy people. Kleven et al. (2013) found evidence for the tax-induced mobility of top earners. Similarly, Martinez (2017) showed that a major local tax cut in the Swiss canton of Obwalden strongly increased the share of rich taxpayers, which suggests that high income earners do indeed react to policy reforms and supports the relevance of behavioral responses to studying the effects of tax systems. Second, reforms of the tax system might induce behavior that is not directly intended. Bütler & Ramsden (2016), for example, showed that tax incentives do influence individual behavior with respect to retirement choices; and Eissa, Kleven, & Kreiner (2008) showed that reforms of the Earned Income Tax Credit (EITC) had an impact on the labor market participation rates of married couples and single mothers. Aside from adjustments in participation or hours worked, tax reforms may also affect tax evasion. A good overview of the growing literature on the elasticity of taxable

income with respect to marginal tax rates is provided by Saez, Slemrod, & Gieritz (2012).

Based on the knowledge that individuals react to tax rates, it is a common mean of federal entities to attract tax payers with favorable tax rates. Tax competition is therefore a key factor that affects the design of tax systems and its redistributive effect (Feld, 2000). A model frequently used to study tax competition is the Tiebout-Model (Tiebout, 1956). The model describes two concurrent processes. Federal entities provide public goods which are financed by taxes. Citizens choose their place of residence according to their preferences concerning tax rates and the amount of public goods. Resulting tax rates are understood as the market equilibrium that optimizes local individual preferences of taxation and public good provision. Following the Tiebout-Model, Sinn (1997) brought to attention that a decentral organization of the state can lead to problematical developments. First, those in high income brackets become harder to tax, as individuals can easily move to a neighboring community. Second, the provision of high amounts of public goods might attract low income groups, which pay too little taxes to finance these goods. If these issues are ignored, tax competition might lead to segregation and a potential collapse of public budgets in some regions. Empirically, this fear is so far unfounded in Switzerland (Feld, 2000) and the European Union (Mendoza & Tesar, 2005). Due to the extensive fiscal federalism in Switzerland that leads to strong tax competition between and within its sub-states, the Swiss cantons, Switzerland is an interesting laboratory for further empirical economic research.

The following analysis of individual tax data uses the canton of Aargau as an example to show the role of taxes in redistribution in Switzerland. The analysis includes how the effects of taxes on different federal levels have changed over time (2001 to 2011). Following the analyses of tax effects, we study the impact of various deductions on the distribution of post-tax incomes. While Switzerland does not use tax credits, tax exemptions for social assistance and preferred tax rates for single parents are common instruments. For methodical reasons, we don't discuss these instruments in our analysis². Furthermore, we are not able to take behavioral responses into account. Reported results must therefore be understood as estimations. Real world effects might differ if actual policy changes would be induced.

Data and methods

Using tax data for inequality studies – The case of the Swiss tax system

As opposed to many other European countries where the levying of taxes is centralized, the tax system in Switzerland mirrors the historically evolved federal structure, giving a lot of power to the sub-state levels, namely the cantons and municipalities (ESTV, 2013). A total of 26 tax laws exist, with each canton having its own

tax law and the municipalities and the federal state also levying taxes. This results in a multitude of direct taxes on income and wealth, which assures that each level of the state can gather the needed revenue to provide public goods autonomously. Even though tax rates have always been low in comparison to international norms, and the federal income tax has undergone only minor reforms over the past decades, increased tax competition³ among Swiss cantons has applied downward pressure on cantonal tax rates (Martinez, 2017). At the same time, Switzerland takes on a special role in international tax competition as a tax haven for wealthy people (Zucman, 2015).

For the present study, the tax data used was collected within the research project “Inequalities of incomes and wealth in Switzerland.”⁴ Tax data has the advantage of including comprehensive information on the financial situation of all citizens of a region, thus not suffering from sampling biases. Information on the tax assessment like taxable incomes and deductions is additionally included, which allows to calculate different income components (such as pre- and post-tax incomes) that are needed for the analysis. However, one has to be aware that the use of tax data is not a mere formality in Switzerland. Tax collection is administered by the canton. Complete information on taxed subjects and their financial situations is therefore in possession of the cantons. Some cantons, however, rule out the use of tax data for research purposes for privacy reasons. Furthermore, historical tax data has only been archived in a few cantons. The present study therefore uses tax data from the canton of Aargau, where detailed data is available from 2001 to 2011. In 2011, Aargau was the fourth-largest canton of Switzerland with a population of 618’298 individuals that handed in 327’047 tax forms. With respect to economic inequality and mean income, Aargau is very close to the Swiss average. Furthermore, Aargau is also a good approximation to Switzerland with regard to its demographics and urbanity (see Table A.1). As the argument of the present paper is of general nature and Aargau is not a special case within Switzerland, we assume our point to be valid for the whole of Switzerland as well.

An important drawback of using tax data is that it is not based on real households but on the tax units that are subject to the tax assessment, which leads to an overestimation of inequality (Hümbelin & Farys, 2016)⁵. Furthermore, means-tested social transfers are not taxed and thus not available for inclusion in the analysis. While both issues lead to an overestimation of inequality, we do not expect that they interfere with the mechanics of how deductions alter the redistributive effect of taxes.

Definition of incomes, taxes and deductions

According to the federal structure of Switzerland, taxes are levied at three levels (federal, canton, and municipality). In addition, there is a church tax (for a graphi-

cal overview see Figure A.1 in the Appendix; the figure also shows the tax assessment for direct taxes on incomes in a simplified way). However, cantons, communities (also referred to as municipalities) and churches also levy taxes on wealth. Taxes are based on gross income, which includes all earned income⁶, capital income and taxable social transfers. Before taxation, several different deductions can be made⁷. Gross income minus deductions results in taxable income. Based on taxable income, either the cantonal or federal level tax rate is applied. To calculate the actual canton, municipality and church taxes, the tax determined based on the cantonal tax rate is multiplied by a factor which communities and cantons can choose for the simplified short-term management of their tax revenue to avoid the more complex legal process of adjusting the rates.

Table 1 shows that more than two thirds of the tax burden is carried by canton and municipality tax, while the federal tax level has a much lower volume and the church tax is relatively minor. In comparison to 2001, canton and municipality tax slightly lost their significance in the subsequent decade while federal level taxes gained importance. This can be attributed to two minor cantonal tax reforms which were issued in the canton of Aargau between 2001 and 2011. These included a rise of deductions for children and comprehensive tax relief, which over-proportionally favored high income filers (see Table A.2 and A.3 in the Appendix). Both reforms can be perceived as reactions to the tax competition; they sought to increase the attractiveness of the canton, especially for high earners.⁸ In accordance with the reforms, the average tax burden shrunk from 13.4% to 12.4%, as seen in Table 1. At the same time, the tax revenue, driven by a higher number of tax units, increased. Furthermore, the population was, on average, richer in 2011 than in 2001. The following section discusses which redistributive effects are associated with this change.

Like all Swiss cantons, Aargau allows for several tax deductions to be made. While the detailed design of the deductions varies slightly between cantons, most models are still very similar. Deductions generally follow three main principles. The first is aim is to relieve hard social circumstances. If someone has additional costs because of children or health issues, these are reimbursed through a tax relief. The second is to help to cover costs that are needed to generate an income. This is the case for all work-related deductions, such as the costs of commuting or costs for further education, but also applies to real estate and interest costs. The third is to incentivise certain behaviors, such as saving for old age and donating to charity and political parties.

For the present analyses, the numerous deductions have been classified into six categories (see Table A.4 in the Appendix for more deductions related details). *Social deductions* consist of deductions that are related to the family and health situation (second earner deduction, child deductions, health care costs, etc.). *Work-related expenses* include miscellaneous necessary costs related to employment, like

Table 1: Tax revenues and burdens for the canton of Aargau by federal level

Tax year		Total (CHF million)	% of taxes	% of total gross incomes
2001	Income tax (federal)	534.5	15.7	2.1
	Income tax (canton)	1241.2	36.5	4.9
	Wealth tax (canton)	129.8	3.8	0.5
	Income tax (municipality)	1186.4	34.9	4.7
	Wealth tax (municipality)	122.6	3.6	0.5
	Church tax	185.5	5.5	0.7
	<i>All taxes</i>	<i>3400.0</i>	<i>100.0</i>	<i>13.4</i>
2011	Income tax (federal)	645.0	17.0	2.1
	Income tax (canton)	1406.4	37.0	4.6
	Wealth tax (canton)	135.1	3.6	0.4
	Income tax (municipality)	1311.7	34.5	4.3
	Wealth tax (municipality)	124.2	3.3	0.4
	Church tax	178.0	4.7	0.6
	<i>All taxes</i>	<i>3800.3</i>	<i>100.0</i>	<i>12.4</i>

Source: Tax data of the Canton of Aargau; authors' calculations.

Note: The tax sums for 2001 are inflation adjusted based on the Swiss consumer price index (2001:92.4, 2011:100).

the costs of commuting, weekly stays and training costs. Expenses relating to real estate like maintenance and interest costs are classified as *real estate and interest costs*. Further deductions are extra-mandatory payments to the pension scheme as well as costs of asset management and insurance costs (*Deductions related to assets and insurance*). Finally, alimonies to partners and donations can be deducted (*Alimonies and charity*). All other deductions are classified as *other deductions*.

Some of the deductions have a clearly defined upper limit (see Table A.4 for details). The smaller deductions include, for example, second earner deduction, invalidity deduction, and deductions for child care, insurance costs, and party donations. Larger deductions are mainly child deductions, and contributions to the voluntary pension scheme. On the other hand, there are deductions that do not have a clear upper limit but are generally linked to the level of income - e. g. buying into obligatory pension scheme or voluntary contributions - or have other restrictions. The deduction on property expenses is tied to the fact that the expenses serve to preserve value or save energy. Debt interest is limited to income from assets plus

CHF 50,000. After all, there are deductions that are not subject to any limits. These are costs of illness or disability, costs of asset management, and alimonies.

Table 2 shows that deductions decrease gross income by almost 30%. This is a magnitude comparable to other countries.⁹ By volume, real estate and interest costs are of most consequence, followed by work-related expenses and deductions related to assets and insurance. Slightly less important are social deductions, alimonies and charity. Compared to 2001, deductions related to assets and insurance were of greater importance in 2011. While these absolute measures highlight the overall significance of each category of deduction in reducing taxable income, they do not show how the deductions affect the income distribution. This is further set out in the section on partial redistributive effects of income and wealth taxes.

Decomposition of redistributive effects

Reynolds & Smolensky (1977) suggest a straightforward concept to measure the effect of redistribution by taxes. This is, as can be seen in formula (1), the difference of a Gini coefficient of pre-tax incomes (G_x) and post-tax incomes (G_{x-t}).

$$(1) RS = G_x - G_{x-t}$$

The present study separates the effects for single types of taxes by a sequential approach which was already used in other studies (Mahler & Jesuit, 2006; Wang & Caminada, 2011; Wang et al., 2014). Therefore, RS is depicted into three components:

$$(2) RS_i = G_x - G_{x-t_i} = K_i * \frac{t_i}{1-t_i} - RR_i$$

where K_i is the Kakwani Index of progressivity (Kakwani, 1977) of the i -th tax, t_i is the tax rate and RR_i is the horizontal reranking effect of tax i . Atkinson (1980) and Plotnick (1981) describe this reranking as the ‘‘horizontal inequity of the tax system.’’¹⁰ As these effects might indeed be intended, horizontal effects are not discussed in the context of justice in this paper. Nonetheless, horizontal effects are reported, as they are important in the context of the effects of deductions.

If multiple taxes are compared to each other, in which order to include which tax has to be determined. If a tax is used first in order, its partial effect tends to be largest, compared to being the last in order (usually the smallest effect). Here, the approach of Wang & Caminada (2011) and Wang et al. (2014) is followed. The effect of each tax is determined by using each tax as first tax¹¹. Therefore, the sum of all effects is slightly higher than 100 percent (of the effect), so the effects are afterwards normalized to 100 percent by dividing by the sum of all effects.

The present study calculates the redistributive effect of different deductions (u_i).¹² Figure A.1 in the Appendix shows that taking deductions leads from gross

Table 2: Tax deductions, canton of Aargau

Tax year		Total (CHF million)	% of all deductions	% of total gross incomes
2001	A Social deductions	1087.3	15.1	4.3
	B Work-related expenses	1756.9	24.4	6.9
	C Real estate and interest cost	2603.1	36.1	10.2
	D Deductions related to assets and insurance	1527.1	21.2	6.0
	E Alimonies and charity	216.1	3.0	0.8
	F Other deductions	10.7	0.1	0.0
	<i>All deductions</i>	<i>7201.2</i>	<i>100.0</i>	<i>28.2</i>
2011	A Social deductions	1144.1	13.7	3.7
	B Work-related expenses	2074.0	24.8	6.8
	C Real estate and interest cost	2755.3	33.0	9.0
	D Deductions related to assets and insurance	2056.6	24.6	6.7
	E Alimonies and charity	319.5	3.8	1.0
	F Other deductions	7.9	0.1	0.0
	<i>All deductions</i>	<i>8357.4</i>	<i>100.0</i>	<i>27.3</i>

Source: Tax data of the Canton of Aargau; authors' calculations.

Note: Deductions for 2001 are inflation adjusted based on the Swiss consumer price index (2001:92.4, 2011:100)

income to taxable income, which is the base for calculating the different taxes (communal, cantonal and federal). Deductions, therefore, have an indirect effect on the distribution of disposable incomes as they modify the tax rate applied. To determine the effects of deductions, the tax assessment procedure of the canton of Aargau was replicated and income distributions were manufactured in a counterfactual fashion. The starting point is a distribution that would result if taxes were levied without any deductions being made beforehand. Next, the partial effect of a deduction is determined by simulating the income distribution after taxes using the *i*-th deduction and calculating the difference of Gini coefficients. As the first deduction usually yields the highest marginal tax relief, the effects are slightly overstated. Therefore, all effects are corrected to sum to 1, as previously described.

Redistributive effects within the tax system

Various studies have focused on the redistributive effects of social transfers and taxes in Switzerland. In comparative studies, Switzerland consistently appears as a country with a low redistributive impact of taxes and transfers (Immervoll & Richardson, 2011; Marx & Van Rie, 2014; Wang et al., 2014). This is usually explained with salaries being rather equal and employment being high. Therefore, poverty quotas are lower than the EU average (Eurostat, 2017) and the need for redistribution to the poorest through social expenditures is lower than in other countries¹³. Concerning the trend of redistribution, studies based on the Luxembourg Income Study (Immervoll & Richardson, 2011; Wang et al., 2014) find an increase of redistribution between 1985 and 2004, regardless of whether or not pensioners are included. This finding is due to the effects of social transfers (e.g., pensions, unemployment benefits). At the same time, however, the effect of taxes decreased due to tax competition (Feld, 2000; Kirchgässner & Pommerehne, 1996; Wang & Caminada, 2011). In this context, Wang & Caminada (2011:272) note: “In this country it appears to be difficult to levy redistributive taxes from the rich and mobile persons to the poor. As a result, the amount of taxes paid by rich people is relatively low.”

Detailed effects of the tax system are, however, not well studied. This section starts with an assessment of the overall net redistributive effect of Aargau’s tax-transfer system and how it changed from 2001 to 2011. The overall effect is then decomposed into the partial effects of social transfers and taxes. Results from Aargau are then compared to estimates for Switzerland from other studies to get a feeling if, and in what sense, the canton of Aargau deviates from Switzerland as a whole. Subsequently, the effect of direct taxes is then decomposed into the six single components of the different state and sub-state taxes. Finally, the effects of deductions are analyzed in detail, showing which deductions favor the poor and which benefit the rich, and how deductions overall influence the redistributive effect of taxes.

Inequality and redistribution via social transfers and taxes

Table 3 shows inequality and redistributive effects calculated with tax data from the canton of Aargau. In accordance with the definition of Reynolds-Smolensky, the effect is shown (a) as an absolute difference between the Gini coefficient of market incomes and the Gini coefficient of incomes after social transfers and taxes, as well as (b) the relative change. The lower half of the table shows the partial contributions of taxes and social transfers.

Comparison over time shows that market and disposable income inequality was more pronounced in 2011 than in 2001. The same is true for redistribution. Redis-

Table 3:
Inequality and redistributive effects of social transfers and taxes

	2001	2011	2012 (CH)
Gini: Market incomes (Aargau)	0.489	0.522	0.37
Gini: Disposable incomes (Aargau)	0.391	0.401	0.29
Net redistribution, Reynolds-Smolensky	0.098	0.121	0.08
Redistribution (in %), Reynolds-Smolensky	20.0%	23.1%	22.6%
<i>Partial effects</i>			
Social transfers			
abs.	0.076	0.100	
in %	77.6%	82.6%	
Direct taxes			
abs.	0.022	0.021	
in %	22.4%	17.4%	

Source: The first two columns are own calculations based on individual tax data from Aargau (2001 and 2011). The last column is based on the OECD Dataset “Income Distribution and Poverty.”

tribution rose mainly due to an increase of social transfers¹⁴. On the other hand, redistribution by direct taxes was smaller. This is the case for both the absolute and the relative affect. In sum, redistribution increased under-proportionally to the increase in market inequality, therefore resulting in a small increase in disposable income inequality. In contrast to the studies of Immervoll & Richardson (2011) and Wang et al. (2014), who find a decrease in income inequality for Switzerland based on the Luxembourg Income Study (LIS), the present study does not find a decreasing trend.

Comparison with Switzerland

In comparison to the figures from the OECD (see right column in Table 3), one can see similarities and discrepancies. Based on tax data, inequality turns out to be higher for both market incomes as well as disposable incomes. This may raise the question of whether analyses based on Aargau data are indeed representative for Switzerland. With respect to economic indicators, it can be cautiously assumed that Aargau is within the Swiss middle range, giving a good approximation of the Swiss population. Rather, it is to be assumed that the difference in Table 3 stems from the data source. Tax data is superior to survey data – which the OECD figure is based on – as it covers the whole population, including high incomes which are often

under-represented in survey data. The latter therefore underestimate inequality. However, one notable drawback of using tax data is, that the observation units are real households but tax units which leads to an overestimation of inequality (Hümbelin & Farys, 2016). The net redistributive effects, however, are similar in both data sources, being between 20% and 23.1% of market income inequality. Concerning the partial redistributive effects of social transfers and direct taxes, the results are comparable to those from other studies (Immervoll & Richardson, 2011; Wang & Caminada, 2011; Wang et al., 2014). The largest share of redistribution stems from social transfers, a minor share from direct taxes. It should be noted that the results are based on all age groups, i.e. pensions are part of the redistribution. At the same time, redistribution by social assistance cannot be depicted as this information is not included in tax data.

Partial redistributive effects of income and wealth taxes

Figure 1 shows the net effect of each of the six taxes for 2001 and 2011 and provides a first visual overview of the absolute income inequality reduction effect of the single taxes. It can be seen that redistribution by income taxes is more pronounced than by wealth taxes and federal income tax has the largest effect. When comparing 2011 to 2001, inequality overall increased slightly. The effect of deductions on redistribution generally persists in 2011. One exception is the slight decrease of the impact of municipal income tax over time.

Table 4 shows the redistributive effects in more detail. By comparing the absolute effects of each tax for 2001 and 2011, it can be seen that the reduced overall effect is primarily due to the reduced tax burden of the communal income tax (and, to some extent, also to the cantonal income tax; see Table A.5 and A.6 in the Appendix), while the effect of federal taxes was stable. Therefore, the proportional significance of federal taxes increased. For communal taxes, progression as well as the mean tax rate decreased. The results suggest that redistributive effects declined on the level where tax competition was most pronounced. While federal tax is exposed to international tax competition, federal units in addition compete with other cantons or even with other communities within their canton.

The table further indicates the significance and mechanism of the different taxes. Although the federal tax makes up only 1/8 of the total tax burden (see Table 1), it accounts for more than one third of the total redistributive effect. According to the progressivity index, federal tax is the most progressive tax. It is even more progressive than the wealth taxes levied by the canton and municipalities. Within the same federal level, however, wealth taxes are more progressive than income taxes. Yet the latter nevertheless contribute more to the net redistributive effect because their tax load is far bigger than that of the wealth taxes.

Finally, horizontal reranking effects quantify how much redistribution via taxes

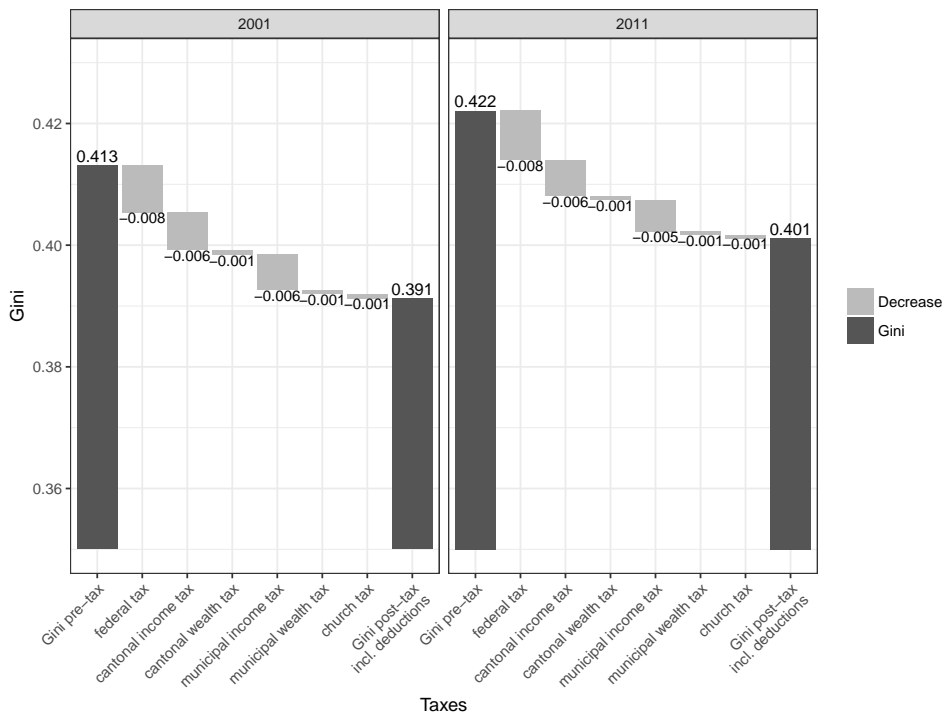
Table 4 : Partial redistributive effects of different taxes

	2001		2011	
	Abs.	in %	Abs.	in %
All taxes				
Net redistrib. (Reynolds-Smolensky)	0.0220	100.0	0.0210	100.0
Progressivity index (Kakwani)	0.1490	-	0.1550	-
Horizontal reranking	0.0012	5.3	0.0010	4.7
Ø – tax burden	0.1340	-	0.1240	-
Income tax, federal				
Net redistrib. (Reynolds-Smolensky)	0.0080	35.4	0.0080	38.7
Progressivity index (Kakwani)	0.3360	-	0.3550	-
Horizontal reranking	0.0000	0.1	0.0011	5.0
Ø – tax burden	0.0210	-	0.0210	-
Income tax, canton				
Net redistrib. (Reynolds-Smolensky)	0.0060	28.5	0.0060	28.0
Progressivity index (Kakwani)	0.1150	-	0.1180	-
Horizontal reranking	0.0001	0.5	0.0011	5.0
Ø – tax burden	0.0490	-	0.0460	-
Wealth tax, canton				
Net redistrib. (Reynolds-Smolensky)	0.0010	3.4	0.0010	3.1
Progressivity index (Kakwani)	0.1410	-	0.1440	-
Horizontal reranking	0.0000	0.2	0.0000	0.2
Ø – tax burden	0.0050	-	0.0040	-
Income tax, municipality				
Net redistrib. (Reynolds-Smolensky)	0.0060	26.3	0.0050	24.7
Progressivity index (Kakwani)	0.1110	-	0.1100	-
Horizontal reranking	0.0001	0.5	0.0001	0.4
Ø – tax burden	0.0470	-	0.0430	-
Wealth tax, municipality				
Net redistrib. (Reynolds-Smolensky)	0.0010	3.0	0.0010	2.7
Progressivity index (Kakwani)	0.1320	-	0.1340	-
Horizontal reranking	0.0000	0.2	0.0000	0.1
Ø – tax burden	0.0050	-	0.0040	-
Church tax				
Net redistrib. (Reynolds-Smolensky)	0.0010	3.4	0.0010	2.8
Progressivity index (Kakwani)	0.1060	-	0.1050	-
Horizontal reranking	0.0000	0.0	0.0000	0.0
Ø – tax burden	0.0070	-	0.0050	-

Source: Tax data of the Canton of Aargau; authors' calculations.

Note: Percentage values in the rows "Net redistrib. (Reynolds-Smolensky)" are the shares that each tax has relative to the total effect of redistribution. Percentage values in the reranking rows can be read as the potentially possible increase of redistribution if reranking is not occurring.

Figure 1
Partial redistributive effect of income and wealth taxes



Source: Tax data of the Canton of Aargau; authors' calculations.

Note: Gini pre-tax refers to income inequality after social transfers, but before taxes. Redistribution coefficients refer to the Reynolds-Smolensky effect displayed in Table 4.

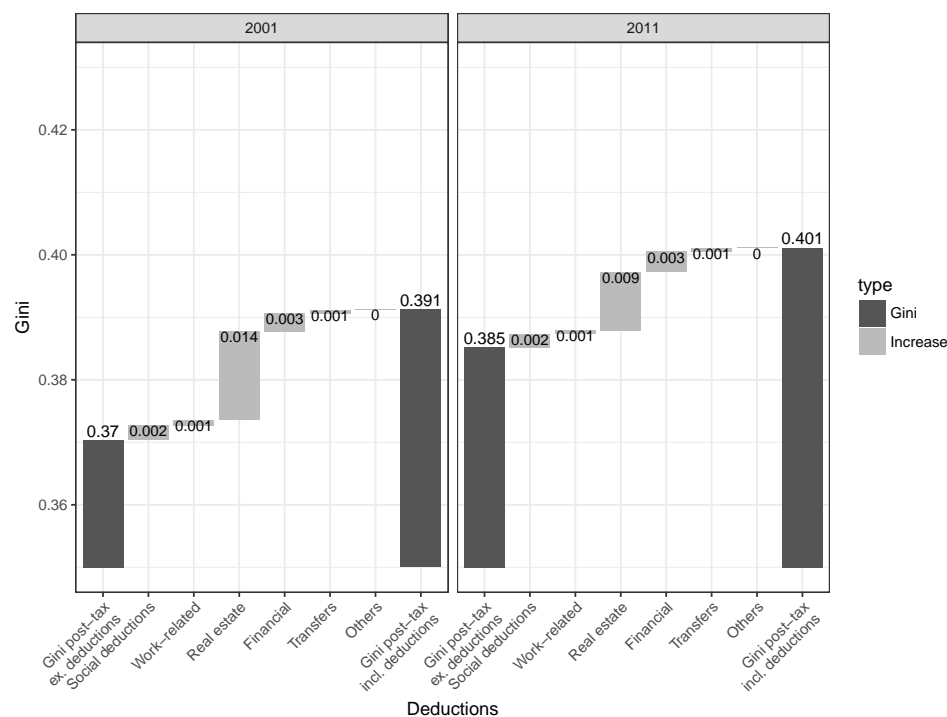
is lost due to reranking households with similar initial gross income. The value of 5.3% of all taxes means that redistribution could have been 5.3% higher if there was no loss due to reranking. Regarding the particular taxes, all reranking effects are rather small. For deductions, however, these effects are more pronounced.

Partial redistributive effects of tax deductions

How do deductions relate to redistributive effects? Figure 2 provides visual access to the different redistributive effects.

The figure starts with a hypothetical value of a post-tax Gini coefficient if deductions are ignored. It is hypothetical in a sense that it does not resemble a true counterfactual world without deductions, since tax subjects would also react to changes in deduction policies. The deductions are then broken down into six main categories and introduced one after another so that the magnitude of the effects of

Figure 2
Partial redistributive effects of deductions



Source: Tax data of the Canton of Aargau; authors' calculations.

Note: Redistribution coefficients refer to the Reynolds-Smolensky effect displayed in Table 5.

each single deduction can be easily seen. Most apparent is the large effect of real-estate deductions which dominates all others in magnitude. Compared to 2001, the effects of deductions remain constant except for real-estate deduction which had a substantially lower impact in 2011.

Table 5 shows detailed information on these effects. In sum, all deductions¹⁵ reduce the redistributive impact of taxes tremendously by -48.8% (2001) and -43.1% (2011). The progressivity index, however, is thereby only slightly modified. In 2001, deductions led to a reduction of progressivity, while in 2011, deductions resulted in a slight increase. More importantly, deductions impact the tax burden by lowering the tax rate according to formula (5), where it is visible that the tax rate acts as a multiplier of progressivity. In sum, deductions led to a tax relief of 39.3% (2001) and 37.5% (2011), respectively.

Detailed analysis of each category of deductions further shows that redistributive effects vary substantially. The biggest contribution to lowering the redistributive effect results from deductions related to real estate and interest costs. Based on

the data, it is not possible to identify the kind of interest, but it can be assumed that for the most part, these are mortgage interests. Comparing 2001 and 2011, it becomes apparent that this effect of real estate expenses and interest costs decreased considerably. This change is the greatest change over time and can be explained with the ongoing decrease of the mortgage reference interest rate, which was 4.25% in 2001 and 2.5% in 2011¹⁶ thus leading to lower interest on debt. As a result, less interest costs had to be paid, and correspondingly less deductions were possible in 2011. Another important impact on the redistributive effect comes from deductions of costs related to assets and insurance. In particular, deductions of extra-mandatory payments to the pension scheme lower the redistributive effect. This category, moreover, gained significance over time, probably due to demographic ageing.

Deductions of work-related expenses are, in terms of volume, the second most important category. Although work-related expenses lead to an increase in progressivity (discussed later), the redistributive effect of income taxes is still reduced because the tax relief this causes outweighs the higher progression. Even social deductions reduce redistribution by taxes. At the same time, social deductions caused substantial reranking effects, of 50% (2001) and 31% (2011), respectively. Therefore, social deductions are the biggest promoter of inequality between households with similar initial financial situations. Finally, it can be said that all deductions diminish the effect of redistribution via income taxes, although some increase the progressivity. This is particularly striking if the effects of work-related expenses and those related to real estate and interest costs are compared.

Figure 3 visualizes the change in progressivity broken down by quintiles. For this purpose, the Stata-Ado `pshare` was used (Jann, 2016), which allows a straightforward representation of percentile shares using histograms. For each quintile, the figure shows the average amount of deduction (column 1 for 2001 and column 3 for 2011), and the resulting tax relief as the share of tax reduction compared to a counterfactual situation without deductions. As can be seen from the figure, high income filers claim higher amounts of deductions. However, their income is also much higher. The effect of progression can be more easily seen if relative tax relief is viewed. Taken as a whole, deductions have the highest impact in the lowest quintile. The least profiting income groups are the second and third quintile or, put simply, the lower middle class. In sum, the progression increases, but the overall effect still decreases as previously described. More explicit – in terms of benefit for the particular quintiles – is the development of tax relief for work-related expenses (progression increases) and real estate expenses (progression decreases). Work-related expenses lead only to a slight reduction of the redistributive effect, while deductions on real estate and interest costs impact redistribution substantially.

The time trend of decreasing redistribution by taxes, it can be said, is not a consequence of deductions. On the contrary, the limiting effect of deductions to re-

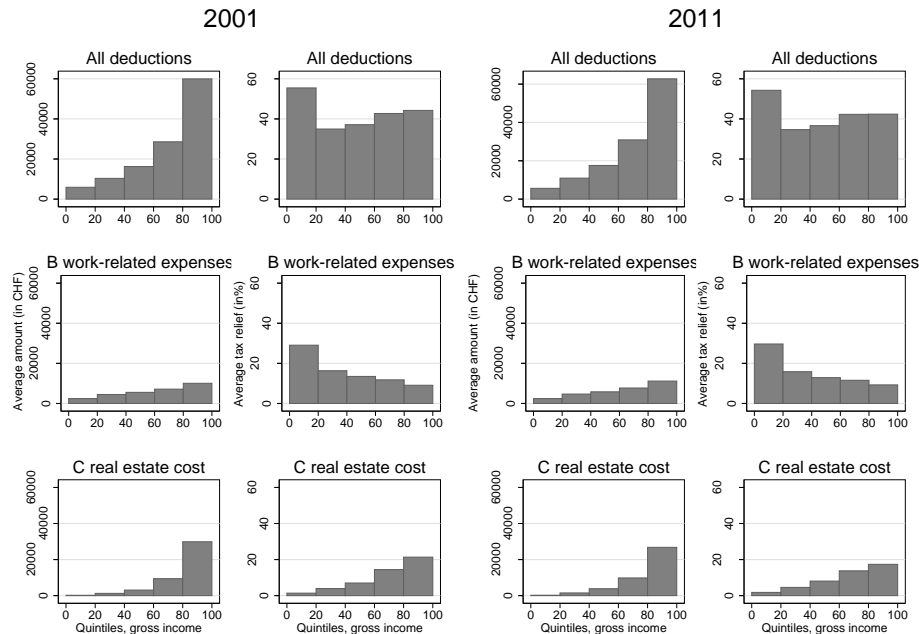
Table 5 : Partial redistributive effects of tax deductions

	2001		2011	
	Abs.	in %	Abs.	in %
All deductions				
Δ -Net redistrib. (Reynolds-Smolensky)	-0.0210	-48.8	-0.0160	-43.1
Δ -Progressivity index (Kakwani)	-0.0050	-3.4	0.0020	1.5
Δ -Horizontal reranking	0.0003	29.7	0.0000	4.7
Δ - \emptyset – tax burden	-0.0870	-39.3	-0.0740	-37.5
A Social deductions				
Δ -Net redistrib. (Reynolds-Smolensky)	-0.0020	-5.6	-0.0020	-5.6
Δ -Progressivity index (Kakwani)	0.0030	2.2	0.0010	1.0
Horizontal reranking	0.0004	50.2	0.0003	30.8
Δ - \emptyset – tax burden	-0.0210	-9.4	-0.0100	-5.1
B Work-related expenses				
Δ -Net redistrib. (Reynolds-Smolensky)	-0.0010	-2.1	-0.0010	-1.7
Δ -Progressivity index (Kakwani)	0.0170	11.2	0.0160	10.7
Horizontal reranking	0.0002	20.9	0.0000	3.6
Δ - \emptyset – tax burden	-0.0210	-9.4	-0.0180	-9.2
C Real estate and interest cost				
Δ -Net redistrib. (Reynolds-Smolensky)	-0.0140	-33.0	-0.0090	-25.2
Δ -Progressivity index (Kakwani)	-0.0300	-19.5	-0.0190	-12.5
Horizontal reranking	0.0002	18.0	0.0000	0.9
Δ - \emptyset – tax burden	-0.0360	-16.5	-0.0280	-14.0
D Deductions related to assets and insurance				
Δ -Net redistrib. (Reynolds-Smolensky)	-0.0030	-6.9	-0.0030	-8.8
Δ -Progressivity index (Kakwani)	0.0060	3.6	0.0040	2.5
Horizontal reranking	0.0000	0.1	0.0000	-4.6
Δ - \emptyset – tax burden	-0.0190	-8.6	-0.0190	-9.7
E Alimonies and charity				
Δ -Net redistrib. (Reynolds-Smolensky)	-0.0010	-1.2	-0.0010	-1.7
Δ -Progressivity index (Kakwani)	0.0010	0.4	0.0000	0.1
Horizontal reranking	0.0000	3.1	0.0000	1.6
Δ - \emptyset – tax burden	-0.0030	-1.3	-0.0030	-1.6
F Other deductions				
Δ -Net redistrib. (Reynolds-Smolensky)	0.0000	-0.1	0.0000	0.0
Δ -Progressivity index (Kakwani)	0.0000	0.0	0.0000	0.0
Horizontal reranking	0.0000	-0.1	0.0000	0.2
Δ - \emptyset – tax burden	0.0000	-0.1	0.0000	0.0

Source: Tax data of the Canton of Aargau; authors' calculations.

Note: Redistributive effects are defined as the difference (Δ) between the taxes redistributive effect before and after applying the i -th deduction. Percentage values are the share of the difference in relation to the effect without deductions. Initial values are listed in Table A.7 and Table A.8 in the Appendix.

Figure 3
Mean amount of deductions (columns 1&3) and resulting relative tax relief (column 2&4)
by quintiles of gross income



Source: Tax data of the Canton of Aargau; authors' calculations.

Note: The mean tax saving is defined as the share of tax reduction in relation to the hypothetical tax burden without deduction.

distribute income decreased over time. This can be explained by declining interest rates, resulting in lower real estate and interest costs, which consequently result in lower deductions for real estate costs, as shown in Figure 3 in the third row. Apart from that, the role of deductions was quite stable over time.

Discussion

Redistribution through tax system design is a key feature of modern welfare states. Many countries rely on progressive taxes. This implies that financially strong members of society carry a higher burden to contribute to the public budget. This taxing scheme has a direct redistributive effect that is measurable as a reduction of post-tax income inequality. Recent studies show that inequality reduction due to the tax system declined over time (Immervoll & Richardson, 2011; OECD, 2015; Wang et al., 2014), which highlights the importance of fully understanding the mechanics

of a tax system. While most studies focus on direct taxes paid, this paper is able to expand this perspective by providing insight into the mitigating effect of the often hidden part of the fiscal welfare state: deductions.

In theory, deductions can help meet social goals, e.g., by benefiting families or the ill, or by providing incentives for financially desirable behavior like saving for old age. Sometimes, deductions are also a mere hotchpotch of special interests that have accumulated over the years. In the end, the redistributive effect of deductions is determined by the degree and extent to which the different income classes actually claim deductions. The effect of deductions on redistribution is therefore hard to predict, and the present study disclosed these effects using administrative individual tax data that contains complete information on the taxing procedure from a large Swiss canton. Framed in an analysis based on the Reynolds-Smolensky (net) redistributive effect, we have simulated the taxing process and were therefore able to calculate taxes and their impact on income inequality for several scenarios with and without specific deductions. This enabled us to identify the moderating impact of several deductions. The results indicate that deductions have a massive impact on the redistributive effect of taxes, therefore increasing inequality. For the case of the canton of Aargau, we can show that the redistributive effect of taxes was reduced by -49% in 2001 and -43% in 2011, respectively. The lower impact in 2011 can be attributed to the fact that real estate expenses have decreased as a result of falling interest rates.

Put simply, high income earners disproportionately profit from deductions. There are two reasons for this. First, while a lot of deductions were created to reduce taxes to ease the consequences of difficult social or work-related circumstances (such as the deduction for children or deductions for commuters); they are nevertheless open to everyone. Therefore, relative to their income, most deductions profit the poor (except for real-estate deduction). However, in absolute terms, deductions disproportionately benefit the rich. Deductions are more or less flat (lump sums), while taxes are progressive, so the higher the tax paid, the higher the tax relief. Due to that mechanism, deductions increase inequality, which is not quite obvious at first glance. Second, high income earners have more options to claim deductions. This becomes very evident for deductions related to homeownership, as it is possible to reduce taxable income dramatically by claiming deductions for renovations. On the one hand, this seems fair, since owning a house leads to costs. On the other hand, this is a way to save massive amounts on taxes that is only available to people who can actually afford a house in an expensive country like Switzerland¹⁷. Another type of deduction that favors high income earners is the transfer of money to the pension system. While this is thought of as an incentive for people to save for old age, it is in practice an attractive option to lower the marginal tax rate and to flatten out incomes over the life course.

While the main argument of this paper focuses on the role of deductions, the

analysis of deductions by nature also encompasses an analysis of taxes. Our paper therefore also reveals the subtle changes that occur in a complex tax system like that of Switzerland with respect to income redistribution that may result from tax competition in general. While the canton of Aargau did not aggressively take part in the tax competition, authorities still did over-proportionally reduce tax rates favoring high income earners to keep up with adjustments in other cantons. The comparison over time showed that disposable income inequality increased in the observed period and the increase is ultimately attributable to a decrease in the redistributive power of taxes. Decomposition of the total effect into single tax components furthermore shows that the redistributive effect of taxes diminished the most at the lowest federal level: the municipalities. The effectiveness of cantonal taxes also decreased. The redistributive effect of direct federal tax, however, remained constant during the ten years of observation. This suggests that tax competition puts the most pressure on communities, i.e. the smallest federal units.

Although the presented analysis fits well into the existing literature, the procedure of comparing pre-tax, post-tax and hypothetical post-tax income distributions with and without deductions as we applied it comes along with the limitation that behavioral responses to tax rate adjustments and the deduction scheme is not modeled adequately. As it is likely that individuals adjust to policy changes, maybe they attract new or repel old citizens, or that individuals change their state of employment, it is likely that adjustments to the tax system also induce indirect effects and that they therefore also alter the distribution of market incomes. The results presented are thus estimates as they do not include any indirectly induced effects. Further research examining the behavioral aspects of tax deductions would be an interesting addition.

Still, our paper provides detailed insights of redistributive effects as part of the tax system. All in all, this paper argues that income inequality and redistribution through taxes should be examined not only in terms of tax rates, but also with an eye on deductions in order to better understand the changing face of modern tax systems, as they can drastically moderate the direct effects of taxes.

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Notes

¹Bargain et al. (2015) for example, present a new method to distinguish between direct policy effects and indirect effects by analyzing how individuals adapt to policies.

²Tax exemptions related to social assistance cannot be investigated, as information on the receipt of social assistance is not systematically collected by the tax authorities. However, the effect of preferred tax rates can be estimated. Within our example data 21'918 or 3.7% of all taxed households are single parents. The canton of Aargau allows them to tax their income with the tax rates for married couples instead of the rate for singles and thus to tax their income at a rate that follows a slower progression. The method described below allows us to compare income inequality with and without that preferred tax rate. We find a very small income inequality reduction effect of 0.0001 Gini points which corresponds to an income inequality reduction of 0.03%. This rather small effect can be explained with the fact that single parents are comparably few and they often don't have a high income. The slower progression of the applied married tax rate therefore does not dramatically change the distribution of post-tax incomes. In order to limit the paper's focus on direct taxes and deductions, the effects of preferred tax rates are not reported in more detail.

³Sub-state tax competition is particularly attractive in Switzerland, as Switzerland is relatively small and it is easy for citizens to relocate. Brülhart & Schmidheiny (2013) state that tax cuts since 2008 have increasingly been regionally correlated, meaning that competition between neighboring cantons and municipalities has intensified. However, the precise reasons for the initial increase of tax competition cannot be depicted. The financial scope of cantons was influenced by economic cycles, the distribution of dividends by the National Bank and also by the reorganization of the intercantonal burden sharing system in 2008, which had mixed effects on tax competition between regions.

⁴See the project website <http://Inequalities.ch> for further details.

⁵In Switzerland, individuals submit either a tax form for individuals or a joint form for married couples. The income of children under the age of 18 is not listed in a separate tax return, but in the form of their parents. For welfare studies, however, (equivalent) household incomes are usually studied, which is why individuals are ideally grouped according to the way in which they share economic resources (often, but not always on the basis of who shares the habitat). There are multiple situations in which one household hands in more than one tax declaration, although all household members live off the income that was jointly earned. One example are young adults living with either their families or together with their unmarried partner. When these constellations are ignored, many households are mistakenly assumed to be low income earners although they have more resources at their disposal.

⁶Social security contributions are already deducted from earned income.

⁷The data only include deductions possible for cantonal taxation. Federal tax deductions can differ slightly.

⁸Apart from that, Aargau was not amongst the cantons that were aggressively competing.

⁹Verbist & Figari (2013) looked at 15 countries and reported a decrease of gross income by means of deductions within a range of 23% (Denmark) to 38% (France).

¹⁰Some authors distinguish between “pure horizontal inequity” and “unequal treatment of equals” The latter includes unequal taxation for similar starting positions without switching ranks (see Lambert, 1993). It is, however, difficult to implement what is defined as financially “equal” (Urban & Lambert, 2008). The subsequent analyses were done without differentiating.

¹¹Another approach would be to calculate all permutations of possible combinations of taxes and use the mean of all effects.

¹²All estimations of the redistribution components were conducted with Stata *ado* *progres* (Peichl & van Kerm, 2007).

¹³There are some methodological aspects worth mentioning. According to Engler (2011), a substantial part of the redistribution is based on redistribution within the life cycle (e.g., pension schemes) and not attributable to redistribution between households. Christoffersen, Beyeler, Eichenberger, Nannestad, & Paldam (2014) further show that the amount of measured redistribution depends on what is or is not defined as a state service. As Switzerland organized multiple services in a private manner (pension scheme, health care), comparisons have to be treated with caution.

¹⁴It is not possible to tell exactly which benefits caused the increase, as pension benefits are reported as one joint figure. It can, however, be assumed that the increase is comprised of pensions from old-age provisions and that the result is an effect of demographic ageing.

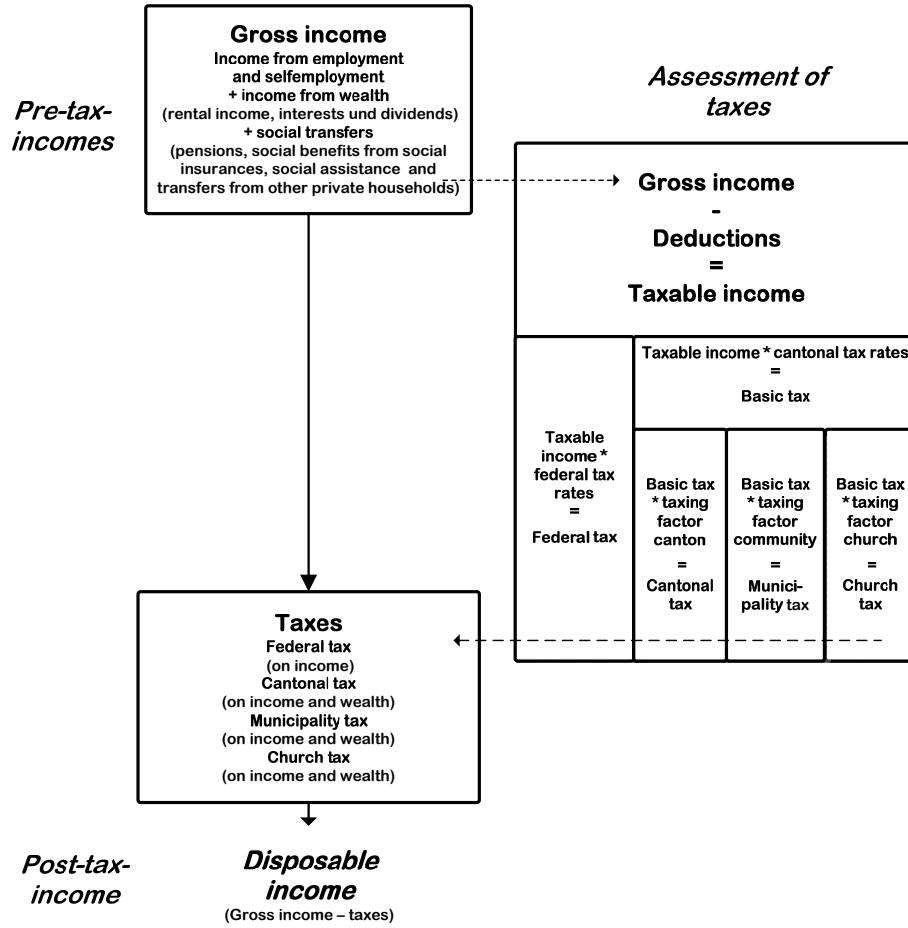
¹⁵Due to the scope of this paper, special allowances related to wealth tax have been left out and the focus has been solely on deductions for income taxes.

¹⁶See *mietrechtspraxis/mp* (2017)

¹⁷55% of Swiss citizens live in rented housing (FSO, 2017).

Appendix

Figure A.1
From gross income to disposable income and the tax assessment



Source: Own diagram

Table A.1:
Demographic and economic key figures for Switzerland and Swiss Cantons, 2011

	Population	Employment age 15-64 (%)	Foreigners (%)	Urban population (%)	Mean tax- able income (CHF)	Tax burden ¹⁾
Switzerland	7954662	80.3	22.8	73.7	58700	19.8 ²⁾
Aargau	618298	81.6	22.3	65.9	58359	18.3
Appenzell Ausserr.	53313	81.7	14.5	53.0	55357	18.5
Appenzell Innerr.	15743	81.3	10.1	0.0	53650	14.4
Basel-Country	275360	79.8	19.6	91.8	48567	23.9
Basel-City	186255	77.8	33.1	100.0	63638	22.5
Bern	985046	82.2	13.7	62.7	60938	21.4
Freiburg	284668	80.4	19.1	55.8	52800	21.7
Genf	460534	75.0	39.4	99.2	70912	23.6
Glarus	39217	82.7	21.4	0.0	49438	16.0
Graubünden	193388	82.1	17.0	50.0	48766	18.1
Jura	70542	77.8	12.7	30.6	44455	24.0
Luzern	381966	82.0	16.8	50.8	54177	15.1
Neuenburg	173183	78.0	23.4	74.6	50051	25.6
Nidwalden	41311	82.0	11.8	87.6	73990	13.9
Obwalden	35885	82.0	13.7	0.0	54744	12.0
Schaffhausen	77139	81.0	23.6	75.9	51359	20.9
Schwyz	147904	81.0	18.9	80.2	52185	11.6
Solothurn	256990	81.8	19.7	77.6	52550	21.8
St. Gallen	483156	81.5	22.1	66.9	95082	21.6
Tessin	336943	72.5	26.2	87.9	53743	20.3
Thurgau	251973	81.7	22.1	50.0	52545	17.0
Uri	35382	80.4	9.8	0.0	47516	13.0
Waadt	725944	78.4	31.6	74.7	60927	21.5
Wallis	317022	77.6	21.2	56.8	41463	21.6
Zug	115104	81.4	24.6	96.2	126048	12.6
Zürich	1392396	82.2	24.6	95.1	68060	17.7

Source: Federal Statistical Office: Population, Employment, Foreigners, Urban population; Federal Tax Administration: Mean taxable income, Tax burden.

Note: 1) Exemplary marginal tax burden of a single with gross income of 80000 - 100000 CHF in the main city of the canton. 2) Population weighted average.

Table A.2: Marginal tax rate of cantons, communities and church in percent of gross income for unmarried individual living in Aarau (capitol of the canton of Aargau)

	2001	2011	<i>Δ Percent</i>
Low incomes (0 to 35'000 CHF)	3.0	1.2	1.9
Middle incomes (35'001 - 60'000 CHF)	8.9	7.6	1.3
High incomes (60'001 - 125'000 CHF)	14.5	12.6	1.9
Very high incomes (125'001 - 1'000'000 CHF)	21.7	17.9	3.8

Source: Tax burden in canton capital cities, Federal Tax Administration, mean burden for reported income groups

Table A.3: Marginal tax rate of cantons, communities and church in percent of gross income for married with two children living in Aarau (capitol of the canton of Aargau)

	2001	2011	<i>Δ Percent</i>
Low incomes (0 to 35'000 CHF)	0.2	0.0	0.2
Middle incomes (35'001 - 60'000 CHF)	1.6	1.2	0.4
High incomes (60'001 - 125'000 CHF)	6.5	5.9	0.6
Very high incomes (125'001 - 1'000'000 CHF)	18.4	14.5	3.9

Source: Tax burden in canton capital cities, Federal Tax Administration, mean burden for reported income groups

Table A.4: Assignment of deductions to main categories and Limits

A Social deductions	Limits
A1 Second earner deduction	600 CHF
A2 Special deductions for second earners when assisting in own business	600 CHF
A3 Costs of illness or disability	No limit
A4 Child deductions	6400-11000 CHF per child depending on age and year
A5 Deductions for supported persons	2400 CHF per person
A6 Invalidity deduction	3000 CHF
A7 Deductions for child care	3000 CHF
A8 Deductions for paid out life annuities	40%
B Work-related expenses	
B1 Miscellaneous work expenses individual/spouse	Multiple smaller limits for e.g. foreign meals, bus/train tickets,etc.
B2 Child care necessary for job	6000 CHF per child
C Real estate and interest costs	
C1 Property expenses	10-20% of rental income or effective costs of value-preserving expenses
C2 Debt interest	Limited to income from assets over 50000 CHF
D Deductions related to assets and insurance	
D1 Cost of asset management	No limit
D2 Buying into obligatory pension scheme (Pillar 2), individual/spouse	No limit
D3 Contribution to voluntary pension scheme (Pillar 3a)	~6000 – ~34000 CHF depending on year and employment status
D4 Personal premiums to social security (OASI/DI)	No limit
D5 Insurance cost and interest of savings capital	2000 CHF (singles) /4000CHF(married)
E Alimonies and charity (transfers)	
E1 Alimonies to spouse	No limit
E2 Alimonies to children	No limit
E3 Party donations	1100 CHF
E4 Voluntary contributions	20% of net income
F Other deductions	No limit; Apprentice training in private household

Table A.5: Redistributive effects of income and wealth taxes of direct federal, canton, municipality and church tax, Aargau 2001

	Pre-tax Gini	Post-tax Gini	Mean tax burden	Reynolds- Smolensky net redistrib.	Kakwani progressivity index	Vertical equity	Re- ranking
Taxes (Total)	0.4131	0.3912	0.1336	0.0219	0.1495	0.0231	0.0012
Federal	0.4131	0.4059	0.0210	0.0072	0.3360	0.0072	0.0000
Canton (inc.+wealth)	0.4131	0.4066	0.0539	0.0065	0.1174	0.0067	0.0002
Canton-income	0.4131	0.4073	0.0488	0.0058	0.1149	0.0059	0.0001
Canton-wealth.	0.4131	0.4124	0.0051	0.0007	0.1414	0.0007	0.0000
Comm. (Inc.+ wealth.)	0.4131	0.4071	0.0515	0.0060	0.1134	0.0062	0.0002
Comm.-income	0.4131	0.4078	0.0467	0.0054	0.1114	0.0055	0.0001
Comm.-wealth	0.4131	0.4125	0.0048	0.0006	0.1322	0.0006	0.0000
Church	0.4131	0.4124	0.0066	0.0007	0.1060	0.0007	0.0000

Note: Non-normalized effects

Table A.6: Redistributive effects of income and wealth taxes of direct federal, canton, municipality and church tax, Aargau 2011

	Pre-tax Gini	Post-tax Gini	Mean tax burden	Reynolds- Smolensky net redistrib.	Kakwani progressivity index	Vertical equity	Re- ranking
Taxes (Total)	0.4221	0.4011	0.1242	0.0210	0.1549	0.0220	0.0010
Federal	0.4221	0.4145	0.0211	0.0076	0.3552	0.0077	0.0001
Canton (inc.+ wealth.)	0.4221	0.4160	0.0504	0.0061	0.1177	0.0062	0.0001
Canton-income	0.4221	0.4166	0.0460	0.0055	0.1151	0.0056	0.0001
Canton- wealth.	0.4221	0.4215	0.0044	0.0006	0.1443	0.0006	0.0000
Comm. (Inc.+ wealth.)	0.4221	0.4167	0.0470	0.0054	0.1117	0.0055	0.0001
Comm.-income	0.4221	0.4173	0.0429	0.0048	0.1096	0.0049	0.0001
Comm.-wealth	0.4221	0.4216	0.0041	0.0005	0.1340	0.0005	0.0000
Church	0.4221	0.4216	0.0053	0.0006	0.1051	0.0006	0.0000

Note: Non-normalized effects

Table A.7: Redistributive effects of tax deductions, Aargau 2001

	Pre-tax Gini	Post-tax Gini	Mean tax burden	Reynolds- Smolensky net redistrib.	Kakwani progressivity index	Vertical equity	Re- ranking
Excl. deductions	0.4131	0.3703	0.2201	0.0428	0.1548	0.0437	0.0009
Incl. deductions (real)	0.4131	0.3912	0.1336	0.0219	0.1495	0.0231	0.0012
A_Social deductions	0.4131	0.3730	0.2077	0.0401	0.1582	0.0415	0.0013
B_Work-related	0.4131	0.3713	0.1995	0.0418	0.1721	0.0429	0.0011
C_Real estate	0.4131	0.3861	0.1839	0.0270	0.1245	0.0280	0.0011
D_Financial	0.4131	0.3736	0.2013	0.0395	0.1603	0.0404	0.0009
E_Transfers	0.4131	0.3709	0.2173	0.0422	0.1553	0.0431	0.0009
F_Others	0.4131	0.3704	0.2200	0.0427	0.1547	0.0436	0.0009

Note: Non-normalized effects

Table A.8: Redistributive effects of tax deductions, Aargau 2011

	Pre-tax Gini	Post-tax Gini	Mean tax burden	Reynolds- Smolensky net redist.	Kakwani progressivity index	Vertical equity	Re- ranking
Excl. deductions	0.4221	0.3852	0.1987	0.0369	0.1525	0.0378	0.0009
Incl. deductions (real)	0.4221	0.4011	0.1242	0.0210	0.1549	0.0220	0.0010
A_Social deductions	0.4221	0.3875	0.1886	0.0346	0.1540	0.0358	0.0012
B_Work-related	0.4221	0.3859	0.1804	0.0362	0.1688	0.0372	0.0010
C_Real estate	0.4221	0.3956	0.1708	0.0265	0.1335	0.0275	0.0010
D_Financial	0.4221	0.3888	0.1794	0.0333	0.1563	0.0342	0.0009
E_Transfers	0.4221	0.3859	0.1956	0.0362	0.1527	0.0371	0.0010
F_Others	0.4221	0.3852	0.1986	0.0369	0.1525	0.0378	0.0009

Note: Non-normalized effects