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Summary

The present study is the first large-scale analysis of tax incentives for charitable giving in Switzerland for constant donors. Using unique panel data of the entire Geneva taxpayers' population from 2001 to 2011, which includes the rare information on individual wealth of donors, we analyze tax incentives for charitable giving: income tax deductions, focusing on the frequency of donations and the characteristics of regular donors. The latter are not primarily driven by the ceilings for income tax incentives, even though their donations rise over time. However, we find that wealth is an important variable characterizing the donations' frequency based on linear regression estimates.

KEYWORDS

Tax Incentives, Income Tax Deductions, Regularity, Regression Methods, Interaction, Wealth.

1. INTRODUCTION

Tax incentives for charitable giving are a prevalent feature of legal systems around the world (OCDE, 2020). The primary goal of such incentives, at least from an economic perspective, is to boost donations. Other policy objectives can and often are being followed simultaneously: it is for instance argued that the system that grants tax incentives for charitable donations increases transparency in the philanthropic sector (Reiser, D. B, and Steven A. D., 2023). Legislative proposals are often vague on the goal of such incentives. Indicating that they want to increase charitable giving in general, they often fail to say how exactly donors' giving behavior is expected to change as a result of the legal standards establishing tax incentives for charitable giving or which donors these reforms intend to benefit (Lideikyte-Huber, Pittavino and Peter, 2021). However, the intention to encourage the redistribution of private wealth is on the policy agenda in relation to tax incentives for charitable giving (see below regarding Swiss reforms). Such a political discourse is to a certain extent response to the increasing academic research that documents the changes in income and wealth inequality patterns over the previous century, some of the most notorious authors in this domain being Piketty and Saez (2003) and Piketty and Zucman (2014).

There has been little research done globally on the behavior and characteristics of donors, especially in the upper income and wealth brackets, also partly because such a data on wealth is difficult to obtain. This information is, however, valuable for policy makers, because to effectively boost giving through tax incentives, they must first understand how donors react to them. In the field of charitable giving, recent US research shows the tendency of increasing concentration of donors at upper income and wealth classes (Duquette and Mayo, 2021; Duquette, 2018), no such

research exists to our knowledge regarding European jurisdictions. In addition, relatively few studies, particularly in Europe, examine the constancy of donors who respond to tax incentives for charitable giving, and even fewer studies concentrate on changes in donors' behavior to actual changes in tax law. One of the most recent (and few) studies on the subject, Ring. and Thoreson (2021) analyzes the effect of a wealth tax on charitable giving behavior, but their work does not focus on regularity of donations and the impact of specific tax incentives on charitable giving.

The rest of the paper is structured as follows. Section 2 introduces the Swiss tax law framework. Section 3 presents data and methods. Section 4 provides empirical results. Section 5 concludes.

2. SWISS TAX LAW FRAMEWORK

Swiss law allows taxpayers deducting, up to a certain threshold, charitable contributions from their taxable income for individuals and for corporations. This deduction is subject to a threshold which is currently 20% of the net taxable income or profits for federal income tax purpose, with a minimum donation requirement of 100 CHF (Federal Act of 14 December 1990 on Direct Federal Taxation (DFTA), AS 1991 1184, Art. 33a DFTA). According to the Federal Constitution, cantons can fix their own income tax rates, but most of the cantonal tax thresholds are also fixed at same threshold of 20% (Art. 129 of the Swiss Federal Constitution). It is not possible to deduct donations to political parties under this norm; member contributions and other payments of up to CHF 10,300 to a political party are deductible as general deductions under another legal norm (Art. 33 para. 1 (i) DFTA).

The deductible donation must be paid to a legal entity that receives a tax exemption for pursuing public interest or service aims (Arts 33a and 56 let. g DFTA). The conditions for this type of entity's tax exemption are laid out in the legislation and, in particular, in case law. One of the primary requirements is that the entity cannot pursue economic aims since they cannot be regarded as being in the interest of the general public (Art. 56 let. g DFTA). For instance, maintaining sizable shareholdings in business firms is in principle considered an economic goal; it can only be accepted if it is subordinate to the entity's pursuit of public interest goals, and it is necessary to achieve them.

Tax laws changed the ceiling and conditions for charitable deductions twice during the study period: at cantonal level in 2001 and in 2009 respectively. In our study, we sought to understand whether these changes had had an impact on deduction behavior.

The first reform came into force at cantonal level in 2001, at the very beginning of our study period. It introduced the possibility of deducting donations made not only to charitable organizations established in the canton of Geneva, but also elsewhere in Switzerland (Lideikyte-Huber, G. and Peter, H. 2022). In addition, the rule on deductions has been simplified, and the circle of eligible charities has been extended: prior to 2001, only religious, social, humanitarian, cultural or nature conservation objectives were considered eligible (Lideikyte-Huber, G. and Peter, H. 2022).

The second cantonal reform followed the changes that had been carried out at the federal level. On January 1, 2006, the Federal legislator introduced the 20% deduction threshold on taxable income as part of a larger reform of the Swiss federal law (Swiss civil code - modifications),

replacing the previous threshold of 10%. This reform has also carried out other major modifications of federal tax law norms related to charitable giving, introducing a deduction of charitable non-cash donations was introduced and allowing the deductions of donations to the Swiss Confederation, the cantons, the communes, and their institutions (Swiss civil code-modifications). The general aim of this reform was to encourage donors "to give up part of their wealth", due to the fact that private wealth had risen sharply in the previous years and the previous tax incentives were considered insufficient to encourage individuals to part with an "important" portion of their wealth (Report 2003, p. 7428, 7426-7427; Schiesser initiative). Such a justification was the only tax policy objective expressly stipulated by the legislator; thus, at least one of the goals of the reform was to boost donations (the general goal of the 2006 reform was "the liberalization of the Swiss foundation law in order to boost the establishment of foundations") (Report 2003, p. 7426; Lideikyte-Huber and Pittavino, 2022).

After the reform at the federal level, cantonal law modifications were introduced; in the canton of Geneva, the 5% deduction threshold of taxable net individual income (Personal Income Tax Act – V) increased to 20% in 2010 (Personal Income Tax Act of September 27, 2009, FR : Loi sur l'imposition des personnes physiques du 27 septembre 2009 ; LIPP ; D 3 08, in force : 01.01.2010) and the deduction threshold for corporations increased from 10% to 20% (Corporate Income Tax Act of September 23, 1994). Table 1 summarizes the timeline with the two deduction ceilings (5% and 20%) for the two reforms regarding charitable deductions, which are computed based on the intermediary net income, in the Geneva cantonal individual income tax laws.

In the work published in Lideikyte-Huber and Pittavino 2022, the authors of this paper analyzed the characteristics of donors' giving in relation to their income and in the framework of an income

tax law reform. The objective of the present paper shifts focus from legal context to the time influence. In the current work, we study the timing of giving, concentrating on the frequency of deductions over the 11 years' time period, together with the statistical analysis of the significant factors mainly influencing the deductions among regular deducters.

Table 1. Timeline with the two deduction ceilings (5% and 20%) for the two reforms regarding charitable deductions, computed on the intermediary net income, in the Geneva cantonal individual income tax laws.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Cantonal law (GE)	5%								20%		
	1st reform								2nd reform		

3. DATA AND METHODS

I. Data Description

Our analysis is based on information from taxpayer returns over 11 years from the year 2001 until 2011 that the Tax Administration of the Canton of Geneva (TACG) confidentially gave us for this study. The selected variables provide information on the entire population of taxpayers in the Canton of Geneva (approximately 250'000 households). A different data set was provided for each year under study, 11 in total. Each data set comprised the same nine variables, an entire description of them is provided in Lideikyte-Huber and Pittavino (2022) and Lideikyte-Huber, Pittavino and Peter (2021); the ones particularly used in the present study are described and listed below with their original name provided in brackets. For this specific study, two new variables have specifically been created ("`year`" and "`freqded`") to allow a more in-depth longitudinal

analysis for the year of study and the characterization and computation of the frequency of donation over the study period. A merging of the 11 different data set, with the elimination of double IDs, if any, was performed to create the appropriate unique dataset:

- "coded ID" (`"identifiant"`): a coded ID for each taxpayers. This variable allows to follow the same taxpayer over time. The same coded ID is used for a given taxpayer for each fiscal year. As Switzerland has a joint filing system, married couples are considered and treated as one taxpayer in the same way as a single non-married individual, and they have only one coded ID (in this paper, any deducting taxpayer, couple, or individual is referred to as "deducter").
- "year of birth" (`"annee_de_naissance"`): the year of birth of a taxpayer (which is either an individual or a household, depending on marital status). For married couples, it is the year of birth of the "principal" taxpayer, usually the man.
- "income_bracket" (`"bareme_revenu"`) - the binary (0/1) indication of a possible "splitting" of income tax rate in the tax income computation, showing if a taxpayer is a couple (1) and not a single individual (0).
- "global net taxable income" (`"revenu_net_imposable_taux`"): the net taxable income (after all deductions) applied to set the tax rate; this includes the totality of any foreign income.
- "gross wealth" (`"fortune_brute"`): global gross wealth of the taxpayer.
- "deductions for donations" (`"versements_benevoles`"): the amount of deduction (if any) for charitable giving, representing the entire annual amount of the deducted

donations (in case it is less than the deductible threshold) or capped amount of annual donations, if exceeding the deductible threshold.

- "intermediary net income for deductible donations" (`"Sous_total_ded_dons"`): this variable serves as a key reference point for calculating deductions that are under, equal or more than the legal threshold (10% or 20%, depending on the year). It could only be digitally extracted from the databases of the Geneva Tax Administration for the tax years 2010 and 2011. For the previous years, it was determined by internal calculations performed by the Cantonal Geneva Tax Administration (TAGC), based on the elements of the tax base that are included in its definition (Information provided by TAGC).
- "year under study" (`"year"`): this new variable has been generated for the purpose of this study to keep track of the evolution by year of the collected data. It indicates the 11 years under consideration for this study, from year 2001 to year 2011.
- "frequency of deductions" ("`freqded`"): innovative additional variable created to count the frequency a given ID repeated the charitable deductions over the study period.

This data was selected for taxpayers residing in the Canton of Geneva as well as for taxpayers residing in another Swiss canton or abroad, however still taxed in Geneva. The information above does not allow us to distinguish between these different categories of taxpayers. In addition, as from the 2009 tax year, taxpayers who are usually taxed at source ("*impots à la source"*, dedicated taxation practice for newcomers in Switzerland) have the possibility of filing a return, if they meet certain conditions, and are then treated as resident taxpayers ("*quasi-residents*"). These taxpayers are approximately 2,000 in 2009, 4,000 in 2010 and 5,600 in 2011. The variables

provided by TACG does not allow us to identify quasi-resident taxpayers (Loi sur l'imposition des personnes physiques (LIPP-V)).

As reported in the Lideikyte Huber, Pittavino and Peter, 2021, the total number of taxpayers in the canton of Geneva has steadily increased, from 234,117 in 2001 to 266,336 in 2011. The share of the taxpayers deducting charitable donations more than doubled, passing from 8.3% in 2001 to 19.3% in 2011, with a steep increase in 2005 (deducting taxpayers reaching 16.3%). Concerning the general pattern of deductions during the studied period, the total amount of yearly charitable deductions increased significantly, from CHF 29,133,697 in 2001 to CHF 72,741,235 in 2011 (amounts non-adjusted for inflation) which is due to the rise in population and a substantial increase of 48% is recorded in 2009.

In the present analysis we use the terminology of "deducters" to indicate the taxpayers who contributed to charitable donations and used a tax-incentive (deduction) in relation to their donation, since we want to investigate this specific subset of taxpayers' population.

II. Data subset and description by frequency of deducters and deductions' ceiling

The last described variable "`freqded`" has been generated to allow analyzing the data with an innovative perspective by highlighting the frequency of donations from the deducters, over the 11 years under study.

Table 2 indicates the frequency of deductions by each deducter, the total number of deducters within each frequency and the resulting percentage of deducters. We observe that 29.4% of deducters (corresponding to a total of 30'319 deducters) are donating only once. The remaining

70.6% of deducters are donating more than once, showing knowledge of the tax incentives for charitable deductions, a related interest for this fiscal advantage and a start of a repeated behavior within their donations. With this targeted analysis, it was possible to identify a specific group of deducters who donated over the entire time span period of 11 years. This subgroup corresponds to 5948 taxpayers, who represents the 2.54% of the starting Geneva taxpayers' population from 2001 - those people were continuously giving from 2001 to 2011. This subgroup of deducters will be called *deducters11* from now on and it will be compared to another subgroup of deducters identified in Lideikyte-Huber and Pittavino, 2022, who are more interested in targeting the ceiling of deductions, referred to as 'deducters' subset'.

The figures related to the frequency of deductions have also been represented in the bar plot in Figure 1, where for each frequency there is shown the total number of deducters. This graph shows the decaying pattern of the frequency of deductions for all deducters, showing as the majority of people who deducted once, repeated the process in time for more than once and this reflects a repeated behavior in the deducters and an awareness of the tax incentives by the whole taxpayer's population. However, this decaying pattern flattens considerably. It is interesting to observe that the number of donors who give very regularly, from 5 to 11 years during the studied period, is very similar. For instance, the number of donors who give once every two years and every year is nearly the same.

Table 2. Frequency of deductions, total number, and percentage of deducters.

Frequency of deductions	Total number	Percentage
1	30319	29.4
2	15597	15.1
3	10994	10.7
4	8530	8.3
5	7003	6.8
6	5739	5.5
7	5378	5.2
8	4677	4.5
9	4467	4.3
10	4490	4.4
11	5948	5.8

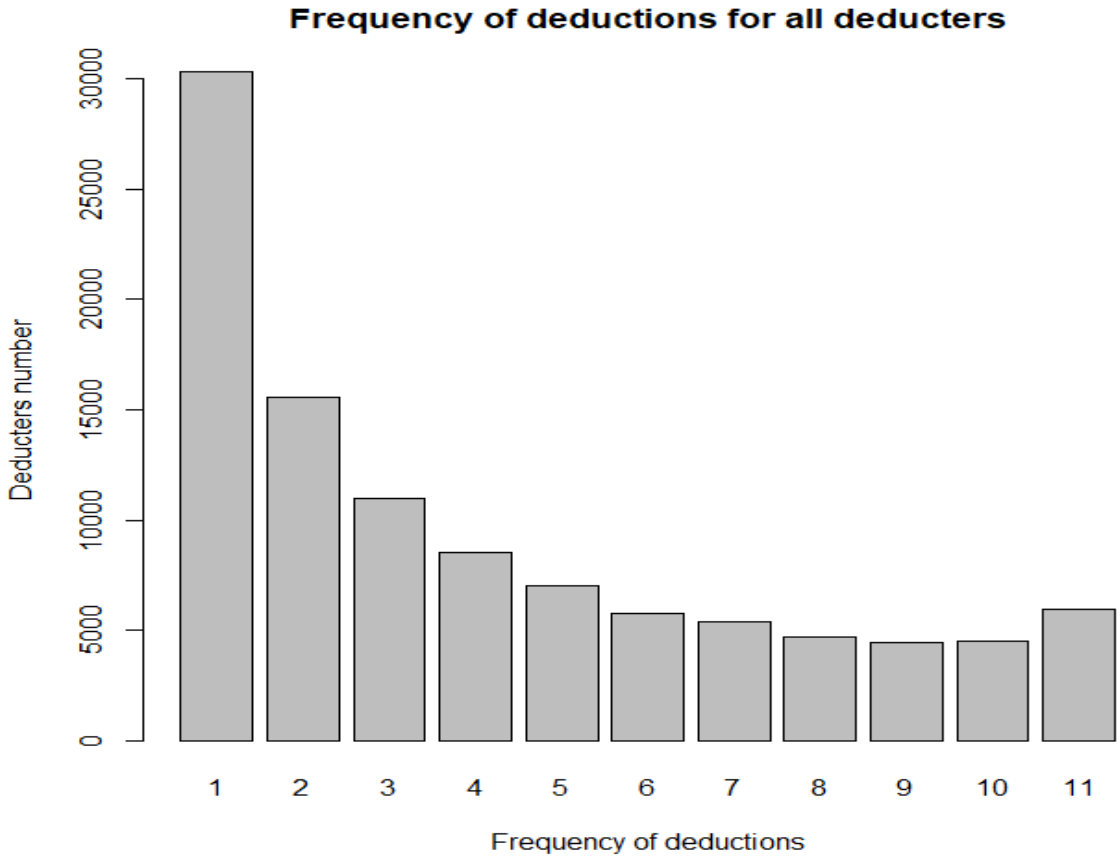

Figure 1. Bar plot representing the frequency of deductions by each deducters over a total of 11 years.

In Table 3 are reported the figures for the frequency of deductions for deducters interested in reaching the ceiling of deductions of 5% of their taxable income and more. In our Lideikyte-Huber and Pittavino, 2022 the 4% threshold was chosen to observe taxpayers that might be targeting the legal 5% deductible threshold, to which the tax incentive was limited during the most of the study period. The reason for lowering the threshold in our work was the fact that it is not easy for taxpayers to predict the exact taxable income for the year in progress - it depends on several factors, for instance, which deductions will be accepted by the tax authorities upon filing tax return. Thus, we estimated that when the taxpayers make donations that they would like to reach the deductible ceiling but not exceed it, they might be cautiously estimating their maximum amount of deduction available, and thus are just not reaching the official ceiling of 5% (because everything that exceeds it is non-deductable).

The third column 49% of all deducters reaching this legal ceiling are donating only once. Moreover, among the 3.1% who are regularly donating over the 11 years under study, they represent only 5% of the totality of constant deducters *deducters11*. These first results highlight that taxpayers reaching the legal ceiling for deduction are not constant deducters. Half of taxpayers reaching the above ceiling are donating only once, as also shown in Figure 2. While from now on we will call *deducters11-ceiling* the constant deducters reaching the ceiling of donations for tax incentives.

Table 3. Frequency of deductions, total number, percentage of deducters11 over total deducters of charitable donations who donated amounts reaching or exceeding the ceiling of 5% and percentage over regular deducters.

Frequency of deductions	Total number	Percentage	Percentage over *deducters11*
1	4667	49.0	15.4
2	1459	15.3	9.4
3	826	8.7	7.5
4	604	6.4	7.1
5	424	4.5	6.1
6	323	3.4	5.6
7	265	2.8	4.9
8	235	2.5	5.0
9	213	2.2	4.8
10	202	2.1	4.5
11	297	3.1	5.0

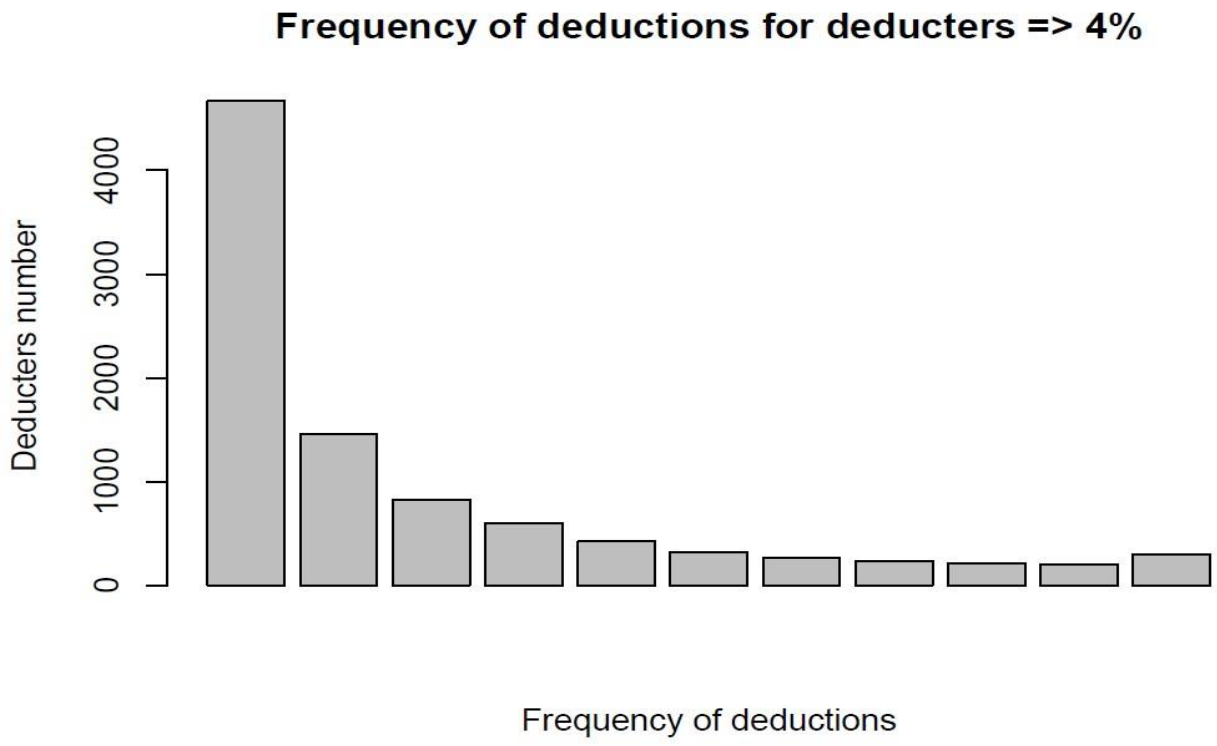

Figure 2. Bar plot representing the frequency of deductions by each deducters, who donated the legal ceiling of 4% and more, over a total of 11 years, under study.

The third variable described above ("splitting") and presented in our dataset shows whether the tax payer household is entitled to specific rates that are applicable to spouses, registered partners (same-sex couples) or taxpayers who live in the same household as their minor or adult children, or a close relative who is a family dependent. By analyzing all the deducters, the *deducters11* and *deducters11-ceiling*, this variable always shows an equally distributed population between these characteristics... even with a prevalence of joint filling. This indicates that the regularity of deductions is typical of family households (married couple, a person with dependents, etc.) rather than single taxpayers, as it was instead relieved by Lideikyte-Huber and Pittavino (2022), while looking at the population's subset features.

III. Methods

Regression methods (linear and linear mixed models) with and without interaction have been applied. In particular, linear bivariable models applied to two subgroups of deducters: *deducters11* and *deducters11-ceiling* to identify the main significant variables driving the charitable deductions in regular deducters, who aren't and are reaching the ceiling threshold. The entire data set, without any subsetting, was analyzed in detail in Lideikyte-Huber and Pittavino (2022). For the Exploratory Data Analysis (EDA) we proceeded to focus on the new subset datasets *deducters11* and *deducters11-ceiling*. The main summary statistics (e.g., mean, SD, min, max, median) have been checked and computed. Since some of the variables represents almost the same quantity (i.e., ""global net taxable income" ("revenu_net_imposable_taux"), "intermediary net income for deductible donations" ("Sous_total_ded_dons")), they are sharing the same part

of the variance to describe the response and it resulted in a very high multicollinearity between some pairs of variables. To measure the amount of variance explained by each one of them for the resulting model the variance inflation factor (VIF) (Ref. to VIF) has been calculated. This quantity was computed to select the optimal set of variables for our analysis. This is an indication of the presence of multicollinearity. Two variables: X1: “global net taxable income” and X2: “gross wealth” resulted with an overall Mean for the VIF of 2.75.

The first method used to analyze the data for the frequency of deductions: *deducters11* and *deducters11-ceiling* was a bi-variable linear regression analysis between income (X1) and wealth (X2), resulted from the VIF check, with and without interaction (Faraway J. Julian, 2004 and 2016; Pittavino Marta et al, 2017a and 2017b).

For the d*educters11* first sub-dataset we have:

Y_i = deductions for donations, i = 1, .. , 5948

$$Y_i = \beta_0 + \beta_{Inc}X_{i1} + \beta_{Wth}X_{i2} + \beta_{Int}X_{i1}X_{i2} + \varepsilon_i \quad (1)$$

Model 1), with interaction.

$$Y_i = \beta_0 + \beta_{Inc}X_{i1} + \beta_{Wth}X_{i2} + \varepsilon_i \quad (2)$$

Model 2), without interaction.

with $\varepsilon_i \sim N(0, \sigma^2)$, independent and identically distributed (iid).

β_{Inc}, β_{Wth} and β_{Int} are the regression coefficients for income, wealth and their interaction.

For the *deducters11-ceiling* second sub-dataset we have:

Y_j = deductions for donations, j = 1, .. , 297

$$Y_j = \beta_0 + \beta_{Inc}X_{jInc} + \beta_{Wth}X_{jWth} + \beta_{Int}X_{j1}X_{j2} + \varepsilon_j \quad (3)$$

Model 3), with interaction.

$$Y_j = \beta_0 + \beta_{Inc}X_{jInc} + \beta_{2Wth}X_{jWth} + \varepsilon_j \ (4)$$

Model 4), without interaction.

with $\varepsilon_j \sim N(0, \sigma^2)$, independent and identically distributed (iid).

Given the panel nature of our data set and the repetition over time for the frequency of deductions, bi-variable linear regression models with random effect: *Linear Mixed-Effects Models* (LME; Pinheiro and Bates, 2000), with and without interaction, have been also performed using the *lme4 R package* (Bates et al., 2014), to incorporate better the subject variability, with and without interaction for income and wealth. LME have been fitted to check if there was subject variability, that was impacting the related estimates.

Two types of LME models have been implemented, with a random intercept: b_{0i}, modelled as Gaussian distribution with mean 0 and variance σ_b^2: $b_{0i} \sim N(0, \sigma_b^2)$ for each subject *i* and with random slope b_{1i}, modelled as a Gaussian distribution with mean 0 and variance σ_1^2: $b_{1i} \sim N(0, \sigma_1^2)$ for each year (timepoint) of deductions.

We also performed *robust regression analysis* based on the Least Median of Squares (LMS) method: $\min_{\beta_0 \beta_1} \text{med } \varepsilon_i^2$, the median of the errors is minimized instead of the sum of the square

errors. There is no analytic expression for the LMS, but search algorithms and the class of *M-estimators* is used: $\min_{\beta_0\beta_1} \sum_{i=1}^{n} \rho\left(\frac{\varepsilon_i}{\sigma}\right)$, Huber and Ronchetti, 2009. An M-estimator is robust if the function ρ limits the extremes values $\frac{\varepsilon_i}{\sigma}$. The function Tukey's bisquare (or biweight), satisfying the previous criteria, is used:

$$\rho_c\left(\frac{\varepsilon_i}{\sigma}\right) = \begin{cases} \frac{6}{c}\left[\left(\frac{\varepsilon_i}{c\sigma}\right)^6 - 3\left(\frac{\varepsilon_i}{c\sigma}\right)^2 + 3\left(\frac{\varepsilon_i}{c\sigma}\right)^2\right] & \text{if } \left|\frac{\varepsilon_i}{\sigma}\right| < \text{c}, \\ \frac{6}{c} & \text{if } \left|\frac{\varepsilon_i}{\sigma}\right| \geq \text{c}, \end{cases} \quad (5)$$

The robust regression is implemented using the *robust R package* (*Wang et al. 2023*), with and without interaction, for both the two datasets *deducters11* and *deducters11-ceiling* to further check our findings.

4. EMPIRICAL RESULTS

The descriptive statistics for the dataset of *deducters11* and *deducters11-ceiling* with the main features are summarized in Table 4 and in Table 5, respectively. If we compare Table 4 with Table 5, which is a special case of the Table 1 in Lideikyte-Huber and Pittavino (2022) for the subgroup of people who are donating interested in reaching the ceiling, we can find overall higher values.

In the subgroup dataset *deducters11*, the total amount of deductions is higher, the median and mean age of taxpayers is higher including younger people and are taxpayer households (married or single-sex registered partners, taxpayers with dependents, etc.). The median and mean values for the global income and gross wealth are also higher than the subgroup of deducters *deducters11-ceiling*. The only lower values are the median and the mean deductions, since they

are not necessary interested in reaching the ceiling the *deducters11* donate on average less than the *deducters11-ceiling*.

The percentage of the amount of deductions for 11 years from *deducters11*, in blue, compared with the annual total amount of deductions, entire bar, is represented in Figure 3. This group of regular taxpayers, contributed to almost half of the total deductions in the beginning of the study period. The relative percentage of *deducters11* compared with the entire deducters/donor population decreases with time, which is explained by the fact that, in absolute terms, the number of deducters increase during the study period (Lideikyte-Huber and Pittavino, 2022).

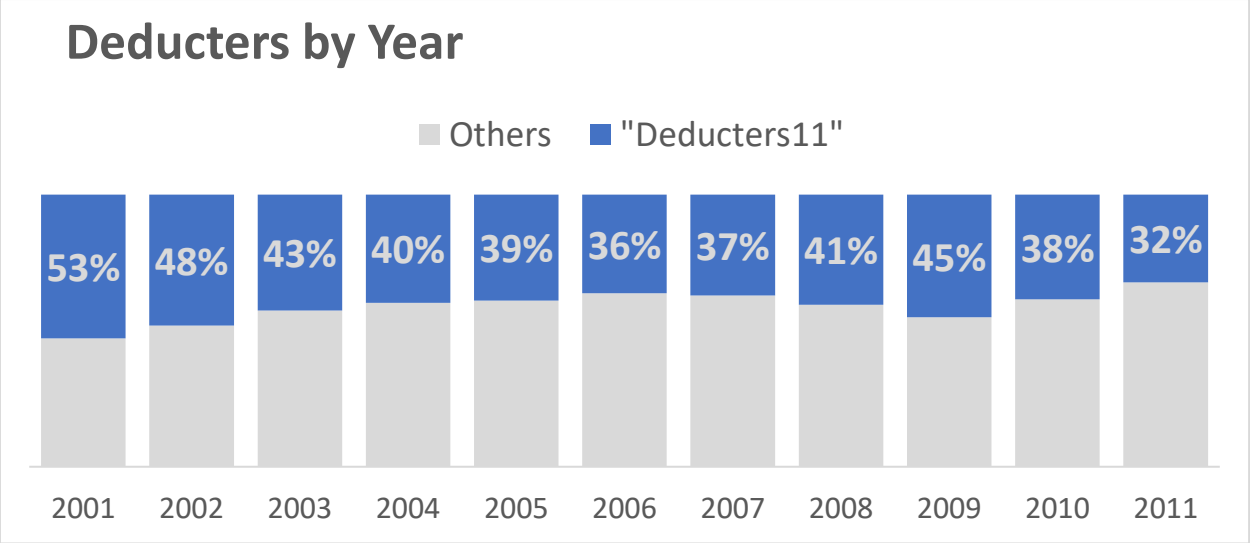

Figure 3. Total amount of deductions by each year for all the subgroup of constant donors: "*Deducters11*", represented in blue line, towards all the others donors who are not deducting for the entire time period.

Table 4. Summary statistics of the *deducters11* constant donors deducting for the entire 11 years of the time period under study, without taking into account the deduction ceiling (n= 5948).

Year	Total deductions	Average deduction	Median deduction	Average net global income	Median net global income	Average gross-wealth	Median gross wealth	Average year of birth	Median year of birth	Single	Married[1], or single with dependents[2]
2001	15'388'211	2587	736	211'194	88'552	2'126'201	431'338	1944	1943	2439	3509
2002	15'987'318	2687	860	187'188	90'846	2'087'835	454'395	1944	1943	2417	3531
2003	14'267'464	2399	950	178'421	90'233	2'230'951	483'034	1944	1943	2411	3537
2004	16'375'487	2753	1050	183'617	89'732	2'339'291	505'483	1944	1943	2416	3532
2005	18'466'780	3105	1150	189'970	89'314	2'582'534	548'907	1944	1943	2387	3561
2006	17'037'744	2864	1100	207'383	90'328	2'820'589	575'364	1944	1943	2383	3565
2007	18'895'196	3177	1176	241'464	92'284	3'085099	588'272	1944	1943	2392	3556
2008	20'963'104	3524	1'215	236'625	93'282	2'870'672	591'562	1944	1943	2408	3540
2009	34'477'153	5796	1'270	192'308	92'600	3'112'107	624'118	1944	1943	2422	3526
2010	32'331'721	5436	1'310	186'050	82'861	3'277'245	639'482	1944	1943	2425	3523
2011	23'467'958	3946	1315	179976	82219	3'296'511	647'618	1944	1943	2441	3507

[1] The civil status « married » also includes registered same-sex partners under Swiss law.

[2] A single, widowed, divorced, separated person and living with minor children, or children between the ages of 18 and 25 who are studying or doing an apprenticeship, or a relative for whom the taxpayer is essentially responsible financially.

Table 5. Summary statistics of the *deducters11-ceiling* constant donors deducting for the entire 11 years of the time period under study, without taking into account the deduction ceiling (n= 297).

Year	Total deductions	Average deduction	Median deduction	Average net global income	Median net global income	Average gross-wealth	Median gross wealth	Average year of birth	Median year of birth	Single	Married[3], or single with dependents[4]
2001	2'461'132	8287	3977	156'574	74'863	2'820'897	411'509	1941	1939	139	158
2002	2'302'032	7751	3933	145'905	74'702	2'642'858	403'154	1941	1939	140	157
2003	2'170'172	7307	3924	137'537	74'099	2'689'108	417'519	1941	1939	140	157
2004	2'238'344	7536	3764	141'340	69'909	2'728'003	429'240	1941	1939	141	156
2005	2'261'060	7613	3826	143'281	71'719	2'977'176	472'066	1941	1939	141	156
2006	2'481'737	8356	3851	157'149	70'738	3'057'097	499'964	1941	1939	141	156
2007	2'487'059	8374	3909	157'296	72'951	3'920'514	496'051	1941	1939	140	157
2008	2'751'581	9265	3961	174'123	73'844	3'474'699	468'818	1941	1939	142	155
2009	4'465'830	15036	7658	142'201	69'127	3'566'142	511'085	1941	1939	145	152
2010	4'655'780	15676	8060	121'683	58'710	3'557'364	516'158	1941	1939	144	153
2011	6'113'253	20583	7300	123'151	60'539	3'503'996	515'717	1941	1939	145	152

[3] The civil status « married » also includes registered same-sex partners under Swiss law.

[4] A single, widowed, divorced, separated person and living with minor children, or children between the ages of 18 and 25 who are studying or doing an apprenticeship, or a relative for whom the taxpayer is essentially responsible financially.

From Table 6 we can observe how the interaction between income and wealth is significant, even if smaller (i.e. all 11 years: β_{Int} = 1.9x10-11) on a global level of all the regular deducters, indicating that higher income and wealth positively influence charitable deductions or vice versa. The income variable per se has a negative effect on deduction, showing that wealth is the main variable influencing the deductions for regular deducters. These aggregated results for the entire 11 years' time period have been granulated by each year to better understand the dynamics: for 5 years out if 11 (2001, 2005, 2008, 2009, 2010) the regression coefficient of the income are negative (i.e. 2001: β_{Inc}=*-2.2x10-3*) showing a negative relationship with the response variable charitable giving and highlighting how wealth has a positive effect on the outcome.

LME have been fitted to check if there was subject variability, but they did not show an improvement in variance and/or in the model coefficient and especially in the variance description. Even if the resulting standard error for each coefficient was slightly smaller, they were not giving an added value to the results obtained with Model 1 and Model 2. This results is the consequence of the homogeneity characteristics of this population as seen in Table 4 and Table 5, which remain constant all over the years and do not imply a drastically change in their behavior, for which the random effects brings advantages.

Three Robust regression models with M-estimation technique, with 90%, 80% and 70% efficiency and corresponding to the *c* constants: c= 3.881, 3.116, 2.664, for the function Tukey's bisquare (5), for an iterative estimation of the coefficients, were also fitted and the results for 90% efficiency are reported in Table 6 and 7. Also in this case there is a negative regression coefficient for income (β_{Inc}=-9.9x10-4) and a positive regression coefficient for wealth (β_{Wth}=1.7x10-4) and a statistical significant interaction (β_{Int}=1.2x-10-10), further confirming the previous findings. Since

the corresponding R^2_{Adj} coefficients for the robust models were slower than the linear and LME ones, the linear regression results were the one further analyzed and considered. Given the similar characteristics of the group of people in *deducters11*, not many outliers are present and so the robust technique do not show an advantage over classic ones. Where the robust regression were showing an advantage of the classical linear one was for the specific case of *deducters11-ceiling*. Both the variable wealth and the interaction with wealth were not significant, highlighting how in the specific subgroup of people interested in reaching the ceiling only income is the only variable driving donations as already explained in Lideikyte-Huber 2022.

While if we observe results from Table 7, referring to the subset *deducters11-ceiling*, the interaction between income and wealth is no longer significant and only income is a statistically significant variable from the resulting p-value smaller than 0.05. These results confirm the findings from Lideikyte-Huber2022 where income was the only significant factor for deducters interested in reaching the ceiling. While for regular deducters among time, income has a negative effect on deductions, while his interaction with wealth and wealth itself is significant and positive. For the robust regression analysis similar results as the ones shown in Table 6 and 7 were found. Moreover, since in the group of regular deducters there are taxpayers with similar characteristics, there were not so many outliers. We preferred to privilege the efficiency of the ordinary least square method rather than the robustness, considering the reduced number of extreme values.

Table 6. Table with the beta estimates: β and the p-values: p for 'Net Income for deductible donations': Inc, 'Gross Wealth': Wth and their Interaction: 'Int', with the adjusted R^2: R^2_{Adj} resulting from the standard bi-variable linear regression model with and without interaction fitted for the subset of deducters11 for all years and for each year under study.

	Linear models with interaction							Linear models without interaction				
Deducters11	βInc	pInc	βWth	pWth	βInt	pInt	R2Adj	βInc	pInc	βWth	pWth	R2Adj
All 11 years	*-4.3x10-3*	<0.05	9.2x10-4	<0.05	1.9x10-11	<0.05	0.31	-4.4x10-3	<0.05	9.7x10-4	<0.05	0.30
All 11 years[1]	*-8.0x10-3*	<0.05	1.3x10-3	<0.05	1.4x10-11	<0.05	0.31	-1.4x10-3	<0.05	1.4x10-3	<0.05	0.30
All 11 years[2]	*-7.9x10-3*	<0.05	1.3x10-3	<0.05	1.5x10-11	<0.05	0.31	-2.9x10-3	<0.05	1.5x10-3	<0.05	0.30
All 11 years[3]	*-9.9x10-4*	<0.05	1.7x10-4	<0.05	1.2x-10-10	<0.05	0.13	-7.4x10-4	<0.05	1.4x10-4	<0.05	0.35
2001	*-2.2x10-3*	<0.05	4.7x10-4	<0.05	2.5x10-11	<0.05	0.56	6.5x10-3	<0.05	5.5x10-4	<0.05	0.51
2002	2.8x10-3	<0.05	4.1x10-4	<0.05	2.2x10-11	<0.05	0.62	9.5x10-3	<0.05	5.0x10-4	<0.05	0.61
2003	5.3x10-3	<0.05	3.2x10-4	<0.05	*-1.5x10-12*	<0.05	0.66	4.7x10-3	<0.05	3.2x10-4	<0.05	0.66
2004	4.4x10-3	<0.05	2.9x10-4	<0.05	1.2x10-11	<0.05	0.69	8.6x10-3	<0.05	3.3x10-4	<0.05	0.68
2005	*-2.8x10-3*	<0.05	2.7x10-4	<0.05	3.7x10-11	<0.05	0.74	1.1x10-2	<0.05	3.8x10-4	<0.05	0.65
2006	6.8x10-3	<0.05	4.5x10-4	<0.05	*-9.7x10-12*	<0.05	0.62	2.3x10-3	<0.05	4.2x10-4	<0.05	0.59
2007	2.9x10-3	<0.05	3.5x10-4	<0.05	3.0x10-12	<0.05	0.66	4.5x10-3	<0.05	3.6x10-4	<0.05	0.66
2008	*-6.9x10-3*	<0.05	7.7x10-4	<0.05	2.3x10-11	<0.05	0.58	4.9x10-3	<0.05	8.2x10-4	<0.05	0.53
2009	*-5.4x10-3*	0.02	7.5x10-4	<0.05	8.3x10-11	<0.05	0.48	3.8x10-2	<0.05	9.8x10-4	<0.05	0.43
2010	*-1.9x10-2*	<0.05	1.9x10-3	<0.05	3.7x10-11	<0.05	0.40	3.0x10-4	0.74	2.0x10-3	<0.05	0.38
2011	1.3x10-2	<0.05	5.3x10-4	<0.05	*-1.9x10-11*	<0.05	0.23	4.4x10-3	<0.05	4.5x10-4	<0.05	0.21

[1]LME: Linear Mixed-Effects Model with a random intercept.
[2]LME: Linear Mixed-Effects Model with a random slope for the years.
[3]Robust: Robust regression with M-estimation and a 90% efficiency.

Table 7. Table with the beta estimates: β and the p-values: p for 'Net Income for deductible donations': Inc, 'Gross Wealth': Wth and their Interaction: 'Int', with the adjusted R^2: R^2_{Adj} resulting from the standard bi-variable linear regression model with and without interaction fitted for the subset of *deducters11-ceiling* globally (All) and for each year under study.

Deducters11	Linear models with interaction							Linear models without interaction				
	β Inc	pInc	β Wth	pWth	β Int	pInt	R2Adj	β Inc	pInc	β Wth	pWth	R2Adj
All 11 years-ceiling	5.1x10-3	<0.05	8.1x10-4	<0.05	1.4x10-10	<0.05	0.76	3.6x10-2	<0.05	3.6x10-2	<0.05	0.73
All 11 years-ceiling[1]	5.1x10-3	<0.05	8.1x10-4	<0.05	1.4x10-10	<0.05	0.76	3.6x10-2	<0.05	1.3x10-3	<0.05	0.73
All 11 years ceiling[2]	5.1x10-3	<0.05	8.1x10-4	<0.05	1.4x10-10	<0.05	0.76	3.6x10-2	<0.05	1.3x10-3	<0.05	0.73
All 11 years[3]	*5.0x10-2*	*<0.05*	*2x10-9*	*0.49*	*-6.1x10-17*	*0.80*	*1*	*5.0x10-2*		*1.7x10-9*	*0.17*	*1*
2001-ceiling	5.0x10-2	<0.05	2.5x10-6	*0.37*	7.3x10-13	*0.19*	0.95	5.0x10-2	<0.05	1.6x10-6	*0.55*	*0.97*
2002-ceiling	4.9x10-2	<0.05	7.0x10-6	0.30	1.3x10-12	0.11	0.98	4.9x10-2	<0.05	8.7x10-6	0.19	0.99
2003-ceiling	5.0x10-2	<0.05	8.5x10-6	0.04	2.5x10-13	0.64	0.98	4.9x10-2	<0.05	9.0x10-6	0.02	0.99
2004-ceiling	4.9x10-2	<0.05	5.4x10-6	0.08	3.5x10-13	0.40	1	5.0x10-2	<0.05	5.9x10-6	0.06	1
2005-ceiling	4.9x10-2	<0.05	9.8x10-7	0.61	8.5x10-13	0.10	1	4.9x10-2	<0.05	1.8x10-6	0.33	1
2006-ceiling	4.9x10-2	<0.05	1.6x10-6	0.45	2.6x10-13	0.47	1	5.0x10-2	<0.05	1.7x10-6	0.38	1
2007-ceiling	5.0x10-2	<0.05	2.5x10-6	0.39	-1.3x10-13	0 .45	1	4.9x10-2	<0.05	4.9x10-7	0.67	1
2008-ceiling	4.9x10-2	<0.05	2.1x10-5	<0.05	6.9x10-13	<0.05	1	4.9x10-2	<0.05	9.2x10-6	0.004	1
2009-ceiling	7.6x10-2	<0.05	1.3x10-3	<0.05	-9.1x10-11	<0.05	0.99	3.5x10-2	<0.05	1.4x10-3	<0.05	0.99
2010-ceiling	9.8x10-2	<0.05	6.4x10-4	<0.05	-5.3x10-11	<0.05	0.99	7.3x10-2	<0.05	7.0x10-4	<0.05	0.99
2011-ceiling	1.0x10-1	<0.05	-1.4x10-4	0.04	2.5x10-10	<0.05	0.99	2.3x10-1	<0.05	-9.3x10-4	<0.05	0.99

[1]LME: Linear Mixed-Effects Model with a random intercept.

[2]LME: Linear Mixed-Effects Model with a random slope for the years.

[3]Robust: Robust regression with M-estimation and a 90% efficiency.

Given the small sample size of 297 regular deducters who are reaching the deductions threshold: "*deducters11-ceiling*" and the small set of variables, the models are giving a perfect fit ($R^2 = 1$). For better explaining and illustrate the findings above, the univariate linear regressions over the entire 11 years of study for both the dataset *deducters11* and *deducters11-ceiling*, considering the income and wealth variables as explanatory variables separately have been represented in the Figures 4 to 7. From the Figures 4 to 7 it is interesting to observe how the amount of deductions diminish considerably when considering the reduced subset *deducters11-ceiling* of people interested in reaching the ceiling, moving from a maximum of 7'912'630 CHF (approx.. 8 million CHF), for *deducters11*, to a maximum of 2'663'594 CHF (25approx. 2 million and a half), for *deducters11-ceiling*. A similar reduction can be observed in the income range, while in the *deducters11* reaches the value of 89'048'109 CHF (approx.. 89 million CHF), for the *deducters11-ceiling* reaches the value of 17'106'874 CHF (approx. 17 million CHF). As already shown from the results in Table 7 and as illustrated in the Figure 6 the regression lines for the years from 2001 to 2008 over-imposed with the same slope of βInc = 5.0x10-2 and only the last one referring to year 2008, represented in olive green, is visible. In Figure 6 is shown how the Income variable is clearly statistically representative, explaining the Deductions link to the legal ceiling. While for the univariate case of the linear regression with Wealth as explanatory variable is possible to see different slope for each year, indicating that as already reported in Table 7 Wealth is not a statistically significant variable for the taxpayers interested in reaching the ceiling of deductions. While as shown in Table 6 Wealth is a statistically significant variable and explaining the driver for donations for the taxpayers that constantly contribute to Charitable Deductions, without

necessarily being interested in the legal ceiling. Both in Figures 4 and 5, the regression line with the highest slope for the subset "*Deducters11*" is represented in light-blue and it corresponds to the year 2009, when the legal tax reform took effect. While for Figures 6 and 7, the regression line with the highest slope for the subset "*Deducters11-ceiling*" is represented in olive green, it corresponds to the year 2011 and it is mainly driven by the biggest donation corresponding to 2'663'594 CHF.

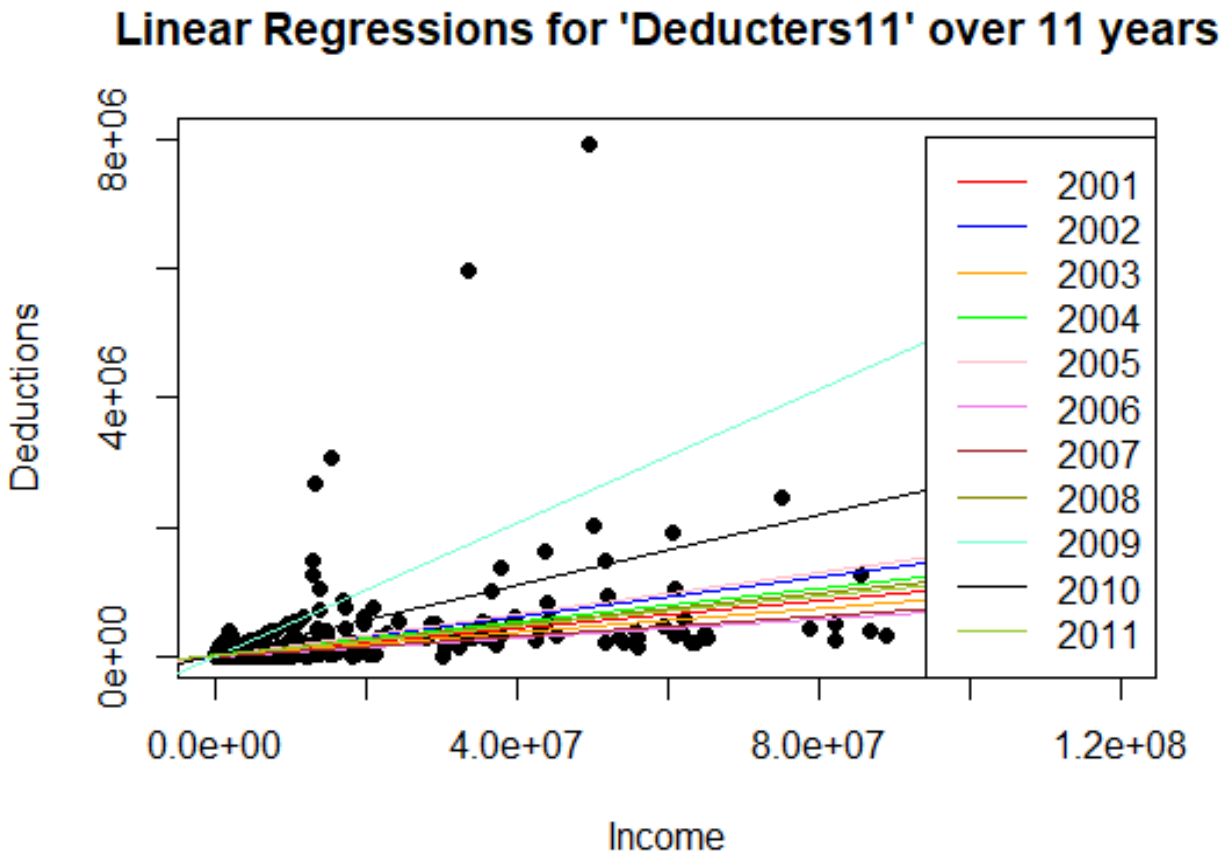

Figure 4. Figure representing the univariate linear regressions with "Deductions" as outcome variable and "Income" as explanatory variable, for the entire 11 years of study for the subgroup of constant *Deducters11*. All the 11 regression lines are clearly visible.

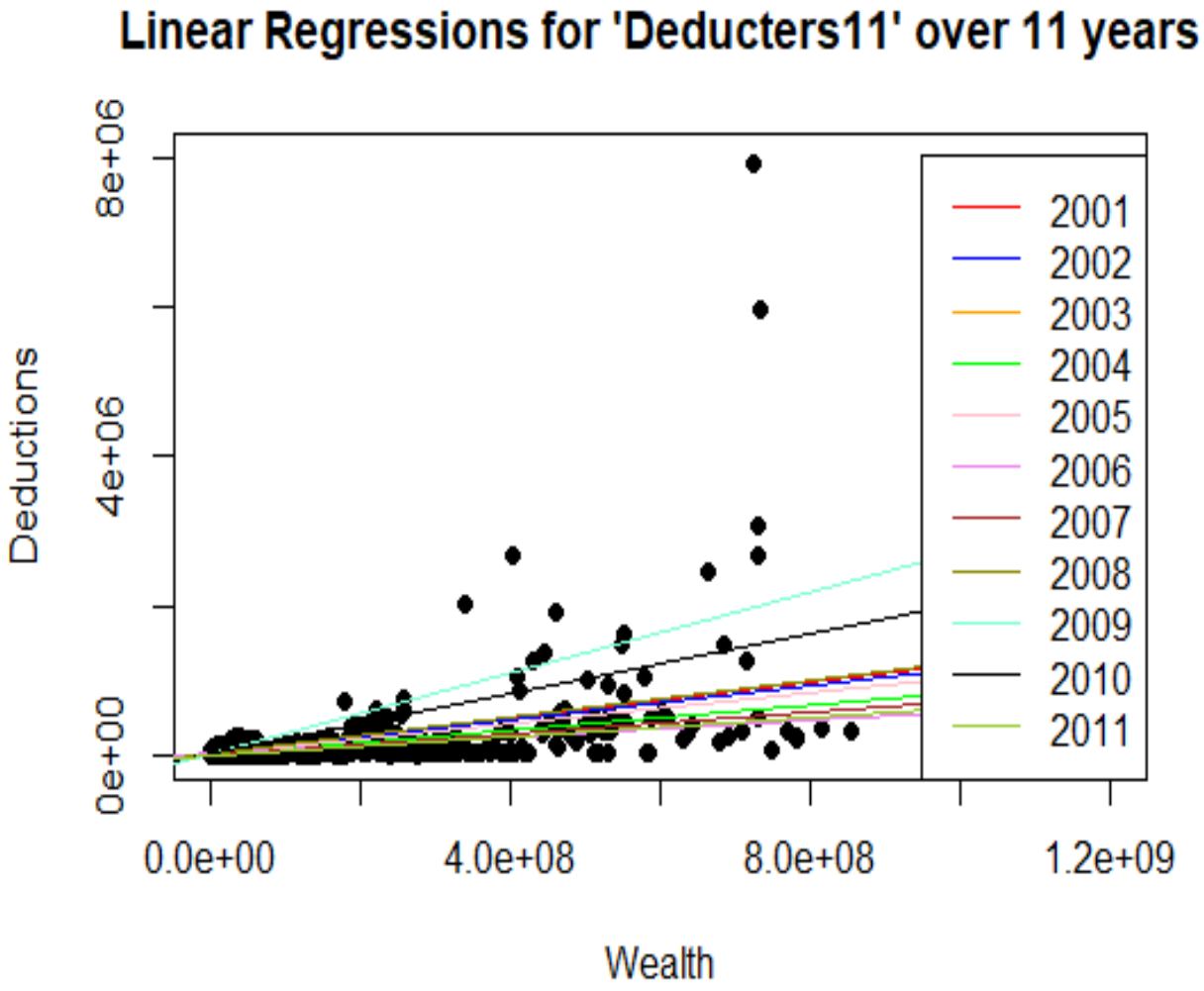

Figure 5. Figure representing the univariate linear regressions with “Deductions” as outcome variable and “Wealth” as explanatory variable, for the entire 11 years of study for the subgroup of constant “*Deducters11*”. In this case the scale for wealth is 1 million bigger, considering the higher range of wealth in comparison with the income one. All the 11 regression lines are clearly visible.

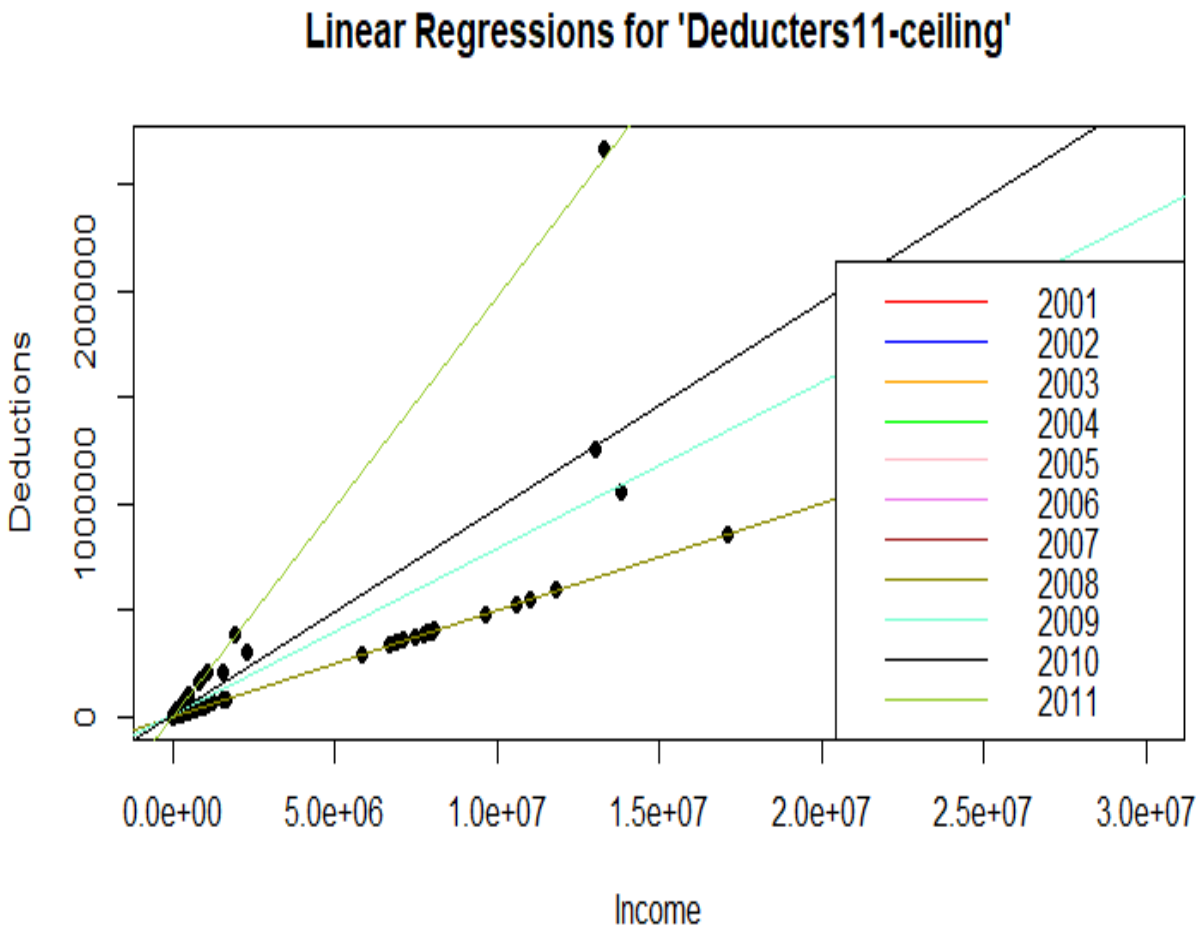

Figure 6. Figure representing the univariate linear regressions with “Deductions” as outcome variable and “Income” as explanatory variable, for the entire 11 years of study for the subgroup of constant “*Deducters11-ceiling*”. For the years 2001 until 2008 the regression lines over-imposed with the same slope, only the models for the last four years are clearly visualized. This indicates the importance of Income variable for this subset of deducters, interested in reaching the ceiling and constantly donating.

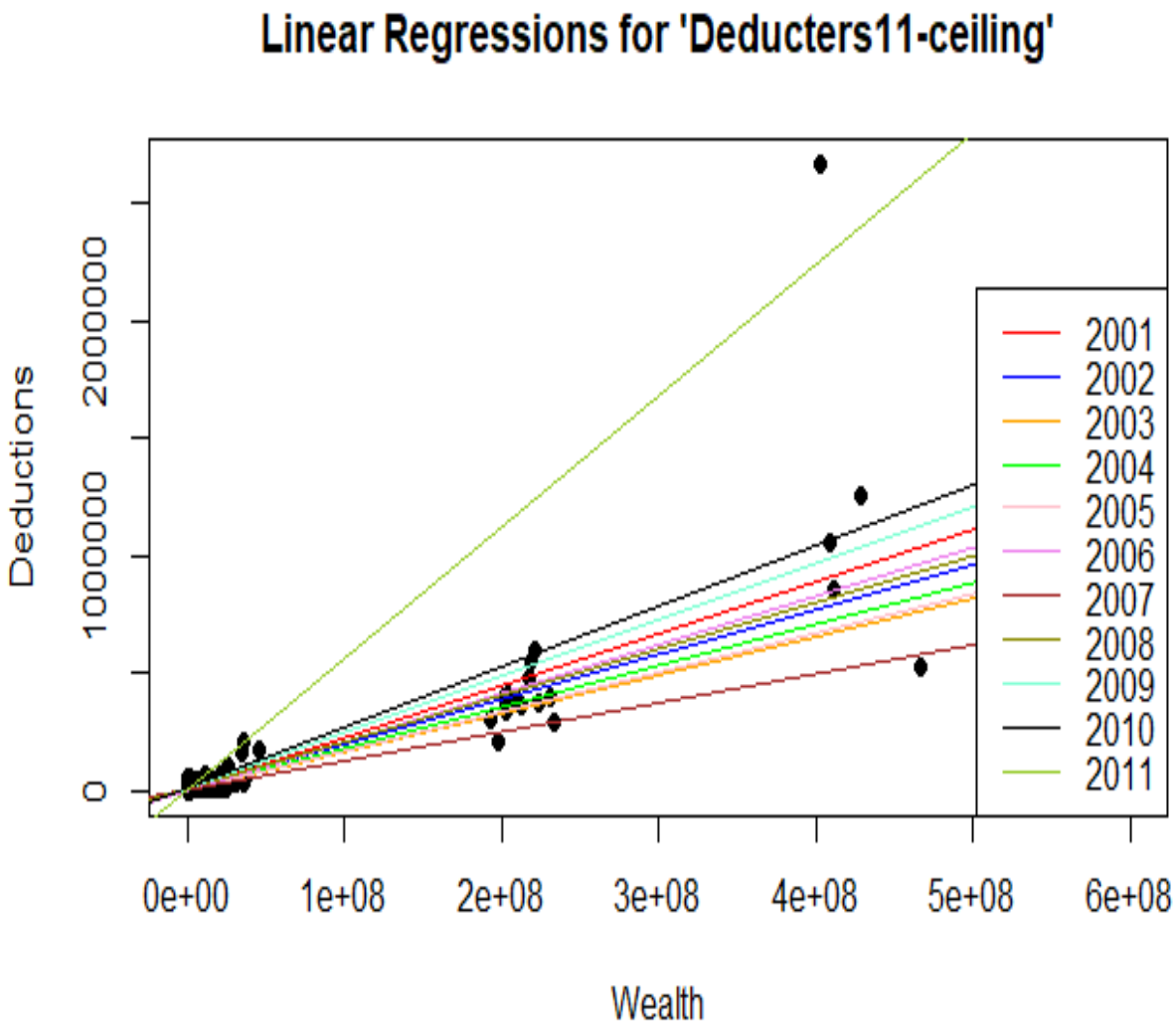

Figure 7. Figure representing the univariate linear regressions with "Deductions" as outcome variable and "Wealth" as explanatory variable, for the entire 11 years of study for the subgroup of constant "*Deducters11-ceiling*". Also in this case the scale for wealth is bigger than is 1 million. All the different 11 models are clearly represented, indicating a different slope for each year and how the wealth for this particular subset is not a significant variable driven donations.

5. CONCLUSION

The current work focuses on the regularity of deductions by donors that use tax incentives for charitable donations. Building up on Lideikyte-Huber and Pittavino (2022), where the focus was on the characteristics of all deducters in Geneva in relation to their income and wealth and the legal ceilings for charitable deductions, in the present work we seek to understand what the characteristics of very constant donors are. Such donors are very important for the funding of the charitable sector, and this research seeks to provide insights into tax incentives that could efficiently target them.

One of the conclusions of Lideikyte-Huber and Pittavino (2022) was identifying a subset of donors that were responsive to tax incentives for charitable donations - their deductions were close to the maximum legal threshold of the tax incentive. The main driver of deductions was their taxable income to which the tax incentives were related. This subset of donors was making a substantial part of annual deductions in Geneva. However, most of those donors were irregular (only 297 out of 5948 were deducting donations during the entire period).

In the present study, using a unique dataset, we focus on the subset of donors that we call "*deducters11*" that are extremely regular donors (giving and deducting donation every year) and "*deducters11-ceiling*", who reach the ceiling of deductions. We compared the subgroup of deducters identified in Lideikyte-Huber and Pittavino (2022). *Deducters11* correspond to 5948 taxpayers, who represent the 2.54% of the entire Geneva taxpayers' population from 2001. The fundamental finding of the present study is that this constancy is mainly influenced by wealth, and not income (to which the tax incentive is related). In fact, 95% of regular deducters do not reach the deductible threshold for charitable deductions. Although they use the tax incentive

(deduction), they do not structure their donations to reach the maximum available limit of it. Even though there is a peak of the amount of deductions by *deductesr11* after the reform that increased the tax incentive, it is temporary. In addition, we observe several other criteria providing characteristics of constant givers. In particular, the regularity of deductions is more typical in multiple-person taxpayer households rather than single taxpayers, as opposed to Lideikyte-Huber and Pittavino (2022) that analyzed deductions related to the income tax incentive. In addition, we observe that such givers are on average and median, in between their mid-50s and late 60s (around legal retirement age in Switzerland).

With respect to the methodology, three types of regression methods have been used and since the population characteristics are similar with a few presence of outliers, the standard linear regression based on least squared efficient estimation gave better results than the mixed models and the robust regression, based on M-estimation.

Wealth being an important factor for regular deducters, a parallel tax incentive linked to wealth, and not to income, could be envisaged to boost donations for this segment of donors. Such a solution, proposed in legal publications (Lideikyte-Huber and Peter, 2022) and which would be in line with the general goals of the Swiss legislator that seeks to maximized total giving, is substantiated by the present empirical analysis. In addition, other criteria established by this study, such the fact that very regular giving typically concerns multi-person household and the age of constant givers must be taken into account structuring tax incentives.

CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to disclose.

AUTHOR CONTRIBUTIONS STATEMENT

M.P. conceived the experiment and the analysis. M.P. conducted the experiment by preparing and merging the data. M.P. analyzed the data. M.P. and G.L-H interpreted the results. M.P. and G.L-H. wrote and reviewed the manuscript.

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DATA AVAILABILITY STATEMENT

Data necessary to replicate the results of this article are available upon request from the corresponding author, subject to a written agreement to share such data by the Tax Administration of the Canton of Geneva.

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