Holes in the ceiling!
Dividend elasticities and tax avoidance in light of the ceiling mechanism of the French wealth tax

Elvin Le Pouhaër

May 18, 2023

Master's Thesis

Master's in Economics, Sciences Po

Supervisor: Lucas Chancel

Member of Jury: Gabriel Zucman

Abstract

We study the implications of the ceiling mechanism of the French wealth tax on wealthy households' behavioral responses. On the one hand, the 2018 wealth tax reform implied a large drop in the income marginal tax rate for households which were benefiting from the ceiling. Accordingly, we show that, in 2018, their dividends increase was 30 percentage points higher than for other tax units only impacted by a concomitant capital income tax reform. The incidence of the ceiling mechanism being important at the very top of the wealth distribution, one has to take it into account when computing rich households' dividend elasticity. We test the isoelasticity assumption along the distribution of wealth taxpayers and show that it cannot be rejected. On the other hand, the ceiling mechanism offers a way for households to reduce the amount of wealth tax they pay by decreasing their declared income. We find limited although statistically significant evidence of such behavioral response, with an excess mass above the ceiling ranging from 4 to 9% of the tax units benefiting from it.

Keywords: French wealth tax, Dividend elasticity, Tax avoidance

Introduction

In the last decades, the empirical literature in public economics has been trying to estimate the elasticity of various tax bases in response to marginal tax rate changes so as to calibrate models of optimal taxation. However, recent research has shown that these estimated elasticities based on tax return data may not be rightly interpreted as structural parameters depending solely on households' preferences. Indeed, rather than estimating pure real response, these estimates tend to capture optimization behaviors by households making use of features of the tax system (Saez et al. (2012); Piketty et al. (2014)). For example, in the literature on dividend taxation, the high responsiveness of thereof to variations in the net of tax rate has been linked to strategies of income and consumption shifting from personal to corporate tax bases by owner-managers and households having a form of control over firms (Alstadsæter and Jacob (2016)). The use of companies as tax-free saving vehicles, allowing inter-temporal shifting of dividend payouts in response to tax hikes and tax cuts have also been documented (Bach, Bozio, Fabre, et al. (2021)). This paper provides an illustration of these seminal findings, showing how a specific provision of the French wealth tax, aimed at limiting households' tax liability, impacted their income reporting behaviors.

The French wealth tax, or "Impôt sur la Fortune" (ISF) is an annual tax that was introduced in 1989[1]. The latter took the form of a progressive tax schedule on wealth above a relatively high exemption threshold and, consequently, never affected more than a limited number of the wealthiest households in France. In 2017, only 358,000 tax units paid the ISF (out of 38 million income tax filers) for a total tax revenue of around five billion euros. Nonetheless, the ISF has always carried a symbolic role and been the subject of heated controversies that resulted in numerous provisions and exemptions limiting the amount eventually paid by wealth taxpayers (Dherbécourt and Forero (2019); Bach, Bozio, Guillouzouic, et al. (2021)). Notably, private business wealth was, to a large extent, excluded from the tax base and households benefited from a significant deduction on the value of their primary residence. Among other debates was the fear that households with limited revenues relative to their wealth would have to pay an amount deemed confiscatory[2], assets' relative illiquidity and non-fungibility forcing them to sell part or all of their wealth to pay the tax. To address this concern, a ceiling mechanism was introduced together with the wealth tax in 1989. This ceiling, only intended for tax units fiscally domiciled in France, saw its modalities evolving over the years (cf. Figure 1). Overall, they make sure that the sum of the wealth tax due in year N, on one side, and the total of income taxes and social contributions paid in year $N-1$, on the other side, does not exceed a certain percentage of a household's income in $N-1$. We refer to this percentage as the *ceiling percentage* while the corresponding amount of revenue is called the *ceiling threshold*. Any amount of wealth tax that would make total taxes exceed that threshold is capped. As featured in Figure 3, the total amount of wealth tax capped represented more than a billion euros in 2017, about a fifth of total wealth tax revenues. From above, households benefiting from the ceiling mechanism are therefore those whose taxes-to-income ratio is greater than the ceiling percentage (whose total taxes is greater than the ceiling threshold). For convenience, we refer to the latter as "tax units located above the ceiling threshold". In 2018, the ISF was replaced by a tax on real estate wealth only, the "Impôt sur la Fortune Immobilière" (IFI), cutting in more than half the number of wealth taxpayers (cf. Figure 2). Although the ceiling mechanism continued to apply after the reform, the number of households benefiting from it

[1]Another wealth tax, called the "Impôt sur les grandes fortunes" was in place in France between 1982 and 1986

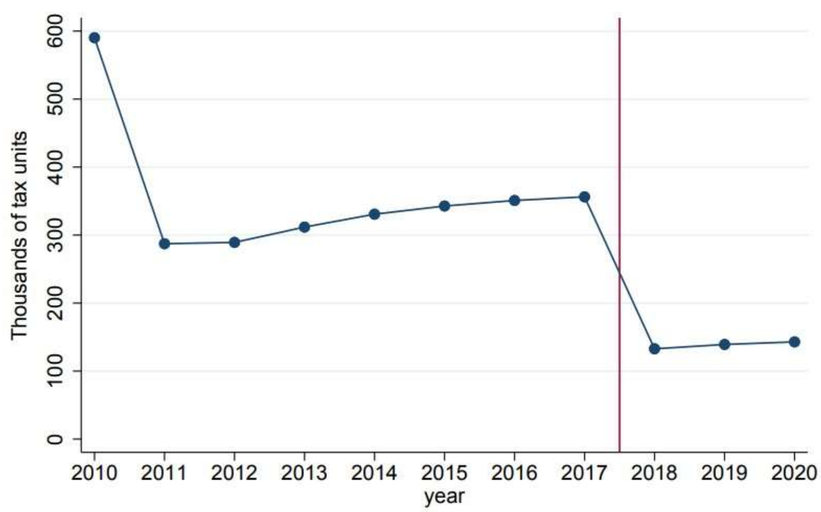
[2]The figure of those "rich poors" or "rich in spite of themselves", named after a 2000s political movement of landowners on the Island of Ré who became wealth taxpayers following a real estate boom, often served as an example in debates against the wealth tax.

as well as the total amount of wealth tax capped both dropped by more than 80%, as featured in Figure 3 and 4.

Figure 1: Main reforms having affected the ceiling mechanism of the french wealth tax

- 1989: Introduction of the wealth tax with a ceiling percentage equal to 70%
- 1991: Increase of the ceiling percentage to 85%
- 1996-2011: The capped amount is itself capped at 50% of the wealth tax initial value
- 2006-2011: Introduction of a "fiscal shield", similar to the ceiling mechanism but applied to a different set of taxes including property and household taxes and with a lower ceiling percentage (50-60%). In practice, for wealth taxpayers, the incidence of the fiscal shield remains limited compared to the ceiling mechanism.
- 2012: The ceiling mechanism is temporarily abolished
- 2013: A ceiling percentage is reintroduced at 75%
- 2018: Transformation of the wealth tax into a real estate wealth tax, decreasing by close to 80% the number of households benefiting from the ceiling mechanism

Figure 2: Total number of households paying the wealth tax, 2010-2020



As mentioned in Bach, Bozio, Guillouzouic, et al. (2021), this ceiling mechanism has two important consequences for households' behaviors, which are to be understood as two

Figure 3: Total number of households benefiting from the ceiling, 2010-2020

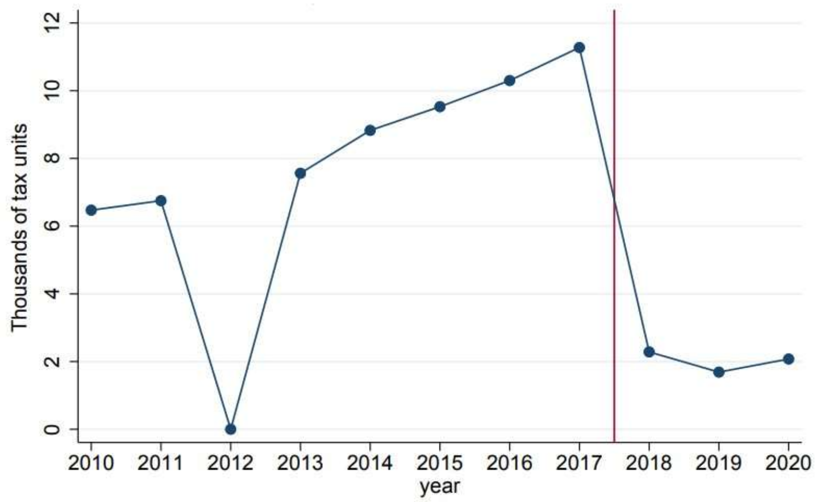
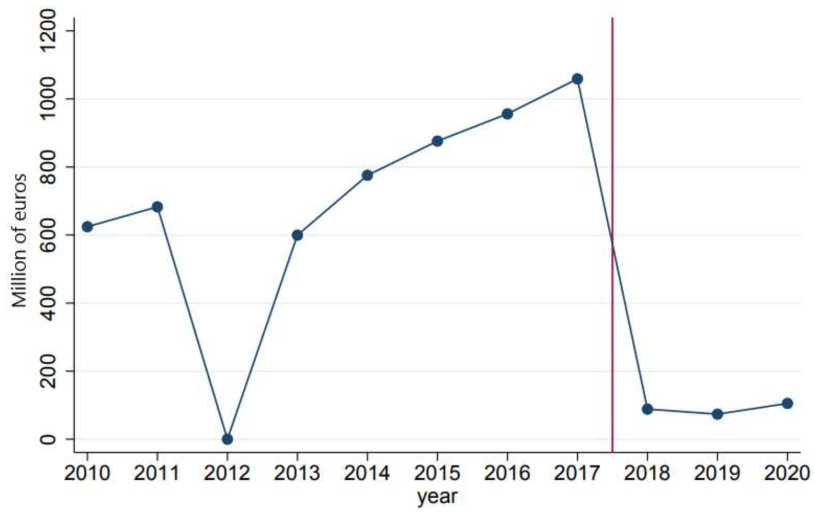


Figure 4: Total amount of wealth tax capped, 2010-2020

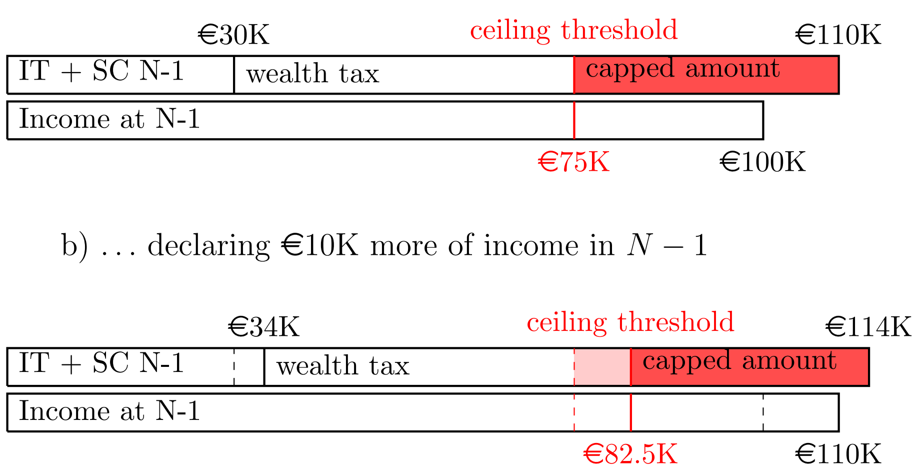


sides of the same coin. On one side, households whose total amount of taxes is above the ceiling threshold face a high marginal tax rate on revenues, equal to the ceiling percentage. We illustrate this intuition in Figure 5. In panel a), we consider, for the sake of example, a household with a 40% marginal tax rate on income (social contributions included) and who is above a 75% ceiling percentage. If this household increases its declared income by €10K in year $N-1$, as featured in panel b), the ceiling threshold mechanically increases to €82.5K (0.75×110K) and the 7.5K difference between €75K and €82.5K (pink area) is paid in taxes, resulting in a 75% marginal tax rate on income. This tax increase is a combination of a €4K increase in income taxes (for simplicity, we assume no change in the tax bracket) and an additional €3.5K increase in wealth taxes. Note that, the lower the household's tax bracket, the greater the contribution of the wealth tax to the overall tax increase. This implicit high marginal tax rate through the ceiling of the ISF holds as long as total taxes are greater than the ceiling threshold. In 2018, a capital income tax reform was implemented, the "Prélèvement Forfaitaire Unique" (PFU). The latter reform decreased the marginal tax rate on capital income to 30% for households in the third, fourth, and fifth income tax brackets. The same year, the ISF was replaced by the IFI, hence reducing significantly the amount of tax paid by wealth taxpayers. Lots of households who were above the ceiling threshold saw their taxes-to-income ratio mechanically plummeting without any change in their wealth or income, thus making the ceiling irrelevant for them. These households who fell below the ceiling threshold after 2018 hence experienced an exogenous huge decrease in their marginal tax rate on income, on top of the decrease generated by the PFU reform.

Figure 5: The ceiling mechanism: an implied marginal tax rate equal to the ceiling percentage

a) Household above a 75% ceiling percentage with a 40% marginal tax rate on income

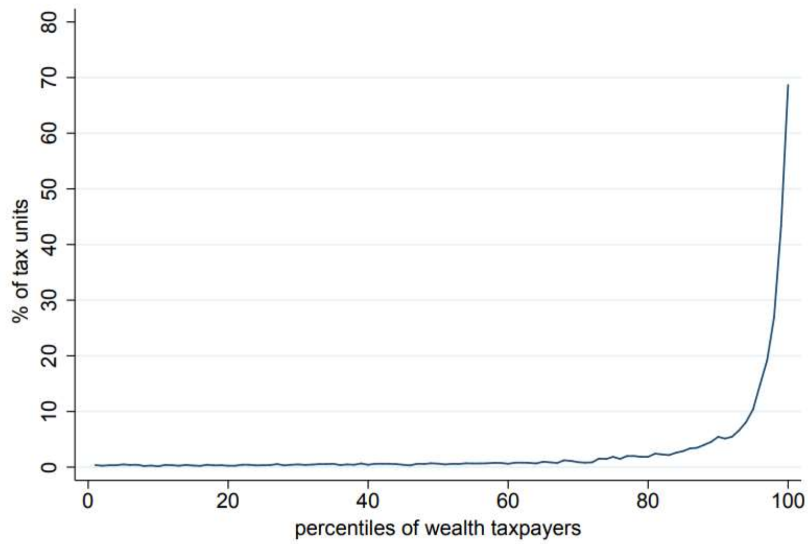
b) … declaring €10K more of income in $N-1$



Note: IT and SC stand for Income Tax and Social Contributions respectively

On the flip side of the coin, the ceiling mechanism offers rich households a way to decrease the amount of wealth tax paid by decreasing their declared income. This is illustrated in Figure 7 where we take the same household as in Figure 5 except that this time, in panel b), we consider the case where the household declares €10K less of income at $N-1$. The 7.5K difference between €75K and €67.5K (0.75 × 90K) is now saved in taxes (pink area). Symmetrically with Figure 5, part of this amount (€4K) simply corresponds to the decrease in income taxes (again assuming no change in tax bracket). But an additional decrease in taxes (€3.5K) is

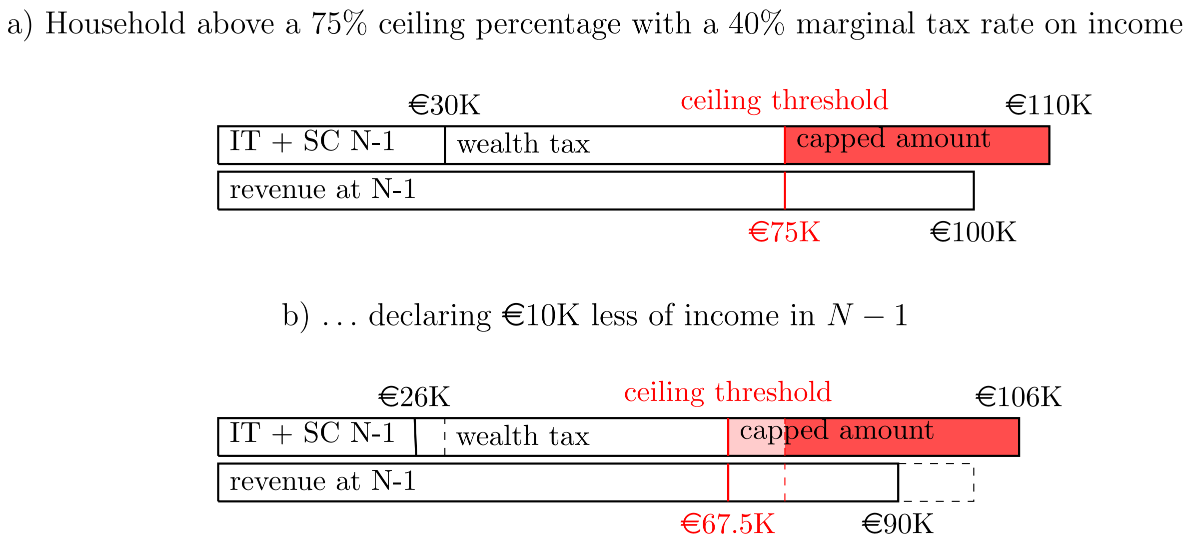
Figure 6: Percentage of tax units benefiting from the ceiling mechanism by percentile of wealth taxpayers, 2017



generated by the fall in the ceiling threshold. Consequently, out of a €10K decrease in declared income, the household only experiences a €2.5K decrease in net of tax income, whatever its tax bracket. Decreasing its declared income is only advantageous to the extent that it does not entail an equivalent drop in standards of living and that it compensates for the cost of potential misreporting or income shifting. In our setting, if the household is able to substitute, at low cost, the €2.5K decrease in net of tax income by a greater increase in standards of living elsewhere, it makes itself better off using the ceiling mechanism. In particular, one can think of three potential ways through which households could take advantage of the ceiling mechanism. First of all, as explained in Bach, Bozio, Guillouzouic, et al. (2021), owner-managers and households having some control over companies could compensate for their net of tax income loss by an increase in intra-firm consumption, hence maintaining their standards of living while capitalizing remaining profits inside the firm and wait for a tax reform to increase dividend payouts. Secondly, prior to the introduction of an "anti-abuse" clause in 2017, income received through family holding companies, so-called "cash boxes", were not included in households' income for the computation of their ceiling threshold, hence offering them a way to artificially decrease their declared income. Finally, the use of the so-called "buy, borrow, die" strategy, by which wealthy households live off loans they obtain using their wealth as collateral while obtaining tax credits on income used to repay the interests, could allow households to declare a disproportionately low income compared to the total amount of their assets.

Our main results can be summarized as follows. First, our difference in differences estimates indicate that, in accordance with the large drop in the marginal income tax rate experienced by households falling below the ceiling threshold after the IFI reform, the increase in dividends

Figure 7: The ceiling mechanism, a way to decrease the amount of wealth tax paid



Note: IT and SC stand for Income Tax and Social Contributions respectively

declared by the latter was 30 percentage points larger than the increase in dividends declared by other households positively affected by the PFU. As featured in Figure 6, households benefiting from the ceiling are mainly located at the very top of the wealth distribution (the top 10% of wealth taxpayers, corresponding approximately to the top 0.1% of the French wealth distribution). Therefore the combination of the PFU and the IFI reforms drastically decreased the marginal tax rate on capital income for the wealthiest households in France, leading them to increase importantly their declared dividends. This has important consequences if one is interested in dividend elasticity at the very top of the wealth distribution. We provide estimations of dividend elasticity in reaction to the PFU and IFI reforms across quantiles of wealth taxpayers and show that we cannot reject the isoelasticity assumption once the incidence of the ceiling is taken into account. Secondly, we study households' optimization behaviors induced by the ceiling mechanism prior to the IFI reform. We start by formally describing reporting incentives under the ceiling mechanism with a simple model of income misreporting. In the data, we find limited, although statistically significant, excess mass of households above the ceiling threshold comprised between 330 and 690 tax units, which represents between 4 to 9% of the tax units benefiting from the ceiling.

The paper is organized in the following way. In Section 1, we relate this study to the literature. Section 2 presents the data we used for the analysis. Section 3 shows how, in accordance with the larger decrease in the marginal tax rate they experienced, households located above the ceiling threshold prior to the IFI and PFU reforms overreacted to the latter. We also study the resulting dividend elasticities along the wealth distribution. In Section 4, we introduce a simple static tax avoidance model allowing to formalize households' reporting incentives under the ceiling mechanism. We then try to estimate the magnitude of these avoidance behaviors by obtaining estimates of excess mass above the ceiling threshold. Finally, Section 6 discusses the limits of our results as well as their implications for policy makers.

1 Related Literature

This study first contributes to the literature on the impact of the 2018 French wealth tax reform using administrative data recently made available to researchers by the "Direction générale des Finances Publiques" (DGFIP) (Dherbécourt and Forero (2019), FranceStratégie (2020) Bach, Bozio, Guillouzouic, et al. (2021)). In particular, in section 4.3 of their report, Bach, Bozio, Guillouzouic, et al. (2021) show that, after 2018, companies having at least one shareholder above the ceiling threshold in 2017 increased their dividends payouts compared to other companies both along the intensive and extensive margins. Although their estimates on the intensive margin suffer from limited precision, they conclude that the IFI reform led to extra dividend payouts, on top of the ones triggered by the introduction of the PFU. Our study confirms their results looking at dividends declared by households in their income tax returns. We also complement these findings by showing that the drop in the marginal income tax rate implied by the IFI reform also had a positive impact on wages declared by tax units who were above the ceiling threshold.

Secondly, we confirm previous results in the literature on dividend elasticity showing that dividends are highly reactive to variations in their marginal tax rate (Poterba (2004); Chetty and Saez (2005)). Our results show that this holds true even when the marginal tax rate is indirectly implied by a parallel tax provision applied on another tax base (wealth). Closer to our setting, Bach, Bozio, Fabre, et al. (2021) find a significant and sizeable reaction of dividends given out by firms in response to capital income tax reforms implemented in France in 2013 and 2018. Using households' income tax returns, they also study the reaction of dividends received by ISF taxpayers in reaction to these reforms and find an even larger dividend response on the household side. We base ourselves on their work for the use of French administrative fiscal data to estimate dividend response. In particular, we adapt their difference in differences framework to our setting and partly follow their study for sample selection and the construction of our variables. We also find that their estimated aggregate dividend response to the PFU reform is robust to the exclusion of households benefiting from the ceiling prior to the reform.

Moreover, in the literature on optimal taxation of capital income, it is generally assumed that the tax base elasticity is constant across households (Saez and Stantcheva (2018), Gerritsen et al. (2020), Schulz (2021)). We test this isoelasticity assumption along the wealth distribution of ISF taxpayers. Since a significant proportion of tax units at the very top of the wealth distribution were subject to the ceiling mechanism, the concomitance of the IFI and the PFU reforms induced a large drop in the marginal tax rate on dividends for the richest households in France. We take this into account when computing their dividend elasticity and show that the isoelasticity assumption cannot be rejected.

Finally, Bach, Bozio, Guillouzouic, et al. (2021) also mention in their study that the ceiling mechanism may offer households a way to reduce the amount of wealth tax paid by decreasing their declared income. They add that this might especially benefit owner-managers and households having some control over firms since they can control dividend payouts and substitute between private and intra-firm consumption. Garbinti et al. (2023) show that ISF taxpayers misreport their declared wealth to benefit from simplified reporting requirements, indicating that these households may be responsive to avoidance incentives. Moreover, income shifting between private and corporate tax bases, as well as overtime, are common results in the tax avoidance literature (Alstadsæter and Jacob (2016); Bach, Bozio, Fabre, et al. (2021)). However, to the best of our knowledge, we are not aware of any previous work on households' avoidance strategies in front of a similar feature of the tax system as the ceiling mechanism studied here. Neither are we aware of any empirical method designed to estimate the kind of shift in the distribution that is to be expected from households' reporting responses induced by this ceiling. Indeed, the fact that households that would locate above the ceiling threshold absent any misreporting also have an incentive to lower their reported income in order to reduce further the amount of wealth tax paid distinguishes our setting from the standard bunching frameworks (Saez (2010); Kleven and Waseem (2013); Kleven (2016)). We thus contribute to the literature by formalizing households' incentives under the ceiling in a very simple static income reporting model. We then adapt the bunching framework presented in Chetty et al. (2011) in an attempt to provide estimates of the excess mass of households above the ceiling threshold.

2 Data

We use French administrative fiscal data on income (POTE files) and wealth (ISF-IFI file) through remote secure access provided by the "Centre d'Accès des Données Sécurisées" (CASD). POTE files contain all the amounts declared by the 38 million French tax units in each of the 3,000 entries of their income tax return. ISF-IFI file is a panel database from wealth tax returns including, for each year, the universe of wealth taxpayers. Using an anonymous unique common identifier variable, we merge POTE and ISF/IFI files for the years between 2010 and 2020. Our baseline sample hence includes all households having paid the wealth tax at least once over the 2010-2020 period.

For the dividend response analysis, we follow Bach, Bozio, Fabre, et al. (2021) and use a balanced subset of the baseline sample including all households present in the income tax files over the whole period between 2013 and 2020 and having paid the wealth tax at least once in the pre reform period (2013-2017). For reasons of confidentiality, the amount of taxable wealth of some very rich households is capped at €200M in the data. For these households, the entries allowing to compute their capped amount are censored and we have no way to infer exactly whether they are above or below the ceiling threshold. We drop the 36 tax units which have censored entries at some point during the pre reform period and which were remaining in our sample at this point. The resulting balanced panel comports 305,422 tax units.

To benefit from the ceiling, wealth taxpayers must fill two items of their wealth tax returns, indicating respectively the total amount of income received and the total amount of taxes and social contributions they paid in the previous year. Households have to compute these figures on their own following detailed instructions provided by the tax administration. Consequently, these figures are only available for households taking the initiative to declare them in their wealth tax returns. In Appendix 1, we describe in details how all the variables mentioned in this study were built from the income and wealth tax returns.

3 Households above the ceiling threshold overreacted to the PFU reform

The first main implication of the ceiling mechanism is that households located above the ceiling threshold face a high income marginal tax rate. In the following section, we show that, due to the simultaneity of the wealth tax (IFI) and capital income tax (PFU) reforms, households who fell below the ceiling threshold between 2017 and 2019 experienced a larger drop in their marginal tax rate on capital income compared to other households positively affected by the introduction of the PFU. Consequently, the wealth tax reform not only significantly reduced the amount of wealth tax paid by the richest households in France, it also drastically decreased the marginal tax rate on their income. Accordingly, we show that, everything held equal, tax units which were above the ceiling threshold before 2018 and no longer after, overreacted to the PFU reform compared to other households that also benefited from the PFU.

3.1 Effect of the IFI and PFU reforms on marginal tax rates

Throughout the paper, we will refer to $\tilde{Y}_{i,N-1}$ as the total income declared by household i in year $N-1$. The sum of income taxes and social contributions paid by household i in year $N-1$ is a function of declared income $\tilde{Y}_{i,N-1}$, noted $T_{Y,i,N-1}(\tilde{Y}_{i,N-1})$. It is tax unit-specific because, for example, households may benefit from different tax exemptions or might have to pay deferred taxes from previous years. Last element, the imputed amount of wealth tax for household i (before the application of the ceiling mechanism) is a function of taxable wealth at N, $W_{i,N}$, and written $T_{W,i,N}(W_{i,N})$. In the following, we simplify the notation by dropping the time subscripts, as well as the household subscript for the tax functions, re-including them only when necessary for the analysis. It follows that households benefiting from the ceiling are those for which:

$$(1) \quad \Big(T_Y(\tilde{Y}_i) + T_W(W_i)\Big) \,/\, \tilde{Y}_i \geq 0.75 \text{ (0.85 prior to 2012)} \;\Rightarrow\; \tilde{Y}_i \leq \Big(T_Y(\tilde{Y}_i) + T_W(W_i)\Big) \,/\, 0.75$$

Importantly, note that i is said to be above the ceiling threshold when its reported income is below the right-hand side of inequality (1).

Between 2013 and 2017, capital and labor income in France were both subject to a progressive income tax schedule with marginal tax rate ($\tau^{bracket}$) depending on households' tax bracket, and a flat social contribution rate of 15.5% ($\tau^{soc.cont}$). The PFU reform of 2018 slightly increased $\tau^{soc.cont}$ to 17.2% while giving households the option to choose between the progressive schedule, $\tau^{bracket}$, and a flat rate of 12.8% (τ^{PFU}) on their capital income. Consequently, the implementation of the PFU reduced the marginal tax rate on capital income to 30% (12.8% + 17.2%) for households in the 30%, 41% and 45% income tax brackets. Following Bach, Bozio, Fabre, et al. (2021), Appendix 2 describes in details how is computed the marginal tax rate on dividends prior to the reform, in 2017 (τ^{2017}), and after the reform, in 2018 (τ^{2018}). Table 1 summarizes the implication of the PFU and IFI reforms for households' dividend marginal tax rates depending on their tax bracket and on whether or not they were above the ceiling threshold prior to 2018 (we do not consider households remaining above the ceiling threshold after 2018). As can be observed, households falling below the threshold after 2018 experienced a large drop in their marginal tax rate on dividends (a large increase in their marginal keep rate) of at least 45 percentage points. This is 34.8 to 42 points more than the drop for other households positively affected by the PFU reform but below the ceiling threshold.

Table 1: Implication of the PFU and ISF reforms on households' marginal tax rate on dividends

a) Households below the ceiling threshold over the whole period

$\tau^{bracket}$	τ^{2017}	τ^{2018}	$\partial(1-\tau)^{B^{bracket}}$	Treatment/Control group
0%	0.155	0.172	$\partial(1-\tau)^{B^{0}}$ = -0.017	Control: $A_i = 0$, $B_i = 0$
14%	0.232	0.249	$\partial(1-\tau)^{B^{14}}$ = -0.017	Control: $A_i = 0$, $B_i = 0$
30%	0.32	0.30	$\partial(1-\tau)^{B^{30}}$ = 0.02	Treatment 1: $A_i = 0$, $B_i = 1$
41%	0.38	0.30	$\partial(1-\tau)^{B^{41}}$ = 0.08	Treatment 1: $A_i = 0$, $B_i = 1$
45%	0.402	0.30	$\partial(1-\tau)^{B^{45}}$ = 0.102	Treatment 1: $A_i = 0$, $B_i = 1$

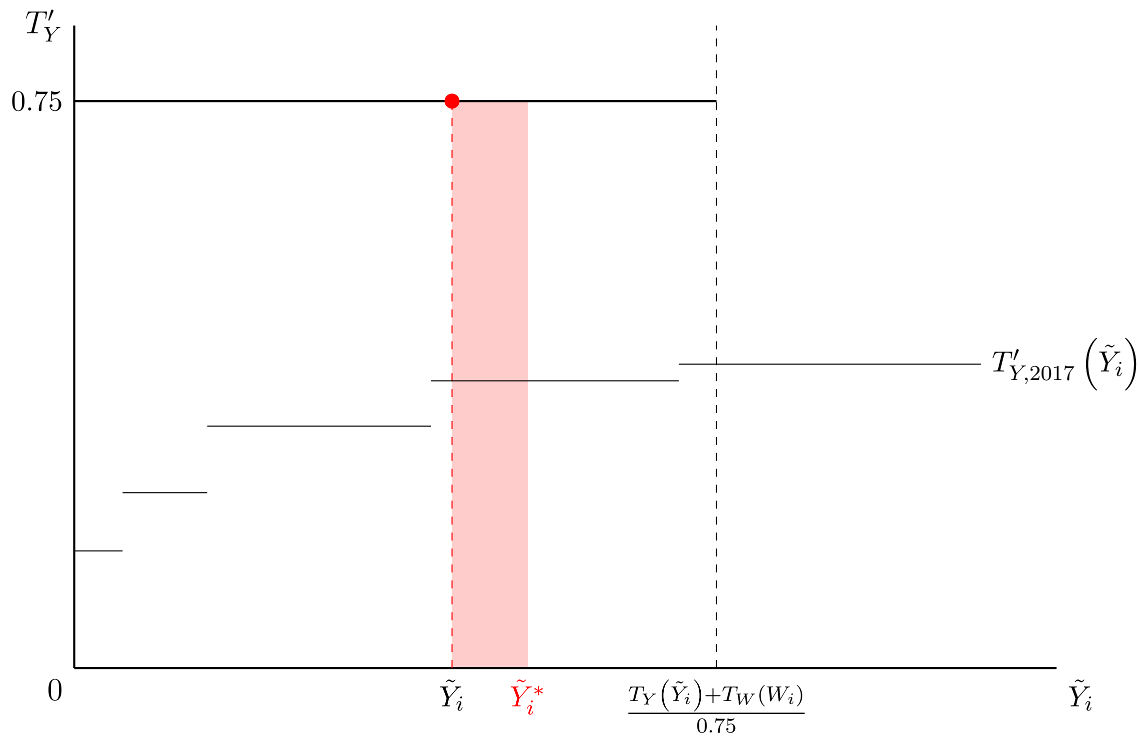
b) Households above the ceiling threshold before 2018 and below after

$\tau^{bracket}$	τ^{2017}	τ^{2018}	$\partial(1-\tau)^{A^{bracket}}$	Treatment/Control group
0%	0.75	0.172	$\partial(1-\tau)^{A^{0}}$ = 0.578	Treatment 2: $A_i = 1$, $B_i = 0$
14%	0.75	0.249	$\partial(1-\tau)^{A^{14}}$ = 0.501	Treatment 2: $A_i = 1$, $B_i = 0$
30%	0.75	0.30	$\partial(1-\tau)^{A^{30}}$ = 0.45	Treatment 2: $A_i = 1$, $B_i = 0$
41%	0.75	0.30	$\partial(1-\tau)^{A^{41}}$ = 0.45	Treatment 2: $A_i = 1$, $B_i = 0$
45%	0.75	0.30	$\partial(1-\tau)^{A^{45}}$ = 0.45	Treatment 2: $A_i = 1$, $B_i = 0$

Note: Households remaining above the ceiling threshold after 2017 are exclude from the analysis

Figure 8 represents graphically the progressive income tax schedule on dividends in 2017 as well as the situation of household i, in the 41% tax bracket, being above the ceiling threshold in 2017. If i increases its dividends from $\tilde{Y}_i$ to $\tilde{Y}_i^*$, it will pay $0.75 \times (\tilde{Y}_i^* - \tilde{Y}_i)$ more in taxes out of which $T'_{Y,2017}(\tilde{Y}_i) \times (\tilde{Y}_i^* - \tilde{Y}_i)$ are paid in income taxes and social contributions and the remainder in wealth tax. We can observe that the implied 75% marginal tax rate only applies so long as i remains above the ceiling threshold. In Figure 9 we model the situation in 2018 for household i keeping the same income $\tilde{Y}_i$ and wealth W_i but experiencing a sharp decrease in the amount of wealth tax paid (from $T_W(W_i)$ to $T_W^*(W_i)$) due to the IFI reform. Consequently, household i falls below the ceiling threshold and the 75% marginal tax rate implied by the ceiling does no longer apply. The green area characterizes the impact of the IFI reform on the overall drop in i's marginal tax rate while the blue area represents the impact of the PFU reform.

Figure 8: Marginal tax rate on dividends for household i located above the ceiling threshold in 2017



3.2 Impact of the ceiling mechanism on households' dividends

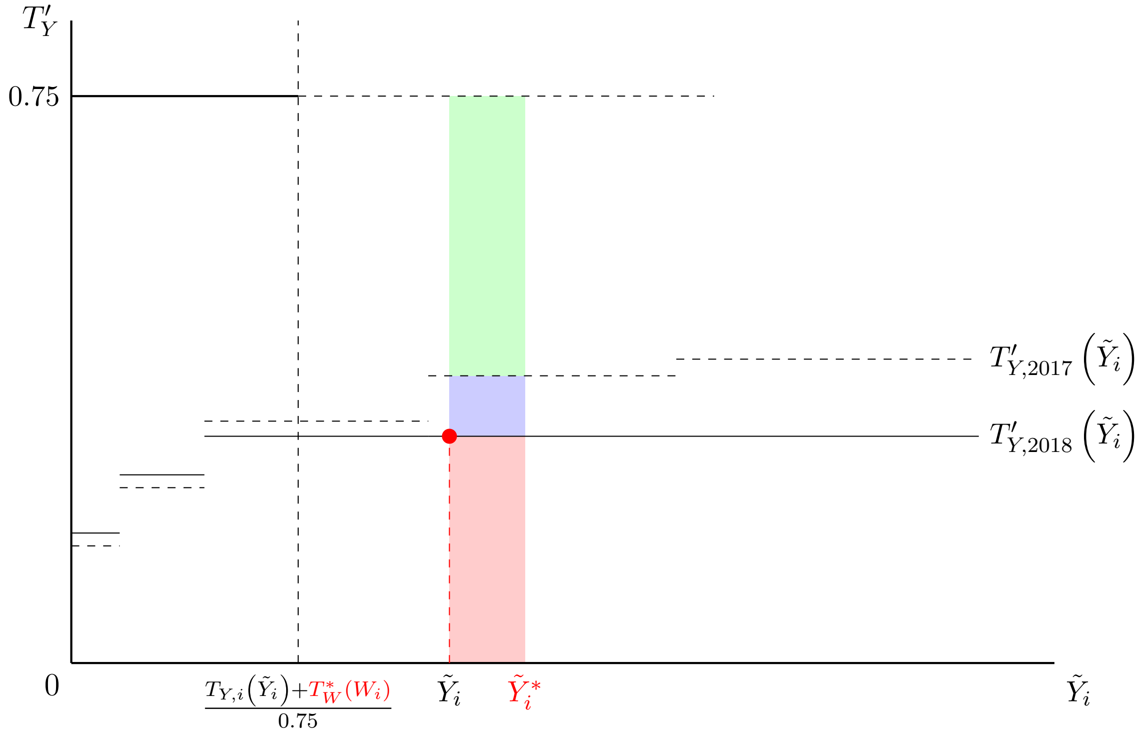
3.2.1 Difference in differences model

Now that we have seen that households falling below the ceiling threshold after 2018 experienced a larger decrease in their marginal tax rate we show that, consequently, their dividends overreacted to the PFU reform. To do so, we use a difference in differences model similar to the one proposed by Bach, Bozio, Fabre, et al. (2021) to estimate the effect of the PFU reform. We estimate equation (2) below:

$$
\begin{aligned}
(2) \quad D_{it} = \sum_{\substack{d=2013 \\ d\neq 2016}}^{2020} \mathbb{1}\{t=d\}\lambda_t + \beta_d^B \times \mathbb{1}\{t=d\} \times B_i \\
+ \beta_d^A \times \mathbb{1}\{t=d\} \times A_i + \mathbf{x}_i'\mathbb{1}\{t=d\}\boldsymbol{\delta}_d + \mu_i + \varepsilon_{it}
\end{aligned}
$$

Where D_{it} are the dividends declared by tax unit i in year t over the 2013-2017 average. $\mathbb{1}\{t=d\}$ is a dummy variable for year t. B_i is a dummy for tax unit i being positively affected by the PFU reform but below the ceiling threshold while A_i is a dummy for i being above the ceiling threshold in 2017 but not after 2018. μ_i and λ_t are respectively tax unit and time fixed effects. Finally, $\mathbf{x}_i'\mathbb{1}\{t=d\}$ are time-invariant tax unit characteristics set prior to the reform

Figure 9: Marginal tax rate if household i is above the ceiling threshold prior to the reform



interacted with year indicators. We control for age of the first declarant in 2016, number of fiscal shares in 2016, fractile of declared dividends in 2015 (20^{th}) and fractile of financial wealth in 2016 (20^{th}). β_d^B and β_d^A are our coefficients of interest for treated households below and above the ceiling. To determine a household's tax bracket, we follow Bach, Bozio, Fabre, et al. (2021) and use a measure of its stable income understood as the sum of wages and pension divided by the number of fiscal shares. The goal is to determine the marginal tax rate faced by households on the first euro of dividend declared. We take 2016 as the reference period.

3.2.2 Empirical challenges

Estimating dividends response of households impacted by the ceiling mechanism presents several identification challenges. First of all, our second treatment group ($A_i = 1$) is made of households which were above the ceiling threshold in 2017 but no longer in 2018, 2019, and 2020. Those are the households for which the drop in the marginal tax rate implied by the ceiling was exogenously brought by the IFI reform. Indeed, without major changes in their wealth to income ratio, these tax units would have continued being above the ceiling in 2018 in absence of the IFI reform. However, as presented in the introduction, when a tax unit is above the ceiling threshold in a given year, its dividends from the previous year are implicitly subject to a 75% marginal tax rate. Consequently, dividends received in 2017 by households in our second treatment group were ex-post no longer subject to the high marginal tax rate implied by the ceiling. This brings concerns on potential anticipation effects. The law transforming the ISF into the IFI was passed on November the 21^{st} 2017. Only at that time did households in our second treatment group know for sure that their 2017 dividends would no longer be subject to the implied 75% marginal tax rate. This gave them little room of manoeuvre to significantly increase their received dividends for 2017. Nevertheless, one could argue that these households may have anticipated the coming wealth tax reform, which was part of the newly elected president's program during the election campaign in 2017. Consequently, they could have increased their received dividends immediately after the election in May or even before if they were expecting him to win. The difference in differences framework allows us to test for these anticipation effects. We observe no significant pre-reform increase in declared dividends.

Secondly, dividends are very volatile at the household level. Our outcome variable is a ratio of dividends over pre-treatment period mean. If the latter is close to zero, even a small absolute value increase in dividends would lead to a large increase in our outcome variable. Since we don't want these extreme values to drive our results, we follow Bach, Bozio, Fabre, et al. (2021) and winsorize symmetrically the outcome variable at the 1% level. We also present estimates where we exclude from the sample any tax unit who has never declared more than 1,500 euros or dividends in the pre treatment period.

Table 2 presents descriptive statistics for our baseline treatment and control groups. By definition of the ceiling mechanism, households in the second treatment group are richer than households in the control and first treatment groups. Identifying the effect on post-reform dividends coming from the ceiling mechanism thus requires netting out the wealth effect coming from the simple fact that richer households were both more likely to be above the ceiling before the reform (as featured in Figure 6) and more likely to possess company shares and thus to increase their post-reform dividends. We address this concern by controlling for 20^{th} of financial wealth. In Appendix 3, we show that our estimates are robust when we control instead for whether household i belongs to the bottom 50%, middle 40%, top 10%, top 1% or top 0.1% of the wealth taxpayers' distribution, alleviating any concerns that our results may be driven by the very rich only.

Finally, in our baseline estimates presented in Figure 10, the second treatment group is made of households above the ceiling threshold in 2017 and no longer after. An important part of these households (around 25%) were not above the ceiling threshold prior to 2017. As shown in Appendix 4, the entrance above the ceiling threshold is preceded by a net drop in income declared in the previous year, particularly in declared dividends. This explains the drop in dividends observed in 2016 among the second treatment group. Although the difference in pre-trends goes in the opposite direction as our estimated treatment effect, this violates the parallel trend assumption of the difference in differences estimator. To address any concern that this might impact our results, we present in Figure 11 the estimates from equation (2) when restricting the second treatment group to households who have been above the ceiling threshold every year between 2014 and 2017 (whose dividends were subject to the 75% marginal tax rate starting in 2013). Doing so deletes any difference in pre-trends but it also divides the number of treated units by around 3. Nonetheless, as featured in Figure 11, the estimated treatment effect is slightly higher than our baseline one and remains very significant.

Table 2: Descriptive statistics on our treatment and control groups in 2016, baseline results

	Treatment Group 2 ($A_i = 1$)				Treatment Group 1 ($B_i = 1$)			
	Mean	Median	1^{st} decile	9^{th} decile	Mean	Median	1^{st} decile	9^{th} decile
Age (1^{st} declarant)	66.0	67.0	49.0	84.0	68.2	68.0	53.0	83.0
Fiscal shares	1.8	2.0	1.0	2.5	1.9	2.0	1.0	2.5
Taxable income (K€)	58.6	27.0	0.0	127.1	83.7	56.5	32.1	141.6
Labor income (K€)	16.5	0.0	0.0	42.9	66.4	0.0	0.0	189.6
Dividends (K€)	26.2	0.1	0.0	34.7	23.2	0.3	0	33.6
Capital gains (K€)	33.6	5.0	0.1	46.7	53.6	3.5	0.2	64.3
Other capital income (K€)	12.1	1.6	0.0	28.3	6.6	1.0	0.0	14.0
Wealth (K€)	11,600.0	7,594.1	2,350.8	23,500.0	2,788.9	2,151.6	1,476.8	4,658.0
Financial wealth (K€)	5,557.9	1,835.3	27.4	12,300.0	1,728.6	956.8	48.9	3,474.4
Number of observations	6,869				147,993			

	Control Group			
	Mean	Median	1^{st} decile	9^{th} decile
Age (1^{st} declarant)	66.8	67.0	51.0	84.0
Fiscal shares	2.1	2.0	1.0	3.0
Taxable income (K€)	51.0	31.9	12.3	99.0
Labor income (K€)	19.2	0	0	55.7
Dividends (K€)	10.5	0.1	0	16.0
Capital gains (K€)	35.4	3.1	0.1	48.0
Other capital income (K€)	6.1	1.1	0	13.8
Wealth (K€)	2,427.2	2,006.4	1,435.5	3,837.2
Financial wealth (K€)	1,328.4	766.1	3.9	3,037.9
Number of observations	148,010			

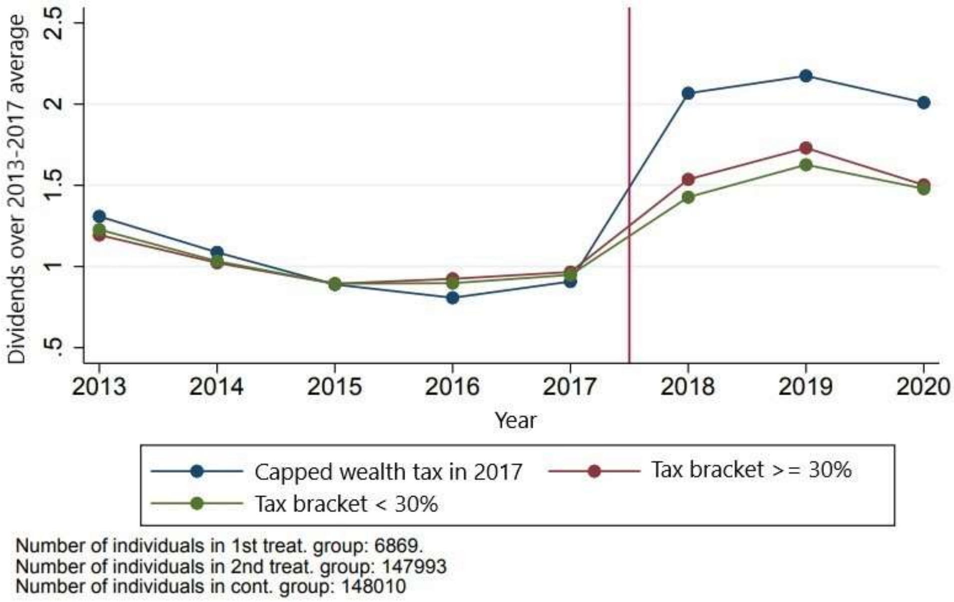
3.2.3 Difference in differences results

Figure 10 presents our baseline estimates. Compared to the control group, the increase in dividends over pre reform mean by households positively impacted by the PFU reform but below the ceiling threshold in 2017 (first treatment group, $B_i = 1$) is 25 percentage points higher. For households falling below the ceiling threshold in 2018, the increase in dividends over 2013-2017 average is almost 60 percentage points higher than the increase for the control group. Consequently, the increase in dividends for households who fell below the ceiling threshold as a result of the IFI reform is more than 30 percentage points higher than for other households positively impacted by the PFU reform. These results are in line with the ones obtained by Bach et al. (2020) on the firm side. In their study they show, for example, that firms exposed to the ceiling in 2017 and impacted by the PFU reform multiplied their dividends-to-turnover ratio by more than four while firms only impacted by the PFU multiplied this ratio by less than two. However, in contrary to their results, our estimates are very significant as indicated by the reported 95% confidence interval in panel b). In Appendix 5, we present results on the extensive margin, replacing the left-hand side variable in equation (2) by a dummy variable for whether household i received positive dividends in year t. Once we include our controls, we find no effect while they do find a significant effect on the probability of firms paying out dividends.

In Figures 12 and 13, we also present our difference in differences results when, in the same

Figure 10: Difference in differences results, baseline estimates

(a) DiD averages



(b) DiD estimates

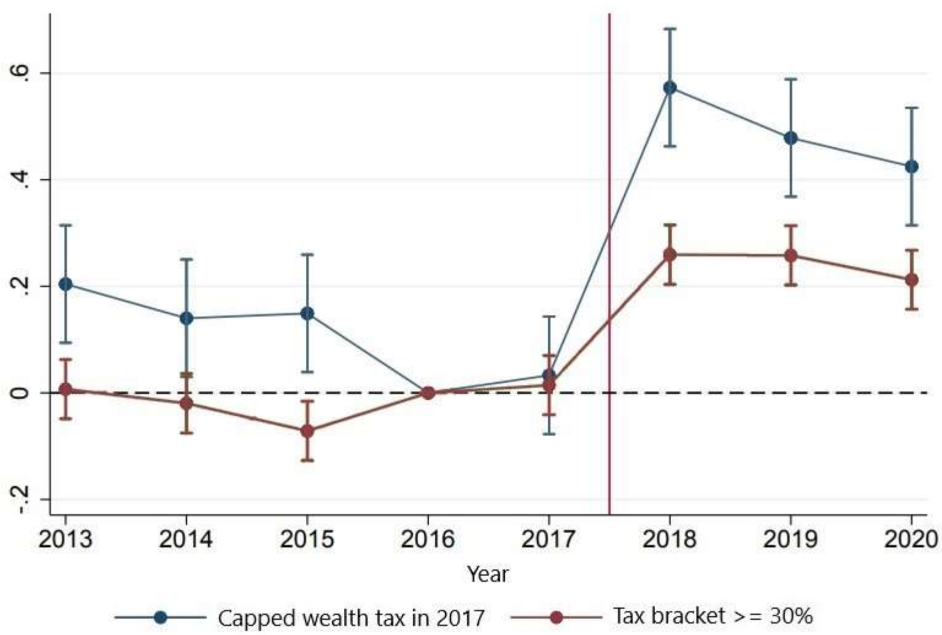
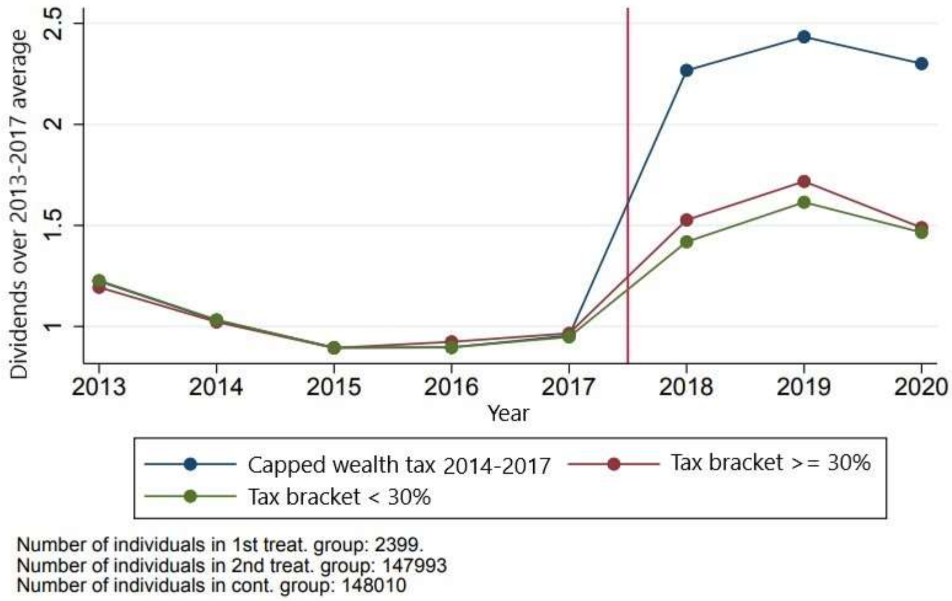
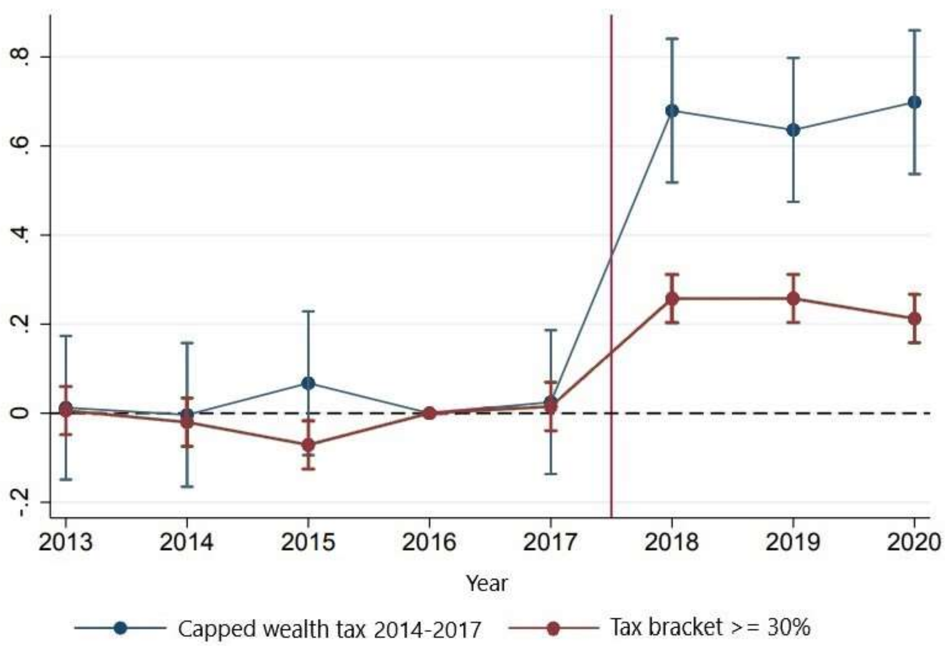


Figure 11: Difference in differences results, second treatment group made of households being above the ceiling threshold over 2014-2017

(a) DiD averages



(b) DiD estimates



way as Bach, Bozio, Fabre, et al. (2021), we restrict our sample to households having received more than 1,500 euros of dividends at least once over the pre treatment period. Although the estimated effects are lower: the percentage increase in dividends for households falling below the ceiling is around 35 percentage points larger than the increase in the control group, this causal effect is still 20 percentage points larger thane the one for households in the first treatment group. Comparing our coefficients for treatment group 1 ($B_i = 1$) in panels b) of Figures 12 and 13 with Figure 5 in Bach, Bozio, Fabre, et al. (2021), one can test the robustness of their results to the exclusion of households impacted by the ceiling from the treatment and control groups. Although our specification and sample selection are slightly different than theirs, the coefficients are virtually the same. This indicates that the additional increase in dividends triggered by the IFI reform has no influence on the estimated aggregate dividend response to the PFU. This was to be expected as households benefiting from the ceiling represent a tiny sub-sample of ISF taxpayers and can be found in both their treatment and control groups.

3.2.4 Robustness tests

A concern one might have is that the median household located above the ceiling threshold was in a higher tax bracket prior to the reform and therefore experienced a larger decrease in its "statutory" marginal tax rate than the median household in the first treatment group. In Appendix 6, we show that the proportion of households above the ceiling threshold is greater among low tax brackets than among high tax brackets. If there was no effect of the IFI reform on dividends, tax units above the ceiling threshold should, if anything, have reacted less to the PFU reform than other tax units positively impacted by it. In Appendix 7 we also show that a significant effect on dividends of falling below the ceiling threshold between 2017 and 2018 can be observed within every tax bracket.

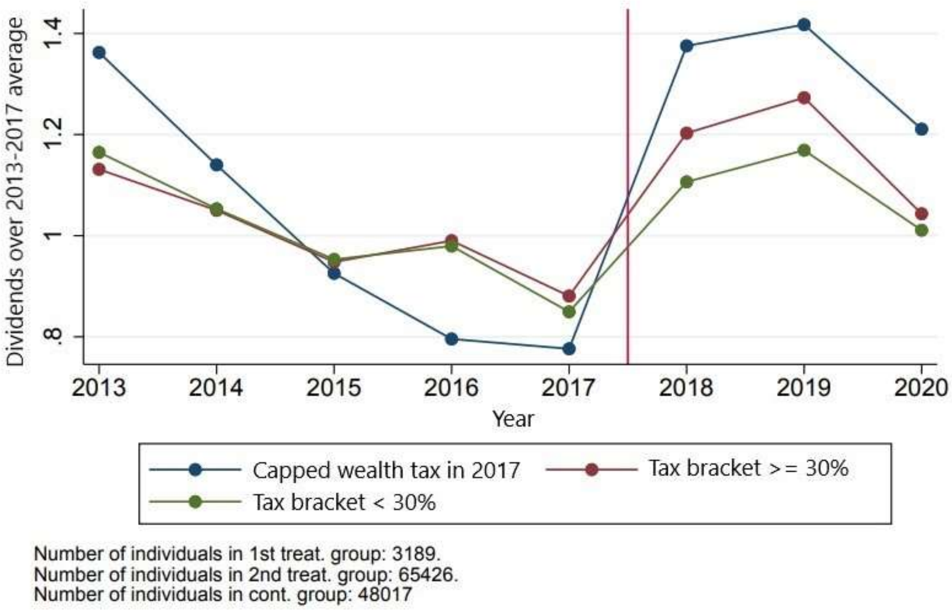
To strengthen our point that the observed greater response of dividends for households falling below the ceiling is indeed due to the disappearance of the implied 75% marginal tax rate that they were facing before the reform, Appendix 8 shows that households who remained above the ceiling threshold in 2019 and 2020 (and who thus did not experience the implicit large drop in their marginal tax rate on 2018 dividends) did not overreact to the PFU reform (their dividend response is even lower than the one of households in the control group). Moreover, the 75% tax rate implied by the ceiling does not apply to capital income only, but to any type income. Therefore, if this marginal tax rate was indeed perceived by households, we should be able to observe an increase in other types of income not affected by the PFU reform. In Appendix 9, we show that households falling below the ceiling threshold between 2017 and 2018 seem to increase their wages after the reform compared to households below the ceiling threshold. The causal effect, 4 percentage points in 2018 and 10 percentage points in 2019, is significantly lower than for dividends and only significant in 2019.

3.3 Dividend elasticity along the wealth distribution

Studies on optimal taxation of capital income generally assume a constant elasticity of the tax base across the wealth distribution. In this subsection, I test this isoelasticity

Figure 12: Difference in differences results, households having received more than €1,500 of dividends in the pre-treatment period

(a) DiD averages



(b) DiD estimates

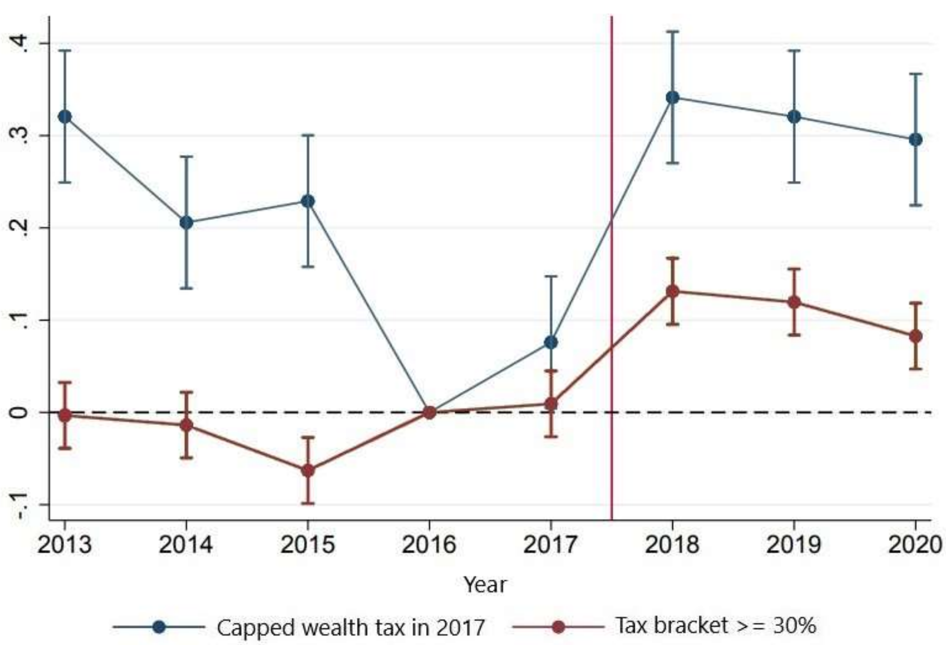
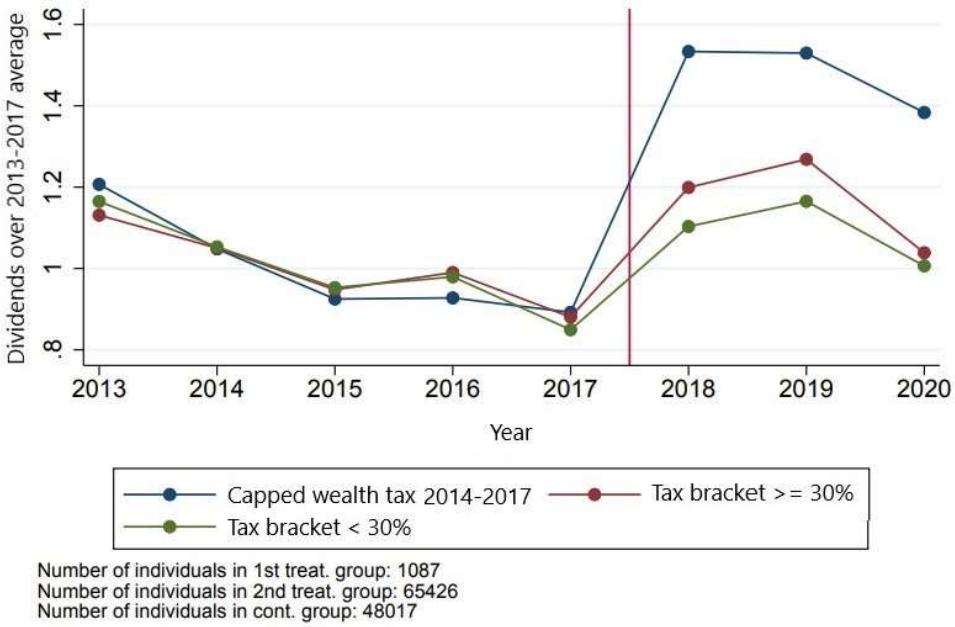
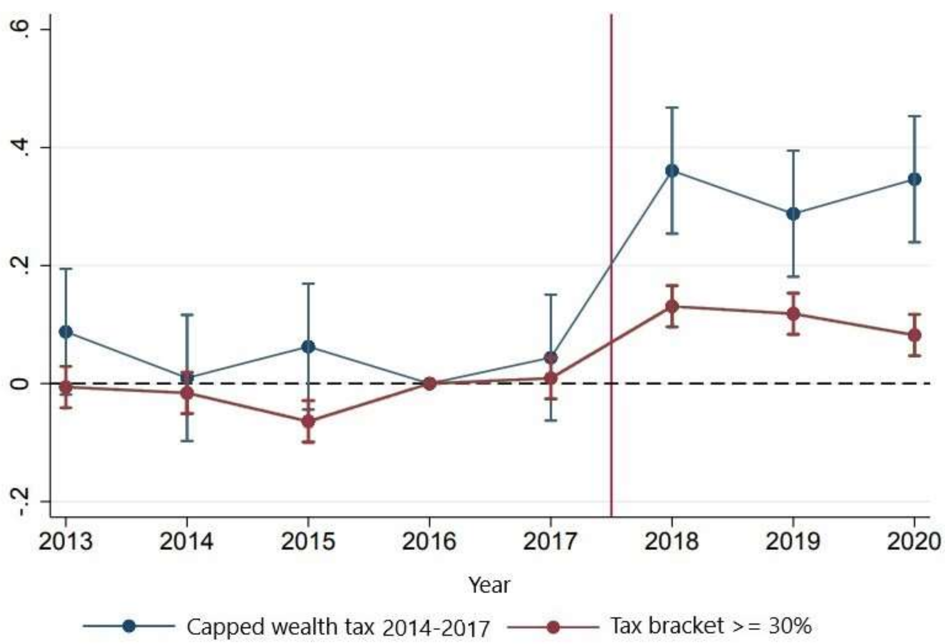


Figure 13: Difference in differences results, households having received more than €1,500 of dividends in the pre-treatment period, second treatment group made of households being above the ceiling threshold over 2014-2017

(a) DiD averages



(b) DiD estimates



assumption by computing the average dividend elasticity in response to the PFU reform in every 20^{th} of wealth taxpayers, ω. This first requires computing $\overline{\frac{\partial(1-\tau)}{(1-\tau)}}_{\omega}$, the average change in the marginal keep rate on dividends for treated households in wealth group ω. Then, using the same difference in differences framework as above, we compute $\overline{\frac{\partial D}{D}}_{\omega}$, the average causal dividend response to the PFU reform in wealth group ω. The elasticity of dividends in response to the PFU reform in wealth group ω is then estimated as:

$$\hat{\varepsilon}_{\omega} = \overline{\frac{\partial D}{D}}_{\omega} \times \left(\overline{\frac{\partial(1-\tau)}{(1-\tau)}}_{\omega} \right)^{-1}$$

3.3.1 Average change in the marginal keep rate

Equation (3) describes how we compute the average change in the marginal keep rate on dividends for treated households in fractile of wealth ω as a weighted average of households' change in their marginal keep rate. The weights correspond to the share of pre-treatment dividends received by households in treatment group $A_i = 1$ or $B = 1$ (cf. Table 1), wealth group ω and tax bracket τ in total pre-treatment dividends received by households in wealth group ω.

$$\text{(3)}\quad \overline{\frac{\partial(1-\tau)}{(1-\tau)}}_{\omega} = \sum_{i\in\omega} \frac{\text{dividend}_i}{\sum_{i\in\omega}\text{dividend}_i} \frac{\partial(1-\tau)}{(1-\tau)}_i = \frac{1}{\sum_{i\in\omega}\text{dividend}_i} \sum_{\tau} \left[\sum_{i\in A^{\omega,\tau}, B^{\omega,\tau}} \text{dividend}_i \frac{\partial(1-\tau)}{(1-\tau)}_i \right]$$

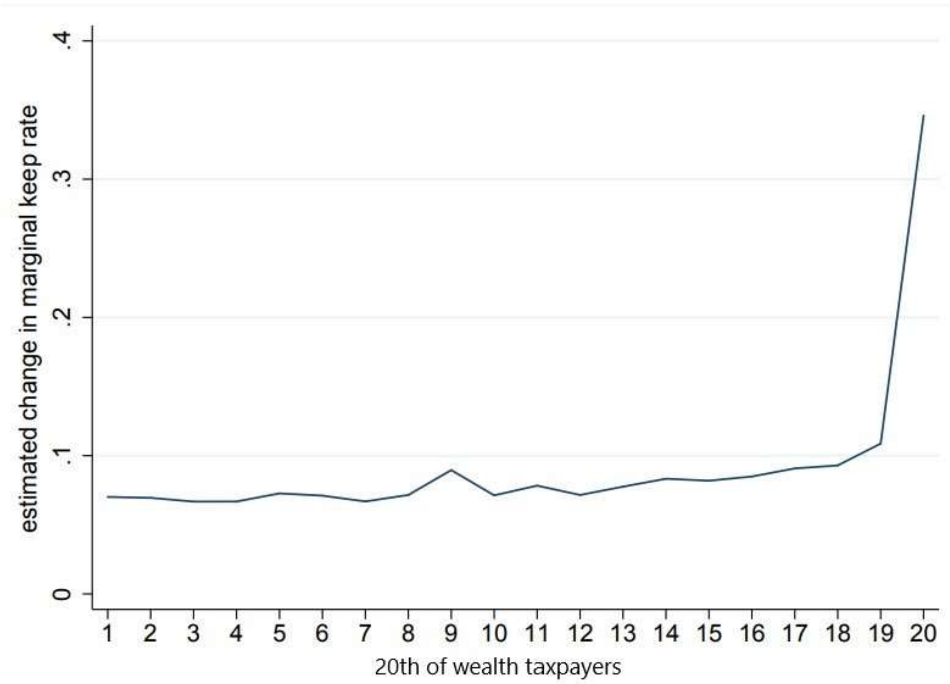
$$= \frac{1}{\sum_{i\in\omega}\text{dividend}_i} \sum_{\tau} \left[\frac{\partial(1-\tau)}{(1-\tau)}_{\tau} \sum_{i\in A^{\omega,\tau}, B^{\omega,\tau}} \text{dividend}_i \right]$$

In Figure 14, we present the resulting average change in marginal keep rate on dividends for every 20^{th} of wealth taxpayers. Starting around 7% for household in the bottom 5% of the distribution of ISF taxpayers, it is steadily increasing as we move up the wealth distribution to reach 11% for the 19^{th} fractile. It then sharply increases to 35% for the top 5% of wealth taxpayers. This should be expected since households benefiting from the ceiling mechanism fall disproportionately in the very top of the wealth distribution.

3.3.2 Average dividend response

In order to estimate the average causal response of dividends to the PFU reform in each wealth group ω, we estimate equation (4). It is the same as equation (2) except that this time we define only one treatment group ($T_i = 1$) including all households being either in the 30%, 41%, and 45% income tax brackets or above the ceiling threshold in 2017. We also no longer control for financial wealth. Finally, we follow Bach, Bozio, Fabre, et al. (2021) and exclude from the sample any tax unit having never received more than 1,500 euros of dividends in the pre reform period.

Figure 14: Average change in the marginal keep rate in each 20^{th} of wealth taxpayers



$$D_{it} = \sum_{\substack{d=2013 \\ d\neq 2016}}^{2020} \mathbb{1}\{t=d\}\lambda_t + \beta_d^T \times \mathbb{1}\{t=d\} \times T_i + \mathbf{x}_i'\mathbb{1}\{t=d\}\boldsymbol{\delta}_d + \mu_i + \varepsilon_{it} \quad (4)$$

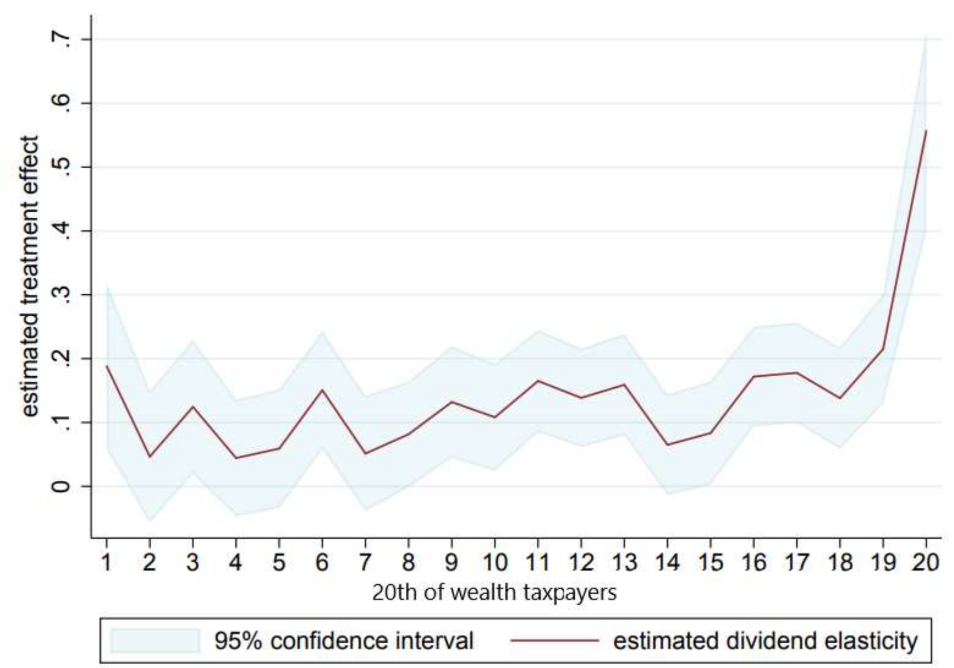
We then define the estimated coefficient $\hat{\beta}_{2018}^T$ as our average dividend response to the PFU reform in wealth group ω.

The resulting estimates for each 20^{th} of wealth taxpayers are plotted in Figure 15. We obtain a graph with a similar hockey stick shape as the one for average changes in the marginal keep rate.

3.3.3 Dividend elasticity along the wealth distribution

As should be expected, the larger the increase in the marginal keep rate, the larger the dividend response. Combining Figures 14 and 15, we compute the elasticity of dividends within each wealth group ω and plot the results in Figure 16. Excepted from the first wealth group where the estimated elasticity is high, it otherwise remains between 1 and 2 along the whole wealth distribution and no upward or downward pattern seems to emerge. Therefore, we cannot reject the isoelasticity hypothesis. This indicates that the higher estimated dividend response at the very top of the wealth distribution in Figure 14, perfectly corresponds to the

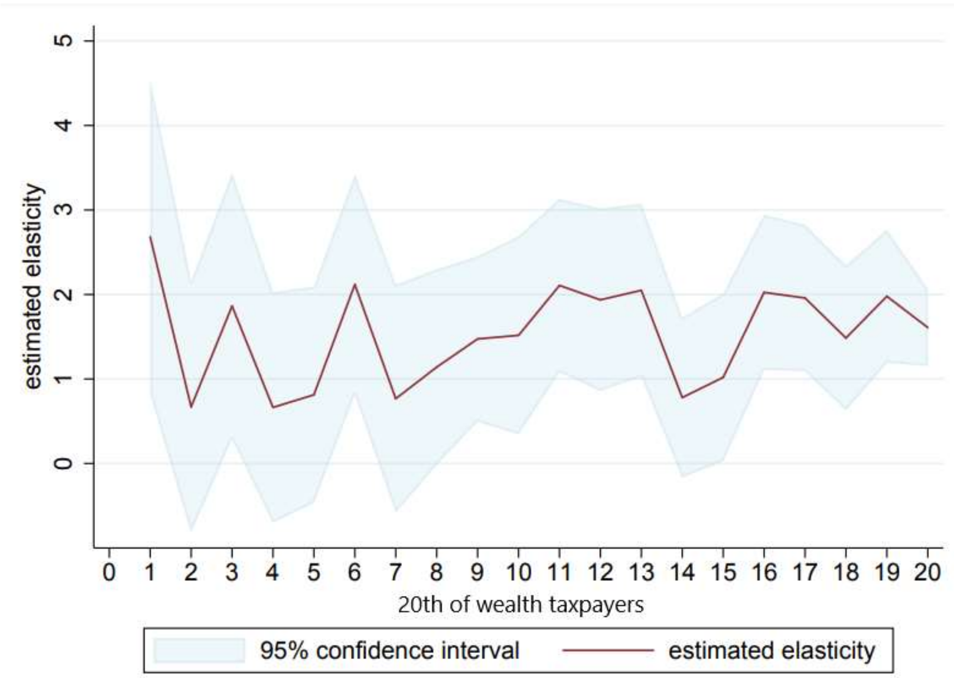
Figure 15: Estimated dividends response to the PFU reform by 20^{th} of wealth



larger decrease in the marginal tax rate on dividends these households experienced due to the important incidence of the ceiling among them.

Our estimated elasticities may seem high compared to other results in the literature. For example Chetty and Saez (2005) find elasticities of dividends with respect to the marginal tax rate of 0.5. However, our results are in line with the elasticity of 2 found by Bach, Bozio, Fabre, et al. (2021) in their study of the PFU reform. As the latter mention, computing dividend response on the household side will mechanically yield higher estimates since the effect obtained using firms' data generally correspond to an intent-to-treat estimate only. Moreover, one has to keep in mind that our elasticity estimates most likely do not indicate households' real response and thus cannot be rightly interpreted as structural parameters to derive the optimal capital income tax rate (Saez et al. (2012)). As suggested in Bach, Bozio, Fabre, et al. (2021), the large dividend increase observed in 2018 may partly correspond to optimization responses. Households having some control over firms being able to use them as tax-free saving and consumption vehicles, waiting for a tax cut to deplete corporate savings accumulated so far and substitute some professional expenses with dividends.

Figure 16: Estimated dividend elasticity in response to the PFU reform by 20^{th} of wealth



4 Tax avoidance through the ceiling mechanism

In the previous section, we saw how the transformation of the wealth tax in a real estate wealth tax triggered an additional increase in dividends for households who were benefiting from the ceiling. In this section, we now analyse how, in the period preceding the IFI reform, households had, on the contrary, an incentive to declare lower income. We first introduce a simple model allowing us to formalize households' incentives depending on where they would stand relative to the ceiling threshold absent any misreporting or income adjustment. From there, we show that the resulting shift in the distribution that should be expected from households' optimization behaviors does not correspond to any classic bunching framework in the literature. In the last part, we thus try to obtain estimates of excess mass above the ceiling threshold by adapting to our setting the bunching framework introduced by Chetty et al. (2011).

4.1 Formalizing households' reporting incentives under the ceiling mechanism

In this section, we use a simple model of income misreporting to grasp the main intuitions on households' reporting incentives under the ceiling mechanism. We assume every wealth taxpayer i derives utility from an annual income $Y_i > 0$ received at N-1. We assume households cannot modify Y_i[3] but have the possibility to report to the tax authority a different income $\tilde{Y}_i \geq 0$ that can be arbitrarily far from Y_i as long as it stays weakly positive. One must keep in mind that, in that setting, Y_i is to be understood as a wide measure of standards of living including, for example, intra-firm consumption and income received through capital holding companies. Misreporting has a positive, household specific, cost, $c_i(|Y_i - \tilde{Y}_i|) \geq 0$, which is increasing and convex in the absolute difference between actual and reported income ($c_i' > 0$ and $c_i'' > 0$). What we refer to as misreporting here is any way, legal or illegal, allowing household i to decrease its reported income while maintaining the same standards of living. We assume households do not misreport their wealth W_i. Indeed, although this would allow them to mechanically lower $T_W(W_i)$, this type of misreporting does not directly make use of the ceiling mechanism and would therefore be present in a counterfactual world without this tax provision. Finally, as we consider only households paying the wealth tax, we have $T_W(W_i) > 0$ by definition. In case the household is below the ceiling threshold it simply pays the totality of its imputed wealth tax, $T_W(W_i)$. If it is above the ceiling threshold it pays the wealth tax minus the capped amount, $T_W(W_i) - (T_W(W_i) + T_Y(\tilde{Y}_i) - 0.75\tilde{Y}_i) = 0.75\tilde{Y}_i - T_Y(\tilde{Y}_i)$ as long as this stays positive, otherwise it pays zero. This is because the ceiling mechanism only applies to the extent that there remains wealth tax to be paid. Consequently, we have:

$$\text{(6)}\quad \text{Wealth tax due} = \min\left\{T_W\left(W_i\right), \max\left\{0, 0.75\tilde{Y}_i - T_Y(\tilde{Y}_i)\right\}\right\}$$

Assuming linear utility in net-of-tax income, household i's maximization program can thus be written as:

$$\text{(7)}\quad \max_{\tilde{Y}_i \geq 0} \quad U_i = Y_i - T_Y(\tilde{Y}_i) - T_W\left(W_i\right)$$

$$+\ \mathbb{1}\left\{\tilde{Y}_i \leq \frac{T_Y(\tilde{Y}_i) + T_W\left(W_i\right)}{0.75}\right\} \times \left(T_W\left(W_i\right) - \max\left\{0, 0.75\tilde{Y}_i - T_Y(\tilde{Y}_i)\right\}\right) - \ c_i\left(|Y_i - \tilde{Y}_i|\right)$$

Where the indicator function shows whether i is located above the ceiling threshold (remember than i is above the ceiling threshold when $\tilde{Y}_i$ is below $\frac{T_Y(\tilde{Y}_i)+T_W(W_i))}{0.75}$). The FOCs are:

$$\text{(8)}\quad c_i'\left(|Y_i - \tilde{Y}_i|\right)\frac{Y_i - \tilde{Y}_i}{|Y_i - \tilde{Y}_i|} + \lambda = T_Y'(\tilde{Y}_i) \quad \forall \tilde{Y}_i \neq Y_i \quad st.\quad \tilde{Y}_i > \frac{T_Y(\tilde{Y}_i) + T_W\left(W_i\right)}{0.75}$$

[3]ie. we assume away real responses. All the main intuitions we derived from this model could also be derived from a model where, instead of misreporting their living standards, households would choose some measure of effort l to directly adjust Y_i through some income generating process $Y_i = lw_i$ with an increasing and convex effort cost function $e_i(l)$. The behavioral response we observe in the data is certainly a mix of misreporting and real response. However, the only way to explain bunching at $\tilde{Y}_i = 0$ in this setting would be that $e_i'(0) > w_i$ for some households. However, one should keep in mind that $\tilde{Y}_i$ includes all types of income received by the household, including pensions, real estate rents, capital gains, and interests earned on savings. Hence, in that setting, wealth taxpayers declaring zero income must have lived out of cash in hand for one year while still possessing more than 1.3 million euros of wealth yielding no revenue. A we shall see below, a significant number of wealth taxpayers in our sample indeed report no income, we thus believe that our tax avoidance story, understood as a large panel of legal and illegal methods through which households lower their reported income compared to their actual living standards, is more credible.

$$(9) \quad c_i'\left(|Y_i-\tilde{Y}_i|\right)\frac{Y_i-\tilde{Y}_i}{|Y_i-\tilde{Y}_i|}+\lambda=T_Y'(\tilde{Y}_i) \quad \forall \tilde{Y}_i\neq Y_i \quad st. \begin{cases} \tilde{Y}_i \leq \frac{T_Y(\tilde{Y}_i)+T_W(W_i)}{0.75} \\ \max\left\{0, 0.75\tilde{Y}_i - T_Y(\tilde{Y}_i)\right\}=0 \end{cases}$$

$$(10) \quad c_i'\left(|Y_i-\tilde{Y}_i|\right)\frac{Y_i-\tilde{Y}_i}{|Y_i-\tilde{Y}_i|}+\lambda=0.75 \quad \forall \tilde{Y}_i\neq Y_i \quad st. \begin{cases} \tilde{Y}_i \leq \frac{T_Y\left(\tilde{Y}_i\right)+T_W(W_i)}{0.75} \\ \max\left\{0, 0.75\tilde{Y}_i - T_Y(\tilde{Y}_i)\right\}\neq 0 \end{cases}$$

Where λ is the Lagrange multiplier for the non-negativity constraint on $\tilde{Y}_i$. The complementary slackness condition gives us the following solutions:

If $\tilde{Y}_i > 0$ and $\lambda = 0$:

$$(11) \quad c_i'\left(|Y_i-\tilde{Y}_i|\right)=T_Y'(\tilde{Y}_i) \quad \forall \tilde{Y}_i < Y_i \ st. \ 0<\frac{T_Y(\tilde{Y}_i)+T_W(W_i)}{0.75}<\tilde{Y}_i$$

$$(12) \quad c_i'\left(|Y_i-\tilde{Y}_i|\right)=T_Y'(\tilde{Y}_i) \quad \forall \tilde{Y}_i < Y_i \quad st. \quad 0<\tilde{Y}_i\leq\frac{T_Y(\tilde{Y}_i)}{0.75}$$

$$(13) \quad c_i'\left(|Y_i-\tilde{Y}_i|\right)=0.75 \quad \forall \tilde{Y}_i < Y_i \ st. \quad 0<\frac{T_Y(\tilde{Y}_i)}{0.75}<\tilde{Y}_i\leq\frac{T_Y(\tilde{Y}_i)+T_W(W_i)}{0.75}$$

$$(14) \quad c_i'(0)=T_Y'(Y_i) \text{ if } \tilde{Y}_i=Y_i$$

If $\tilde{Y}_i = 0$ and $\lambda \geq 0$:

$$(15) \quad c_i'(Y_i)+\lambda=0.75$$

Solution (14) ensures that, in a counterfactual world without ceiling mechanism, households would not misreport their income ($\tilde{Y}_i = Y_i$). It also guarantees that if, given its standards of living Y_i, wealth W_i and marginal misreporting cost c_i', taking advantage of the ceiling is not optimal for household i originally located below the ceiling threshold, then it will not under-report its income.

In Figures 17 and 18, we show graphically the solutions to our model depending on whether household i would locate respectively below or above its ceiling threshold absent any misreporting. In Figure 17, household A's (teal) marginal avoidance cost function is not low enough to make it advantageous to decrease its declared income in order to benefit from the ceiling mechanism. Therefore it does not misreport, as materialized by the teal dot at the point where $Y_A = \tilde{Y}_A$. On the contrary, household B's (red) marginal avoidance cost function is low enough to allow it taking advantage of the ceiling mechanism. Therefore, as materialized by the red dot, it reports $\tilde{Y}_B < Y_B$ so that it now locates above the ceiling threshold (*ie.* $\tilde{Y}_B < \frac{T_Y\left(\tilde{Y}_B\right)+T_W(W_B)}{0.75}$). Finally household C's (orange) marginal cost function is so low that it is advantageous for it not to declare any revenue and have the entirety of its wealth tax capped. In Figure 18, household D's (blue) total income taxes and social contributions are already greater than the ceiling threshold ($T_{Y,D}(Y_D) > 0.75 \times Y_D$). Therefore, the ceiling mechanism does not offer D any possibility to reduce further its taxes paid since the entirety of its imputed wealth tax is already capped. Things are different for household E and F (respectively purple and olive). Although they would already locate above the ceiling threshold absent any manipulation, they both have an incentive to take advantage of the ceiling threshold by under reporting their income. F even has an incentive to report no income at all and have the entirety of its wealth tax capped. Our simple model thus have three main implications for households' reporting behaviors:

1. Tax units that would locate below the ceiling threshold without any misreporting have an incentive to decrease their reported income to take advantage of the ceiling mechanism to the extent that their marginal avoidance cost is low enough and that they would not locate too far from the ceiling threshold absent misreporting.

2. Households that already locate above the ceiling threshold all have an incentive to decrease their reported income, unless the totality of their wealth tax is already capped.

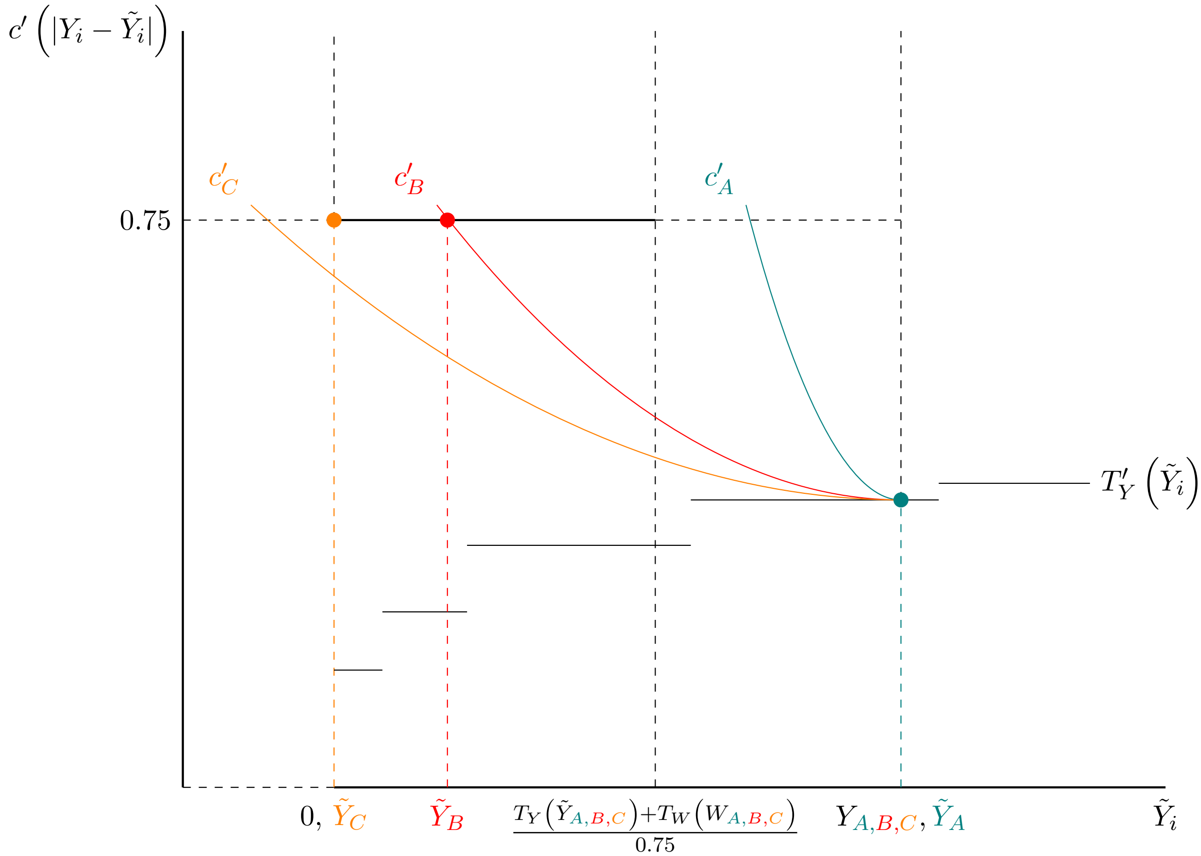
3. Due to households for which it is advantageous reporting no income, we should observe bunching of households at the exact point where the totality of their wealth tax is capped.

In Figure 19, for illustrative purposes, we summarize these intuitions from our model showing how the empirical distribution of households relative to the level of income that would allow them to benefit from the ceiling might look like compared to the counterfactual distribution. We report on this figure the actual and counterfactual locations on the distribution of the 6 households we considered in Figures 17 and 18.

4.2 Estimating tax avoidance behaviors induced by the ceiling mechanism

In this part, we provide significant evidence that, in accordance with our model in Section 4.1, some households manipulate their declared income in order to increase their taxes-to-income ratio and take advantage of the ceiling mechanism. Nonetheless, estimating households' reporting response to the ceiling mechanism presents an important challenge of data availability. Indeed, reported income at $N-1$ ($\tilde{Y}_i$) and total taxes and social contributions on income at $N-1$ ($T_Y(\tilde{Y}_i)$), two of the three figures needed to compute the taxes-to-income ratio, are only available for households who fill up a specific type of wealth tax return, the "D2725", and take the initiative to declare these figures in their tax files in order to benefit from the ceiling. As declaring the amounts required to compute the ceiling threshold is optional, households expecting to be above the ceiling threshold are over-represented among tax units filling up these entries. The excess mass above the ceiling threshold observed using available data is thus partly artificial. A last empirical hurdle is that we only observe these data for the years where the wealth tax and the ceiling mechanism were in place (2010,2011,2013-2017). To overcome this missing data issue, we use income tax files (POTE) to build proxies of $\tilde{Y}_i$ and

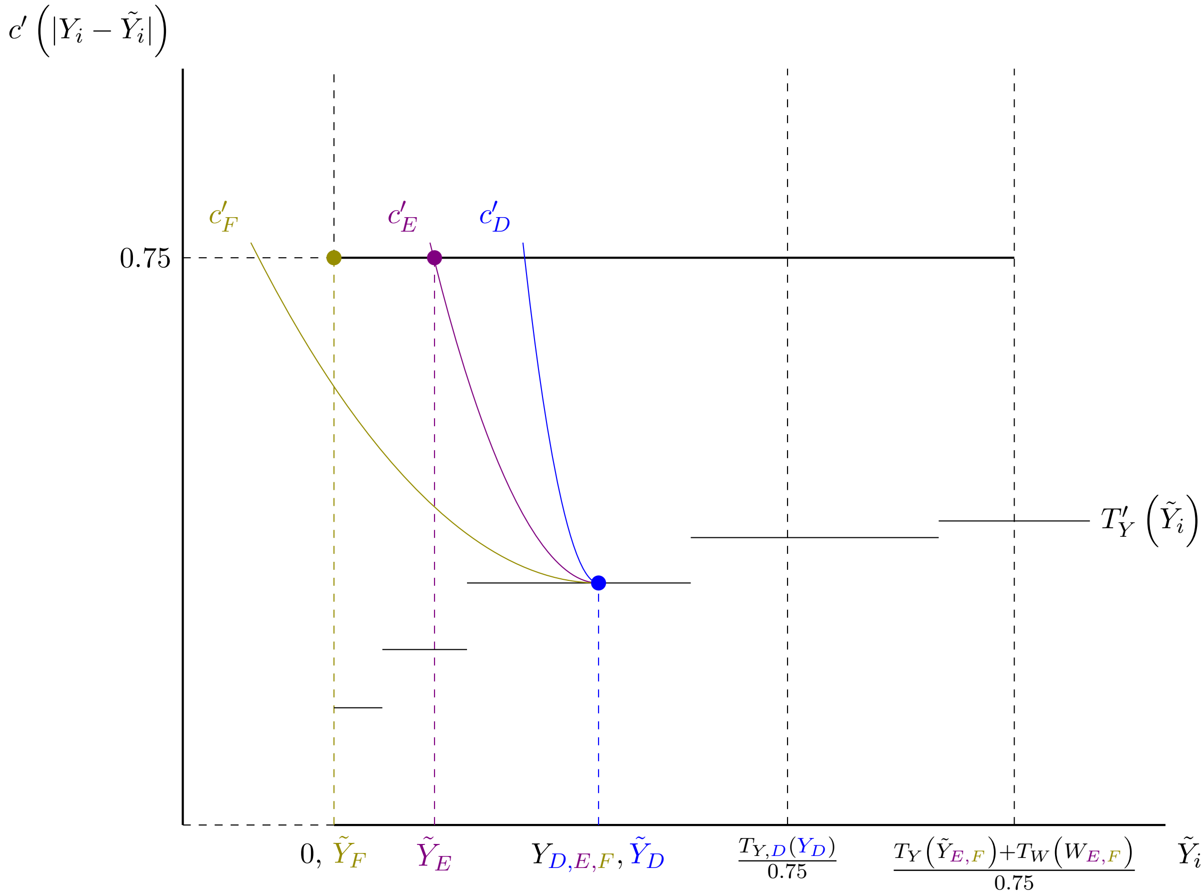
Figure 17: Household's behavioral response if Y_i is below the ceiling threshold



$T_Y(\tilde{Y}_i)$ for all households filling up the "D2725" declaration but for which these figures are not available. "D2725" tax filers represented around 25% of wealth taxpayers between 2013 and 2017 (100% before 2013) and around 85% of people above the ceiling threshold. Simply put, we are doing the job that these households would have done if they had declared these variables. This allows us to recover a full (proxy) distribution of households around their ceiling threshold.

In Appendix 10, we present how well we were able to approximate $\tilde{Y}_i$ and $T_Y(\tilde{Y}_i)$ for households and years for which these figures are available in the ISF-IFI files. Appendix 10.a features the performance of our proxy for $\tilde{Y}_i$. We can observe that the mode is located at 0 and that the majority of the mass is included within $\pm 10\%$ of the actual value. Appendix 10.b does the same for our $T_Y(\tilde{Y}_i)$ proxy. The latter performs less well. Although the mode is still at zero with almost 40% of the mass between $\pm 10\%$ of the actual value, for lots of households, we underestimates the amount of taxes paid. Appendix 10.c finally features the performance of the resulting proxy for the taxes-to-income ratio. Again it tends to underestimate the actual values reported by households. In Figure 20, we plot, for the year 2017, the proxy distribution we obtain for all "D2725" tax filers with respect to the gap between their declared income, $\tilde{Y}_i$, and the income level they would have needed to be above the ceiling threshold given the

Figure 18: Household's behavioral response if Y_i is already above the ceiling threshold

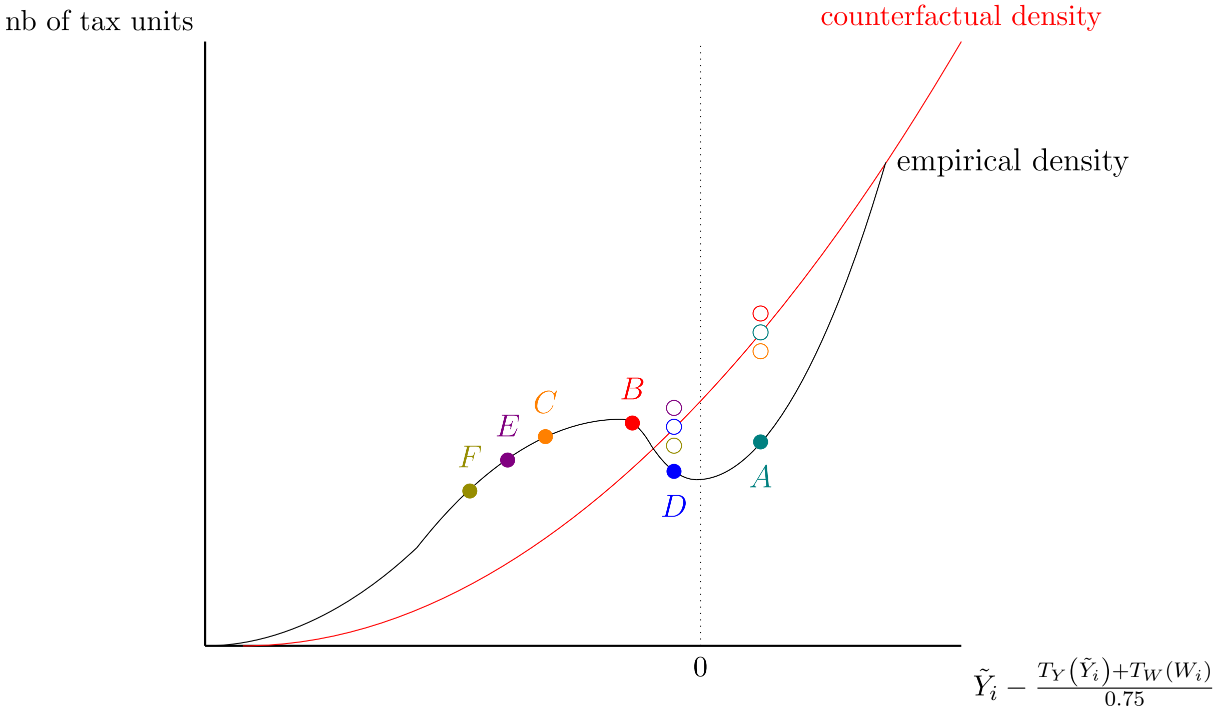


amount of tax they pay, $\frac{T_Y(\tilde{Y}_i)+T_W(W_i)}{0.75}$. For completeness, the distribution for the other years are included in Appendix 11. In all the years, it is possible to observe a shift in the distribution around the level of the ceiling threshold, as predicted by our model. We observe that some "D2725" tax filers find themselves above the ceiling threshold while not having declared the ceiling variables. This either indicates that they did not realize that they could have benefited from the ceiling, or simply stems from errors in our proxies.

4.3 Excess mass of households above the ceiling threshold

We now produce estimates of the excess mass above the ceiling threshold due to households' manipulation of their reported income to take advantage of the ceiling mechanism. As demonstrated in Section 4.2, tax units that would already locate above the ceiling threshold without any behavioral reaction to the ceiling may have an incentive to decrease their reported income so as to increase the amount of their wealth tax that is capped. This gives rise to a shift in the distribution around the ceiling threshold that does not correspond to what classic bunching estimators are designed for. In particular, the lower bound of what we refer to,

Figure 19: Household's behavioral response compared to the counterfatcual distribution



Note: the "observed" locations of households (with respect to the income level at which they would benefit from the ceiling given the amount of taxes they pay) is indicated with colored dots. We represent with colored circles their counterfactual locations.

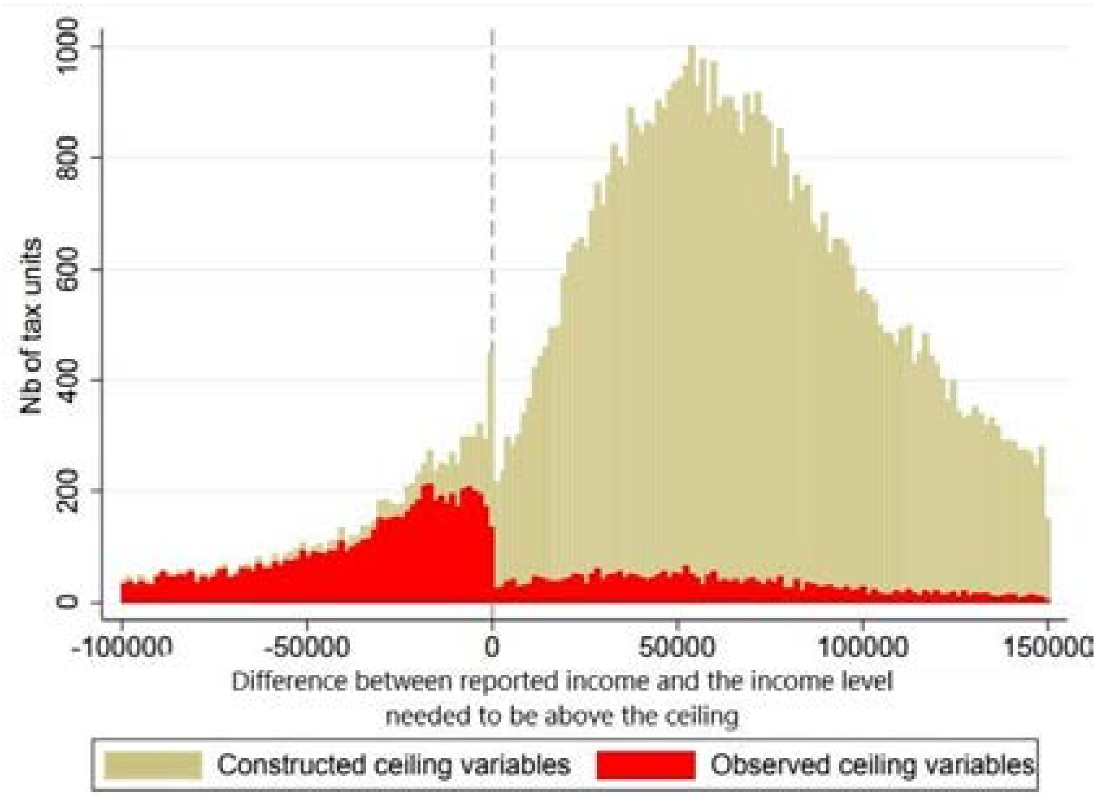
for convenience, as the "bunching range", is not determined because any tax unit above the ceiling threshold potentially misreports its income. We did not find in the literature any study proposing an empirical method allowing to estimate this type of shift in the distribution resulting from households' optimization behaviors. Consequently, in order to obtain a measure of the excess mass above the ceiling threshold, we adapt the bunching analysis framework introduced in Chetty et al. (2011) by setting an arbitrary lower bound for the bunching range that allow us to keep a well-behaved polynomial for the counterfatcual distribution (satisfying the smoothness assumption of the bunching estimator).

We start by using our annual proxy distributions of "D2725" tax filers and construct bins of declared income relative to $\frac{T_Y(\tilde{Y}_i)+T_W(W_i)}{0.75}$, the level of income needed to benefit from the ceiling (0.75 is replaced by 0.85 for 2011). Each bin, indexed by j, has a width of €1250 for 2011 and €2500 for 2013-2017. We then estimate equation (16) below:

$$(16) \quad C_j = \sum_{i=0}^{\rho} \beta_i^0 \times j^i + \sum_{i \in R} \gamma_i^0 \times \mathbb{1}[j=i] + \varepsilon_j^0 \quad \forall j \ st. \ \underline{b} \leq j \leq \bar{b}$$

Where C_j is the number of tax units located in bin j. ρ is the polynomial degree we use. In the results presented below, $\rho = 5$. $R = [\underline{R}, \overline{R}]$ is the arbitrary bunching range

Figure 20: Proxy distribution of "D2725" tax filers with respect to the $\tilde{Y}_i - \frac{T_Y(\tilde{Y}_i)+T_W(W_i)}{0.75}$ difference, 2017



after the ceiling threshold. We choose $R = \{-20000, -19750, \ldots, -1, 250\}$ in 2011 and $R = \{-40000, -37500, \ldots, -2500\}$ between 2013 and 2017. While $\overline{R}$ is a bin after the ceiling threshold, $\underline{R}$ is arbitrary. $\underline{b}$ and $\bar{b}$ are the lower and upper bounds of the analysis window we use. We choose $\underline{b} = -100000$ and $\bar{b} = 30000$ for 2011 and $\underline{b} = -200000$ and $\bar{b} = 40000$ for years between 2013 and 2017.

The first-round estimated counterfactual density in the analysis window $[\underline{b}, \bar{b}]$ is $\{\hat{C}_j^0 = \sum_{i=0}^{\rho} \hat{\beta}_i^0 \times j^i\}_{j \in [\underline{b}, \bar{b}]}$. And the first-round excess mass in the arbitrary bunching range R can be defined as $\hat{B}_N^0(R) = \sum_{j \in R}[C_j - \hat{C_j}^0] = \sum_{j \in R} \hat{\gamma}_j^0$. However, as noted by Chetty et al. (2011), $\hat{B}_N^0(R)$ overestimates the excess mass in R since $\hat{C}_j^0$ does not take into account that excess tax units in bin j come from from bins above j. That is, our first-round counterfactual distribution does not satisfy the constraint that the area under it must equal the area under the empirical distribution. To account for this issue, we follow Chetty et al. (2011) and define our counterfactual distribution as the fitted values $\{\hat{C}_j\}_{\underline{b} \leq j \leq \bar{b}}$, arising from equation (17) where $\hat{B}_N(R)$ is our excess mass estimate in arbitrary bunching range R: $\hat{B}_N(R) =$

$\sum_{j\in R}[C_j - \hat{C}_j] = \sum_{j\in R}\hat{\gamma}_j$. The latter equation adjusts upward the counterfactual distribution above the bunching range R. In Appendix 13, we present the result of this adjustment on the counterfactual distribution compared to the first round estimated one for 2017, we also present results with different choices of lower bound for the bunching range.

$$C_j\left(1 + \mathbb{1}[j > \overline{R}]\frac{\hat{B}_N(R)}{\sum_{j=\overline{R}+1}^{\bar{b}} C_j}\right) = \sum_{i=0}^{\rho}\beta_i \times j^i + \sum_{i\in R}\gamma_i \times \mathbb{1}[j = i] + \varepsilon_j \quad \forall j\ st.\ \underline{b} \le j \le \bar{b} \tag{17}$$

Note that $\hat{B}_N(R)$ appears in the left hand side of equation (17) while being a function of the estimated coefficients on the right hand side of the expression, $\{\hat{\boldsymbol{\beta}}, \hat{\boldsymbol{\gamma}}\}$. Equation (17) is thus estimated by iteration where, at each step n, we use $\hat{B}_N^{n-1}(R)$ from the previous step until we reach a fix point where $\hat{B}_N^{n}(R) \approx \hat{B}_N^{n-1}(R)$ with a tolerance level of 0.01.

To compute the standard errors of our estimated $\hat{B}_N(R)$, we again follow Chetty et al. (2011) using a parametric bootstrap procedure close to theirs. We randomly draw with replacement from the estimated vector of errors $\{\hat{\varepsilon}_j\}_{\underline{b}\le j\le\bar{b}}$ in (17) to get a new bootstrap vector of errors $\{\tilde{\varepsilon}_j^k\}_{\underline{b}\le j\le\bar{b}}$. We then generate a new vector of bin counts $\{\tilde{C}_j^k = \overline{C_j} + \tilde{\varepsilon}_j^k\}_{\underline{b}\le j\le\bar{b}}$, where $\{\overline{C_j}\}_{\underline{b}\le j\le\bar{b}}$ are the fitted values from (17), $\overline{C_j} = \sum_{i=0}^{\rho}\hat{\beta}_i \times j^i + \sum_{i\in R}\hat{\gamma}_i \times \mathbb{1}[j = i]$. Finally, we apply the same iterative procedure as above to estimate equation (17) with our bootstrapped bin counts to obtain $\tilde{B}_N^k(R)$. We run $k = 100$ such bootstrap iterations and define the standard error of $\tilde{B}_N^k(R)$ as the standard deviation of the resulting bootstrap distribution of excess mass estimates $\{\tilde{B}_N^k(R)\}_{k\in[1,100]}$. The resulting estimates and their standard errors are presented in Table 3. In Figure 21, we plot the proxy of the empirical distribution and its estimated counterfactual over the analysis window for the year 2017 (similar plots for the other years can be found in Appendix 12).

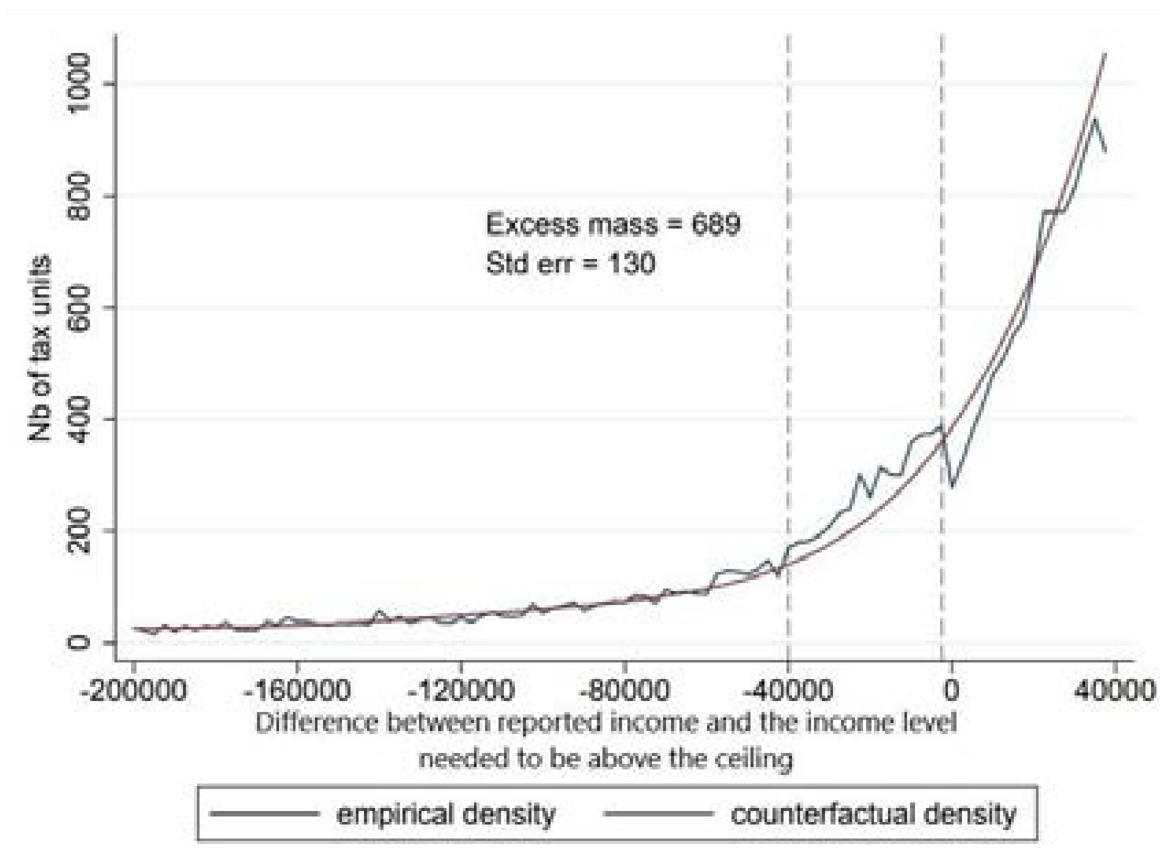
Table 3: Estimates of excess mass above the ceiling threshold

Year	$\hat{B}_N(R)$	Std Err.
2011	580	108
2013	328	107
2014	483	136
2015	553	120
2016	610	149
2017	689	130

Note: We do not provide estimates for 2010 because constructing proxies of the figures used to compute the ceiling that year would require using the income tax returns of 2009 which are not included in our baseline sample.

As can be observed, our estimates of excess mass above the ceiling threshold are statistically significant, indicating that some households indeed manipulate their declared income in order to locate above the ceiling and increase the amount of wealth tax capped. However, the estimated excess mass of households above the ceiling threshold appears to be limited as it

Figure 21: Empirical distribution and estimated counterfactual distribution of households in 2017 relative to the level of income that would have allowed them to be above the ceiling



varies between 330 to 690 households only. This corresponds to around 4 to 9% of the total number of tax units benefiting from the ceiling.

Although we manage to show that some households seem to manipulate their income to take advantage of the ceiling mechanism, deducting from these excess mass estimates a revenue loss for the state is another challenge. First of all, we do not identify the households who are manipulating their income but simply observe excess mass above the ceiling threshold. Secondly, even if we knew which households were bunching, it is hard to identify what would be their counterfactual income, and therefore the amount that is lost by the government. To estimate this figure, we assume that the excess mass estimated between the ceiling threshold and the arbitrary lower bound results from households that were exactly at the ceiling threshold. Said differently, we assume that excess households in the bunching range would have paid the entirety of their wealth tax absent any manipulation. We therefore compute what we see as an upper bound on the amount of wealth tax lost along the extensive margin (ie. resulting from households that would not benefit from the ceiling absent any avoidance behavior). To do so, within each bin j in the bunching range R, we multiply the estimated excess mass by the average amount of wealth tax that is capped. The estimated revenue loss ranges between 2.7 million euros in 2011 to 7.4 million euros in 2017.

4.4 Bunching of households to pay zero wealth tax

Another empirically testable implication of our model is that households' optimization behaviors should result in a concentration of tax units at the point where their amount of wealth tax capped is exactly equal to the amount of wealth tax paid because they report no revenues and hence pay no taxes. That is, the point where

$$\text{Amount of wealth tax capped}_i = T_W(W_i)$$

$$\Rightarrow T_{Y,i}(\tilde{Y}_i) + T_W(W_i) - 0.75 \times \tilde{Y}_i = T_W(W_i)$$

$$\Rightarrow \tilde{Y}_i = \frac{T_{Y,i}(\tilde{Y}_i)}{0.75} \quad \left(\frac{T_{Y,i}(\tilde{Y}_i)}{0.85} \text{ in 2010 and 2011}\right)$$

For most households, the total amount of income tax paid is lower than the ceiling threshold but it can be larger for some tax units due to deferred taxes for example. To obtain these bunching estimates we apply the same iterative procedure as above to run equation (19) on the distribution of households benefiting from the ceiling in a given year. For that we use a 7 degree polynomial ($q = 7$) and $[\underline{b}, \overline{b}] = [-50000, 200000]$ as our analysis window with bins of 500 euros width. Note that, this time, the bunching estimates are obtained directly looking at the actual distribution of households reporting the necessary variables to compute their taxes-to-income ratio.

The estimates for the excess mass of households at this point are presented in Table 5. They vary between 100 and 700 tax units and increase over the 2013-2017 period. In Figure 22, we also plot the actual distribution and the counterfactual one for 2017 (plots for the other years are presented in Appendix 14). Most of the excess mass can be explained by tax units in that bin reporting exactly 0 income. The remaining excess mass corresponds to households reporting very little income and therefore falling in the same bin as those declaring 0. In accordance with our simple model, these results indicate that, for some households, the avoidance cost might be so low as to allow them to declare 0 income and have the entirety of their wealth tax capped.

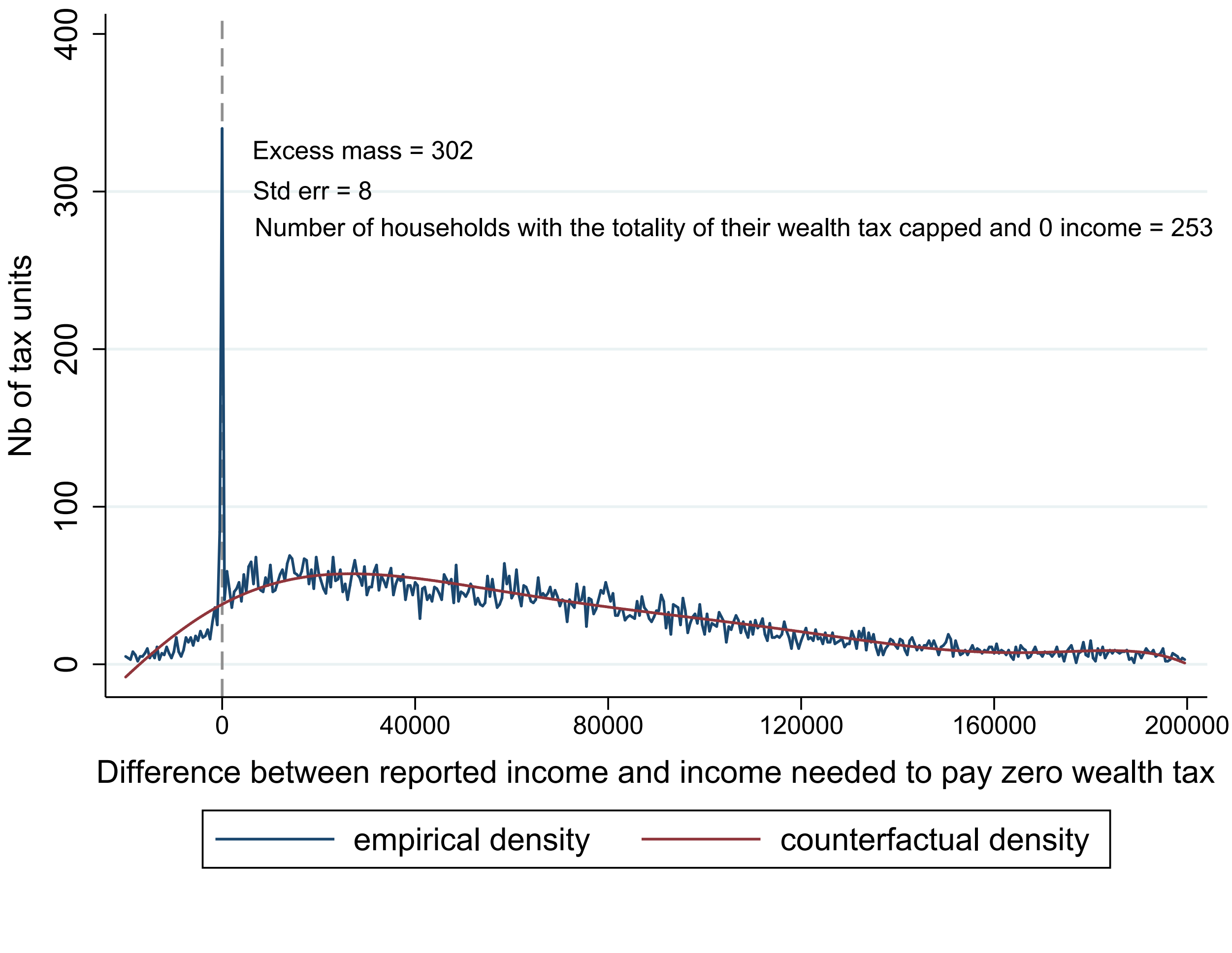
5 Discussion: plugging the holes for the future of wealth taxation

Our results confirm previous findings in the literature showing that rich households have an advanced understanding of the tax system and are, accordingly, very sensible to tax incentives and avoidance opportunities offered by the latter. In this section we discuss both the policy implications and the limits of our findings.

Table 4: Bunching estimates at the point where the totality of the wealth tax is capped

Year	$\hat{B}_N(R)$	Std Err.	Nb of tax units with 0 income
2010	379	20	216
2011	710	8	609
2013	102	4	94
2014	135	6	105
2015	159	6	126
2016	221	9	161
2017	302	8	253

Figure 22: Bunching of tax units where they pay exactly no wealth tax, 2017



First, not only policymakers need to be careful about the way they design the tax schedule for a given tax base, but they also need to pay attention to the interaction between these schedules. As we have seen, a specific feature of the wealth tax can have a significant impact on dividends declared by households. The implications of our findings are, however, limited by the few number of tax units benefiting from the ceiling. Consequently, the additional dividend increase generated by the IFI reform does not seem to influence the aggregate dividend response to the introduction of the PFU. Our results are, therefore, more of symbolic importance as we show that the wealth tax reform of 2018 not only drastically reduced the amount of wealth tax paid by the richest households in France but also led them to receive significantly more dividends, on top of the effect of the simultaneous capital income tax reform.

When it comes to the estimation of avoidance behaviors implied by the ceiling, our ad hoc adaptation of the bunching framework proposed in Chetty et al. (2011) is not entirely satisfying. Indeed it forces to bound the range over which one can estimate the excess mass resulting from the shift in the distribution of ISF taxpayers around the income level allowing them to benefit from the ceiling. The fact that we rely on a proxy distribution of tax filers to obtain our excess mass estimates could also cast some doubts on our results. Obtaining better proxies of income received and taxes paid at $N-1$ would allow to strengthen our conclusions on potential tax avoidance through the ceiling mechanism. The estimates we present feature statistically significant although limited evidence of excess mass above the ceiling threshold, pointing at avoidance behaviors as formalized in our model. This has several policy implications for the design of the ceiling mechanism.

First of all, one must make sure that the definition of a household's financial resources taken into consideration to compute the ceiling threshold is comprehensive enough. Indeed, excluding from this figure some indirect sources of revenue or consumption likely triggers income and consumption shifting. The "anti-abuse" clause, passed in 2017 and aiming at re-including in the $\tilde{Y}_i$ figure any income a tax unit receives through a capital holding company when proven that the latter is used for tax avoidance purposes only, goes in that direction. One could further consider the inclusion to this figure of professional expenses or loans taken to finance consumption when proven that the latter serve tax avoidance purposes too.

Secondly, rather than asking households to do it themselves, the tax administration could compute the $\tilde{Y}_i$ and $T_Y(\tilde{Y}_i)$ figures needed to determine whether a household can benefit from the ceiling. Indeed, these figures can, in theory, directly be computed from the income tax returns of the previous year. This is what we did, with relative success, in section 4.2. Default filling by the administration would allow to prevent first level misreporting by households whereby the latter simply underreport in their wealth tax returns what they declared the year before in their income tax returns.

Finally, the simplest solution might consist in abolishing altogether the ceiling mechanism. As featured in Figure 4, in 2017, this would have brought around €1 billion additional tax revenue. The rationale behind the ceiling is understandable: one may not have the necessary flow of income to pay for a tax on their stock of wealth. However, the ISF/IFI only applies to wealth above a high exemption threshold and the rates of the progressive wealth tax schedule are well below the average market returns for both real estate and financial assets (in 2017 wealth in the top tax bracket, above 10 million euros, was taxed at a rate of 1.5%). Paying the wealth tax might therefore only come as a challenge when households own assets yielding very low returns or when these returns cannot be realized without having to liquidate the assets. Nonetheless, important tax exemptions were limiting households' tax liabilities on their principal residence, artworks, and private business wealth. Consequently, as shown in

Figure 6, the ceiling disproportionately benefited the wealthiest taxpayers in France (the top 0.1% of the wealth distribution). We argue that, for these households, declared income may not the be right metric against which the amount of wealth tax paid should be compared. It is now well documented that, among the wealthiest taxpayers, tax avoidance strategies such as "buy, borrow, die", consumption shifting, and the use of family holdings are widespread and allow them to avoid realizing capital gains while reducing their declared income. In those cases, the wealth tax remains the only tool allowing to tax unrealized capital gains and can act as a powerful tool to reduce wealth inequality.

Conclusion

In the literature on taxable income elasticity, it is now well established that observed tax base responses may, in part, reflect households optimization behaviors implied by specific features of the tax system. We illustrates this point using administrative data to study wealthy taxpayers' behavioral response to the ceiling mechanism of the French wealth tax.

By design, this ceiling implies a high marginal tax rate on income declared by households which benefit from it, while offering them a way to decrease their wealth tax paid by lowering their reported income. In 2018, the transformation of the wealth tax in a tax on real estate wealth drastically decreased the amounts paid by households who were above the ceiling threshold. Therefore, after the reform, lots of them found themselves far below this threshold, hence leading to an exogenous drop in their marginal income tax rate. Our difference in differences analysis show that, accordingly, this reform triggered an additional increase in declared dividends for households who fell below the ceiling threshold, in top of the one generated by a simultaneous capital income tax reform. The ceiling benefits primarily very wealthy households, we thus show that the wealth tax reform induced a larger drop in the marginal tax rate on dividends at the very top of the wealth distribution. Within bins of wealth taxpayers, we compute dividend response to the combination of the wealth and capital income tax reforms and show that the isoelasticity assumption cannot be rejected.

Finally, we try to determine whether, in the pre reform period, households were taking advantage of the ceiling mechanism to decrease their amount of wealth tax paid. To the best of our knowledge, this is the first attempt to estimate tax avoidance through such a feature of the tax system. We start by formalizing households' incentives in a simple income misreporting model and show that the expected behavioral responses do not correspond to the classic bunching setting. Estimating empirically households' optimization behaviors presents several empirical challenges and we are aware that our ad hoc solutions to overcome the latter are not entirely satisfying. Adapting the bunching framework of Chetty et al. (2011) to our setting, we propose estimates of excess mass of households within an arbitrary range above the ceiling threshold. We find limited although statistically significant evidence that, in accordance with our simple model, some households lower their declared income in order to increase the portion of their wealth tax that is capped.

References

Alstadsæter, A., & Jacob, M. (2016). Dividend taxes and income shifting. *The Scandinavian Journal of Economics*, *118*(4), 693–717.

Bach, L., Bozio, A., Fabre, B., Guillouzouic, A., Leroy, C., & Malgouyres, C. (2019). *Évaluation d'impact de la fiscalité des dividendes* (Doctoral dissertation). Institut des politiques publiques (IPP).

Bach, L., Bozio, A., Fabre, B., Guillouzouic, A., Leroy, C., & Malgouyres, C. (2021). *Follow the money! why dividends overreact to flat-tax reforms* (tech. rep.). PSE Working Papers.

Bach, L., Bozio, A., Guillouzouic, A., & Malgouyres, C. (2020). Rapport intermédiaire–Impact de l'ISF sur le tissu productif.

Bach, L., Bozio, A., Guillouzouic, A., & Malgouyres, C. (2021). *Évaluer les effets de l'impôt sur la fortune et de sa suppression sur le tissu productif* (Doctoral dissertation). Institut des politiques publiques (IPP).

Chetty, R., Friedman, J. N., Olsen, T., & Pistaferri, L. (2011). Adjustment costs, firm responses, and micro vs. macro labor supply elasticities: Evidence from danish tax records. *The quarterly journal of economics*, *126*(2), 749–804.

Chetty, R., & Saez, E. (2005). Dividend taxes and corporate behavior: Evidence from the 2003 dividend tax cut. *The quarterly journal of economics*, *120*(3), 791–833.

Dherbécourt, C., & Forero, M. L. (2019). Quelle taxation du capital, avant et après la réforme de 2018? *La note d'analyse de France Strategie*, *81*(4), 1–11.

FranceStratégie. (2020). Comité d'évaluation des réformes de la fiscalité du capital-deuxième rapport.

Garbinti, B., Goupille-Lebret, J., Munoz, M., Stantcheva, S., & Zucman, G. (2023). *Tax design, information, and elasticities: Evidence from the french wealth tax* (tech. rep.). Tech. rep., Working Paper, Paris School of Economics.

Gerritsen, A., Jacobs, B., Rusu, A. V., & Spiritus, K. (2020). Optimal taxation of capital income with heterogeneous rates of return.

Kleven, H. J., & Waseem, M. (2013). Using notches to uncover optimization frictions and structural elasticities: Theory and evidence from pakistan. *The Quarterly Journal of Economics*, *128*(2), 669–723.

Kleven, H. J. (2016). Bunching. *Annual Review of Economics*, *8*, 435–464.

Piketty, T., Saez, E., & Stantcheva, S. (2014). Optimal taxation of top labor incomes: A tale of three elasticities. *American economic journal: economic policy*, *6*(1), 230–271.

Poterba, J. (2004). Taxation and corporate payout policy. *American Economic Review*, *94*(2), 171–175.

Saez, E. (2010). Do taxpayers bunch at kink points? *American economic Journal: economic policy*, *2*(3), 180–212.

Saez, E., Slemrod, J., & Giertz, S. H. (2012). The elasticity of taxable income with respect to marginal tax rates: A critical review. *Journal of economic literature*, *50*(1), 3–50.

Saez, E., & Stantcheva, S. (2018). A simpler theory of optimal capital taxation. *Journal of Public Economics*, *162*, 120–142.

Schulz, K. (2021). Redistribution of return inequality.

Data

Ministère des Finances (DGFiP) [Producteur], Déclarations d'impôt sur le revenu des foyers fiscaux (formulaire 2042 et annexes) - 2010 [Fichiers de données], Centre d'Accès Sécurisé aux Données (CASD) [Diffuseur], http://doi.org/10.34724/CASD.409.3026.V1

Ministère des Finances (DGFiP) [Producteur], Déclarations d'impôt sur le revenu des foyers fiscaux (formulaire 2042 et annexes) - 2011 [Fichiers de données], Centre d'Accès Sécurisé aux Données (CASD) [Diffuseur], http://doi.org/10.34724/CASD.409.3025.V1

Ministère des Finances (DGFiP) [Producteur], Déclarations d'impôt sur le revenu des foyers fiscaux (formulaire 2042 et annexes) - 2012 [Fichiers de données], Centre d'Accès Sécurisé aux Données (CASD) [Diffuseur], http://doi.org/10.34724/CASD.409.3024.V1

Ministère des Finances (DGFiP) [Producteur], Déclarations d'impôt sur le revenu des foyers fiscaux (formulaire 2042 et annexes) - 2013 [Fichiers de données], Centre d'Accès Sécurisé aux Données (CASD) [Diffuseur], http://doi.org/10.34724/CASD.409.3023.V1

Ministère des Finances (DGFiP) [Producteur], Déclarations d'impôt sur le revenu des foyers fiscaux (formulaire 2042 et annexes) - 2015 [Fichiers de données], Centre d'Accès Sécurisé aux Données (CASD) [Diffuseur], http://doi.org/10.34724/CASD.409.3021.V1

Ministère des Finances (DGFiP) [Producteur], Déclarations d'impôt sur le revenu des foyers fiscaux (formulaire 2042 et annexes) - 2016 [Fichiers de données], Centre d'Accès Sécurisé aux Données (CASD) [Diffuseur], http://doi.org/10.34724/CASD.409.3020.V1

Ministère des Finances (DGFiP) [Producteur], Déclarations d'impôt sur le revenu des foyers fiscaux (formulaire 2042 et annexes) - 2017 [Fichiers de données], Centre d'Accès Sécurisé aux Données (CASD) [Diffuseur], http://doi.org/10.34724/CASD.409.3019.V1

Ministère des Finances (DGFiP) [Producteur], Déclarations d'impôt sur le revenu des foyers fiscaux (formulaire 2042 et annexes) - 2018 [Fichiers de données], Centre d'Accès Sécurisé aux Données (CASD) [Diffuseur], http://doi.org/10.34724/CASD.409.3281.V1

Ministère des Finances (DGFiP) [Producteur], Déclarations d'impôt sur le revenu des foyers fiscaux (formulaire 2042 et annexes) - 2019 [Fichiers de données], Centre d'Accès Sécurisé aux Données (CASD) [Diffuseur], http://doi.org/10.34724/CASD.409.3855.V1

Ministère des Finances (DGFiP) [Producteur], Déclarations d'impôt sur le revenu des foyers fiscaux (formulaire 2042 et annexes) - 2020 [Fichiers de données], Centre d'Accès Sécurisé aux Données (CASD) [Diffuseur], http://doi.org/10.34724/CASD.409.4513.V1

Ministère des Finances (DGFiP) [Producteur], Fichier panel des contribuables à l'Impôt sur la Fortune (ISF) et à l'Impôt sur la Fortune Immobilière (IFI) - 2006-2020 [Fichiers de données], Centre d'Accès Sécurisé aux Données (CASD) [Diffuseur], http://doi.org/10.34724/CASD.399.3994.V1

Appendix

Appendix 1: Construction of the variables used in the empirical sections from the POTE and IF-IFI files

- unique anonymous household identifier: $fip18\_c$
- year: *annee* from POTE files
- dividends: $Z2dc$ from POTE files
- wage: $Z1aj$ and $Z1bj$ from POTE files
- pension: $Z1as$ and $Z1bs$ from POTE files
- financial wealth: $case\_cl$, $case\_cb$, $case\_cd$, $case\_ce$, $case\_cf$, $case\_cg$, $case\_co$, $case\_ch$, $case\_ci$, $case\_cj$, $case\_ck$ from the ISF-IFI panel database
- wealth: $case\_hi$ from the ISF-IFI panel database
- age of the first declarant: $aged - annee$
- number of fiscal shares: *nbp* from POTE files
- amount of wealth tax capped: $case\_pv$ from the ISF-IFI panel database
- above the ceiling: $\mathbb{1}\{case\_pv > 0 \;\&\; case\_pv \neq missing\}$
- $\tilde{Y}_i$: $case\_pt$ from the ISF-IFI panel database
- $T_{Y,i}(\tilde{Y}_i)$: $case\_pr$ from the ISF-IFI panel database

A1.a: Income types included in the $\tilde{Y}_i$ figure, extract from the form provided by the tax administration (DGFIP)

B. REVENUS DU REDEVABLE À PRENDRE EN COMPTE
Traitements, salaires (y compris les avantages en nature)
Pensions, retraites, rentes (avant abattement de 10%)
Rentes viagères à titre onéreux (fraction imposable en fonction de l'âge du crédirentier lors de l'entrée en jouissance)
Revenus de valeurs et capitaux mobiliers (y compris crédits d'impôt, avant abattement)
Revenus fonciers
Bénéfices agricoles (avant majoration pour les personnes n'adhérant pas à un centre de gestion agréé)
Bénéfices industriels et commerciaux (avant majoration pour les personnes n'adhérant pas à un centre de gestion agréé)
Bénéfices non commerciaux (avant majoration pour les personnes n'adhérant pas à une association agréée)
Rémunération des gérants et associés
Déficit global antérieur imputé sur les revenus 2013
Plus-values y compris celles exonérées d'impôt sur le revenu (avant seuils, réductions et abattements)
Revenus exonérés d'impôt sur le revenu et autres revenus
Revenus perçus à l'étranger
Produits soumis à un prélèvement libératoire de l'impôt sur le revenu

A1.b: Taxes included in the $T_Y(\tilde{Y}_i)$ figure, extract from the form provided by the tax administration (DGFIP)

IMPÔTS NETS À PAYER PAR LE REDEVABLE DE L'ISF
IMPÔT SUR LES REVENUS soumis au barème progressif au titre de 2013 (avant imputation des seuls crédits d'impôt représentatifs d'une imposition payée à l'étranger et des retenues non libératoires)
Montant de l'IMPÔT SUR LES REVENUS progressif à prendre en considération
Contribution exceptionnelle sur les hauts revenus
IMPÔT SUR LES REVENUS soumis à taux proportionnels
IMPÔT ACQUITTÉ À L'ÉTRANGER
PRÉLÈVEMENTS LIBÉRATOIRES ACQUITTÉS EN 2013
Montant des prélèvements sociaux (CSG, CRDS, ...), au taux global de 15,5 % s'agissant par exemple des revenus du capital, contribution salariale sur les gains de levée d'options ou d'acquisition d'actions gratuites, contribution sociale sur les gains de parts de *carried interest* et contribution sur les « retraites chapeau »

Appendix 2: Marginal tax rate on dividends before and after the PFU reform

$$\tau^{2017} = \tau^{bracket} \times ((1 - \delta^p) - \gamma) + \tau^{soc.cont,\ 2017}$$

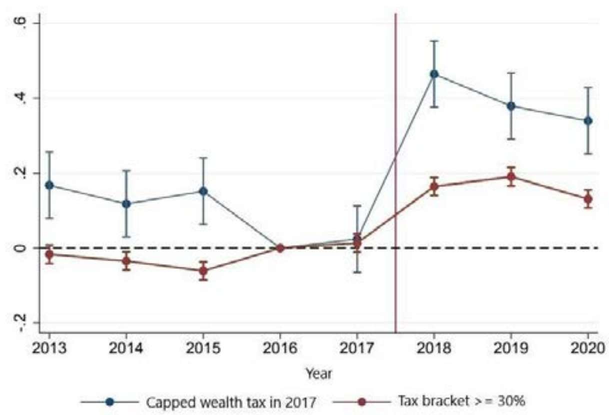
$$\tau^{2018} = \text{MIN}\left\{\tau^{PFU} + \tau^{soc.cont,\ 2018},\ \tau^{bracket} \times (1 - \delta^p - \gamma) + \tau^{soc.cont,\ 2018}\right\}$$

- $\tau^{PFU} = 0.128$: PFU flat rate
- $\tau^{soc.cont,\ 2017} = 0.155$ and $\tau^{soc.cont,\ 2018} = 0.172$: rate of social security contributions
- $\delta^p = 0.4$: proportional abatement rate
- $\gamma = 0.051$: rate of deductible social contributions for dividends (CSG)

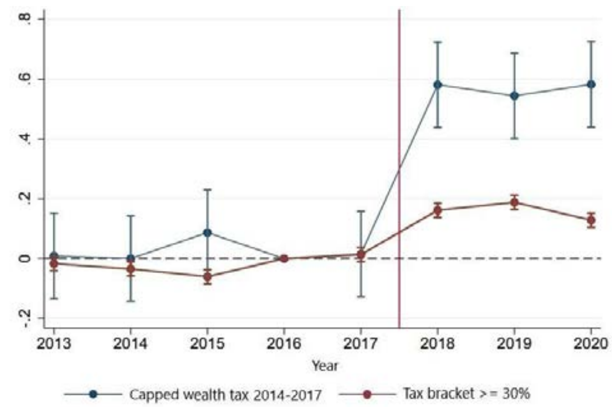
Note: The above formulas assume the lump-sum abatement has already been given and ignore the exceptional contribution on high revenues which applies both before and after the reform.

Appendix 3: Baseline DiD estimates when controlling for bottom 50%, middle 40%, top 10%, top 1%, and top 0.1% of financial wealth

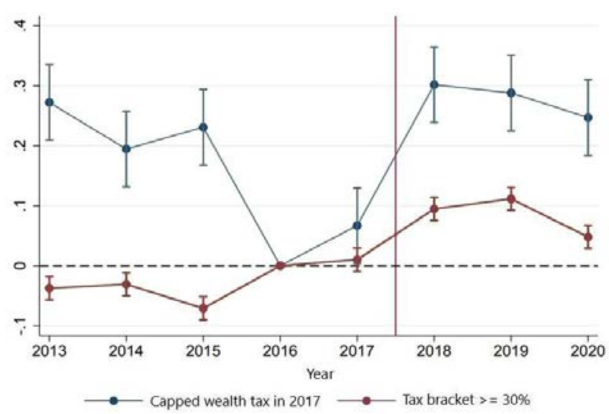
A3.a



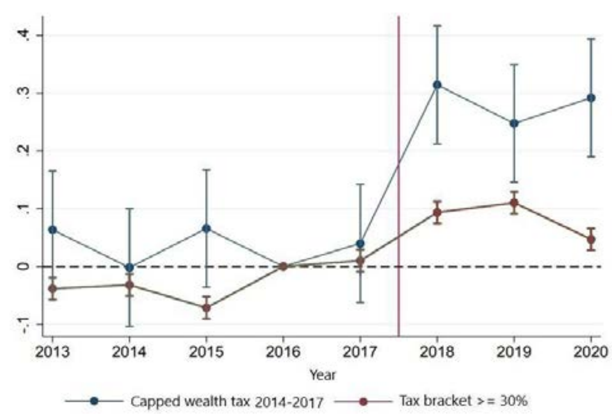
A3.b



A3.c

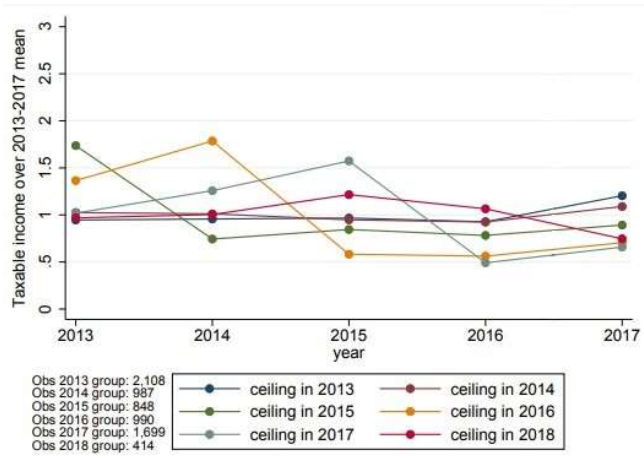


A3.d

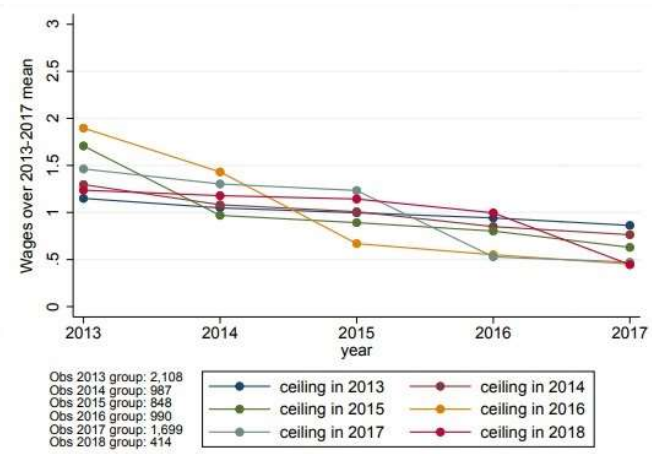


Appendix 4: Income trajectory when reaching the ceiling threshold

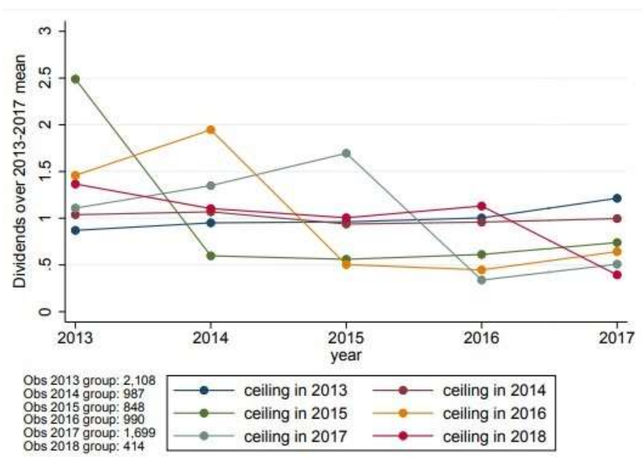
A4.a Taxable income



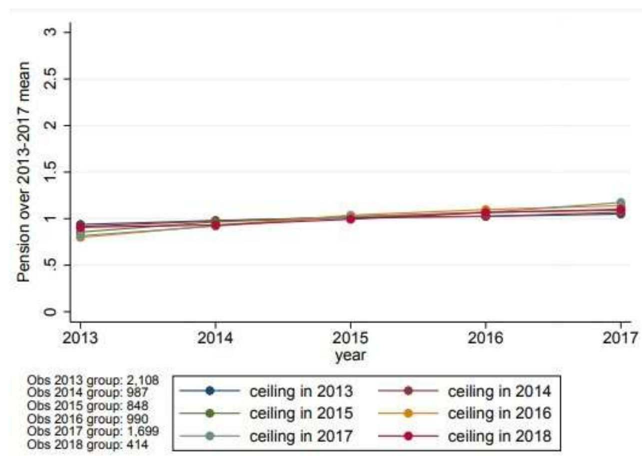
A4.b Wages



A4.c Dividends



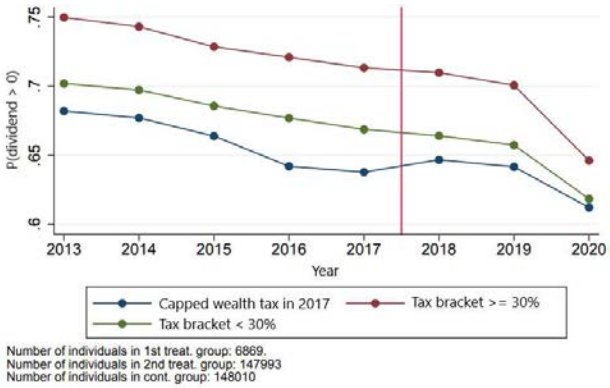
A4.d Pensions



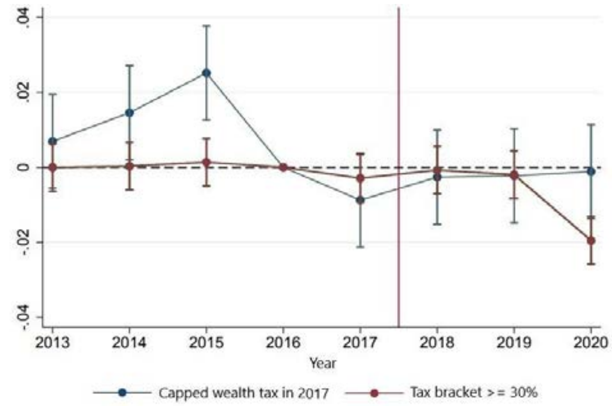
Note: The graphs above show the evolution of different types of income over their 2013-2017 average depending on when tax units reach the ceiling of the ISF. For example the line labeled "ceiling 2015" show the evolution of income for households who were below the ceiling threshold prior to 2015 and stayed above the ceiling threshold until 2017. As can be observed, the year preceding the entry of the household above the ceiling threshold is characterized by a drop in taxable income, in particular in declared dividends.

Appendix 5: DiD estimates, extensive margin

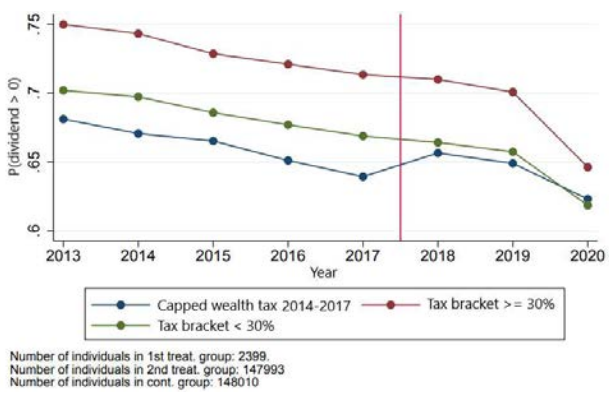
A5.a DiD averages



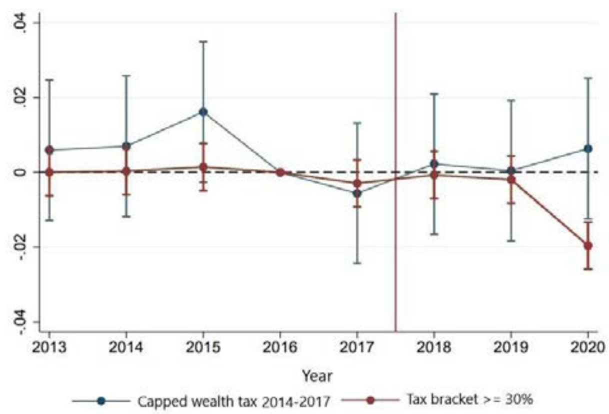
A5.b DiD estimates



A5.c DiD averages

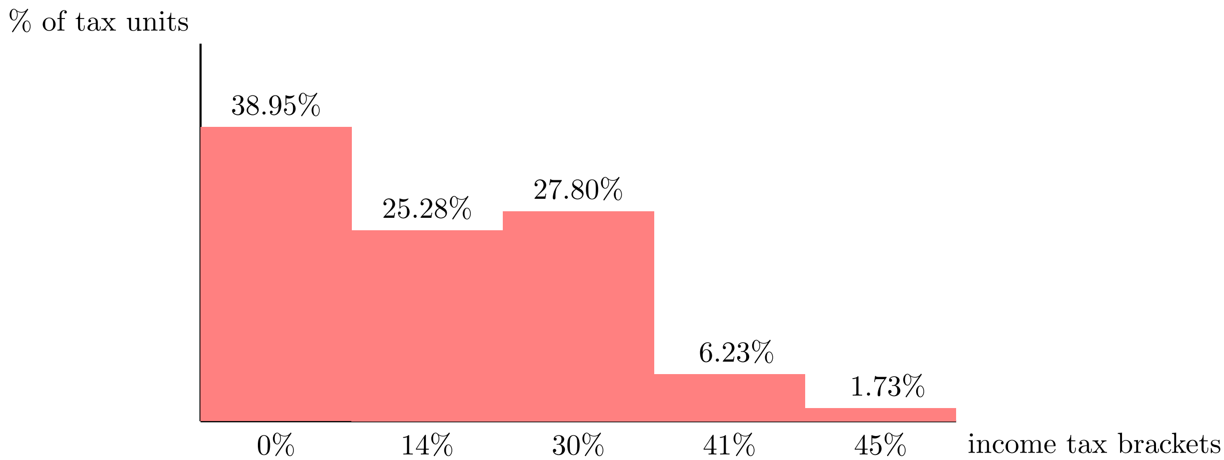


A5.d DiD estimates

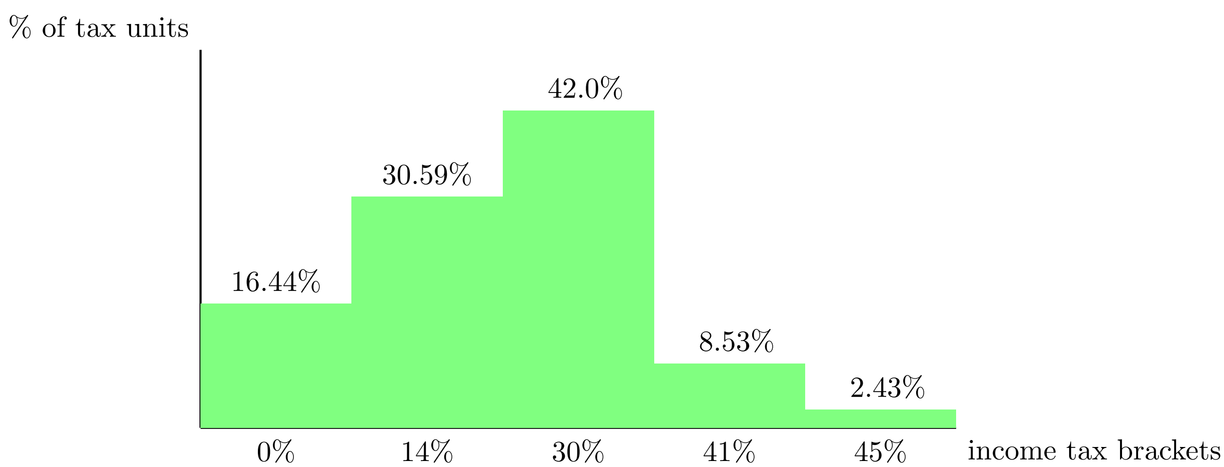


Appendix 6: Distribution of households above the ceiling across the different tax brackets in 2016

A6.a: Distribution of tax units above the ceiling in 2016 across the income tax brackets



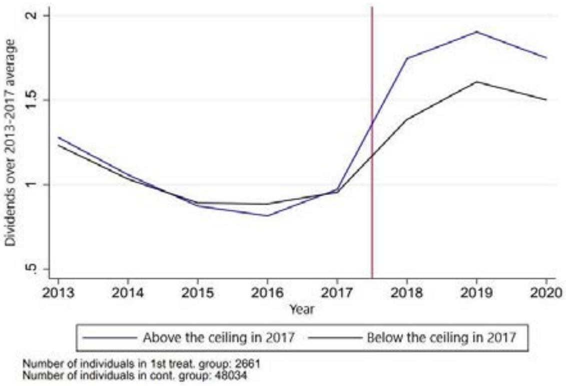
A6.b: Distribution of tax units below the ceiling in 2016 across the income tax brackets



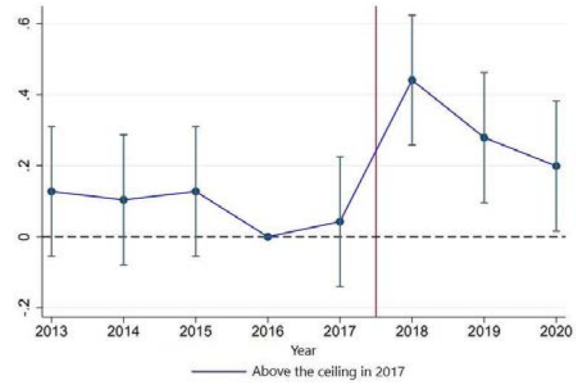
Note: Income tax brackets are determined based on a definition of stable income (wage + pension)

Appendix 7: Treatment effect in different tax brackets

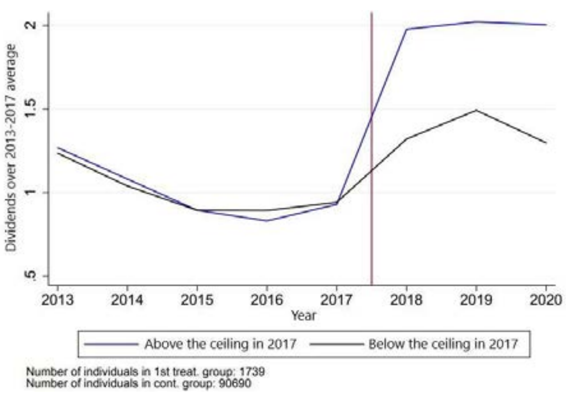
A7.a DiD averages, 0% tax bracket



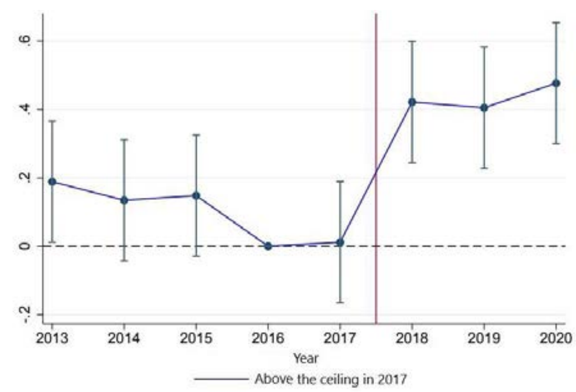
A7.b DiD estimates, 0% tax bracket



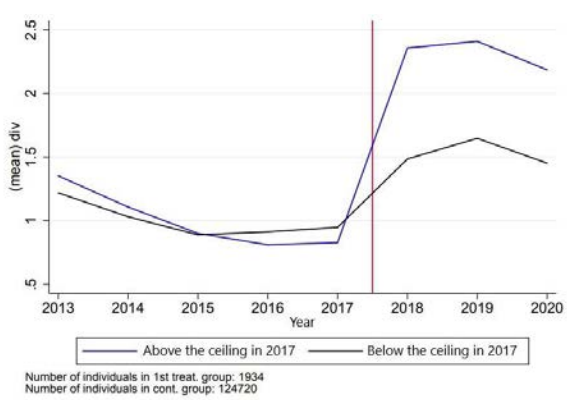
A7.c DiD averages, 14% tax bracket



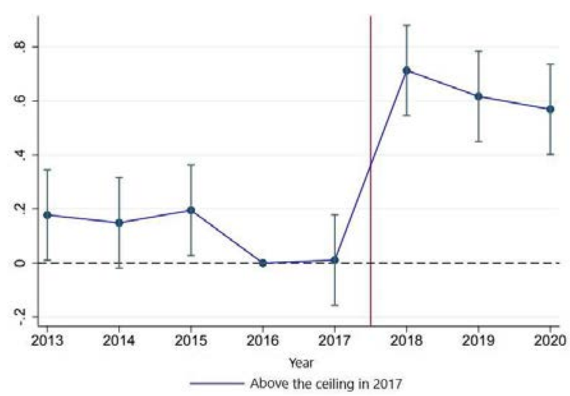
A7.d DiD estimates, 14% tax bracket



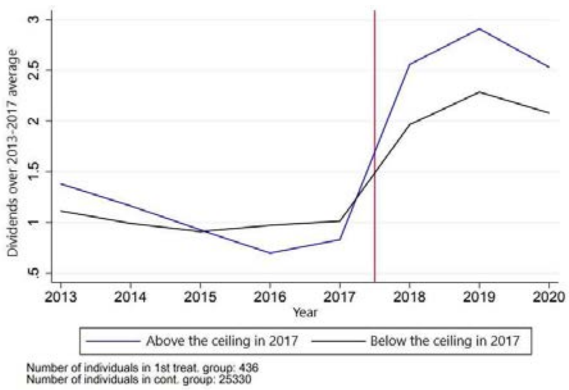
A7.e DiD averages, 30% tax bracket



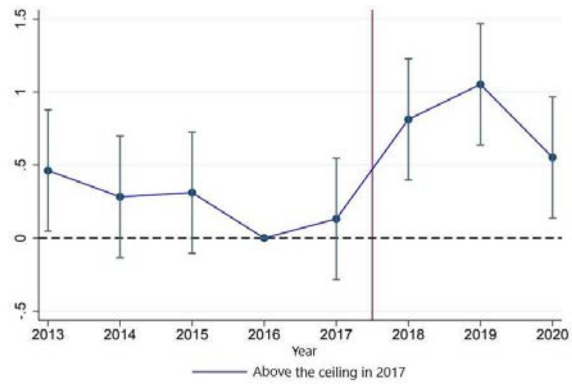
A7.f DiD estimates, 30% tax bracket



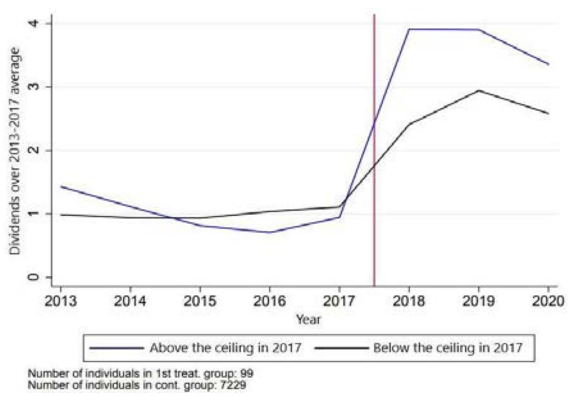
A7.g DiD averages, 41% tax bracket



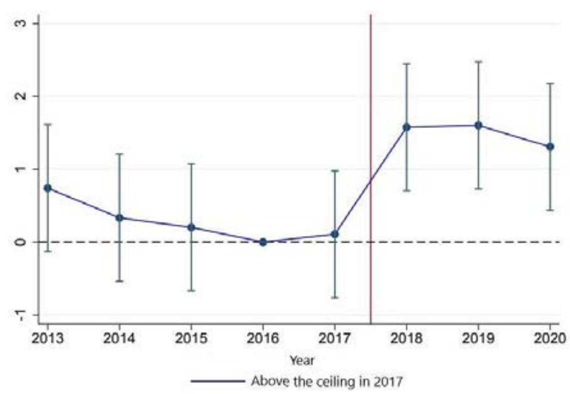
A7.h DiD estimates, 41% tax bracket



A7.i DiD averages, 45% tax bracket

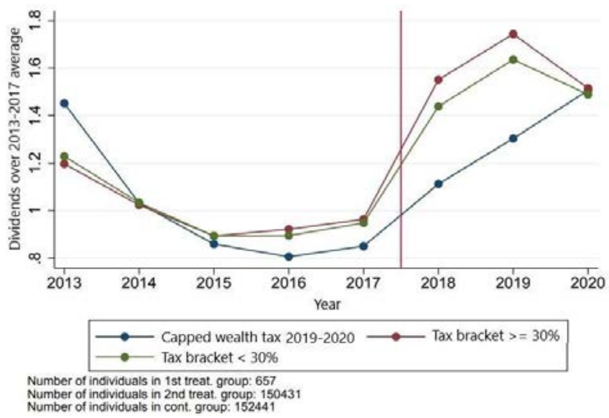


A7.j DiD estimates, 45% tax bracket

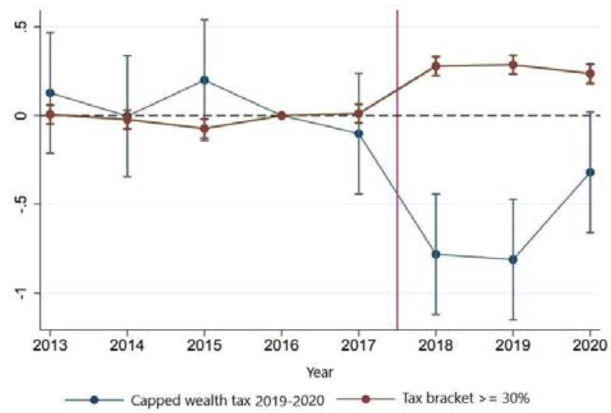


Appendix 8: Households remaining above the ceiling threshold in 2019 and 2020 did not experience an overreaction of their dividends

A8.a DiD averages

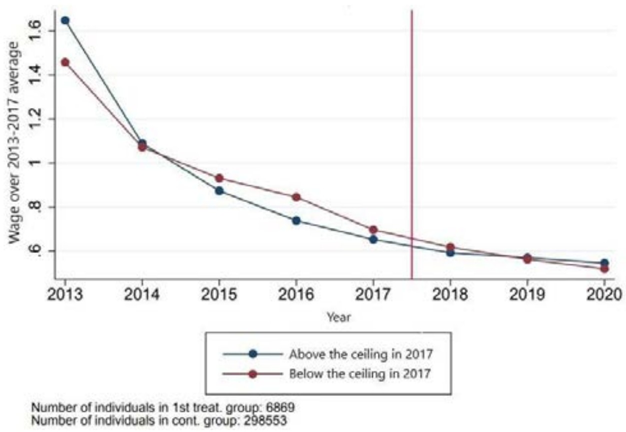


A8.b DiD estimates

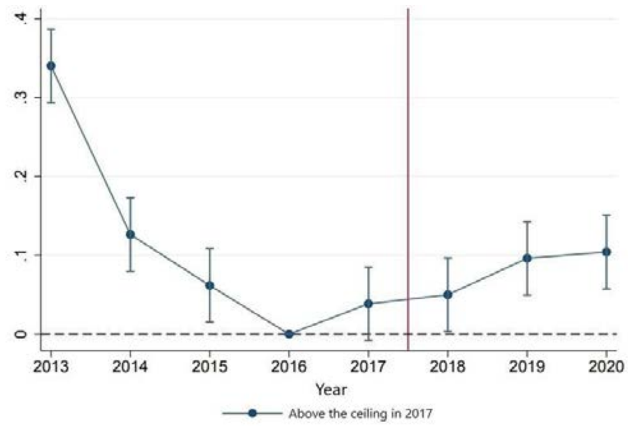


Appendix 9: Households falling below the ceiling threshold between 2017 and 2018 increased their wages

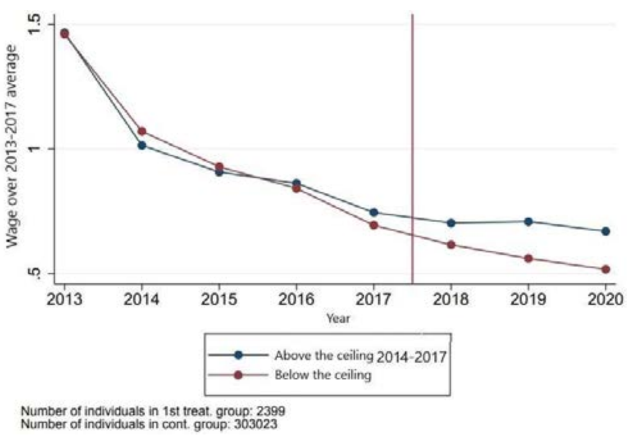
A9.a DiD averages



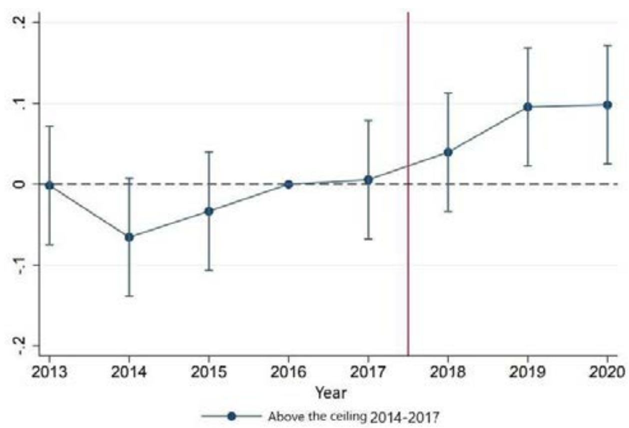
A9.b DiD estimates



A9.c DiD averages

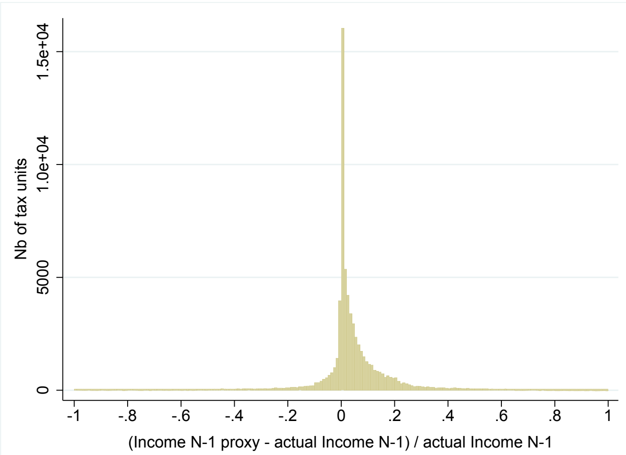


A9.d DiD estimates

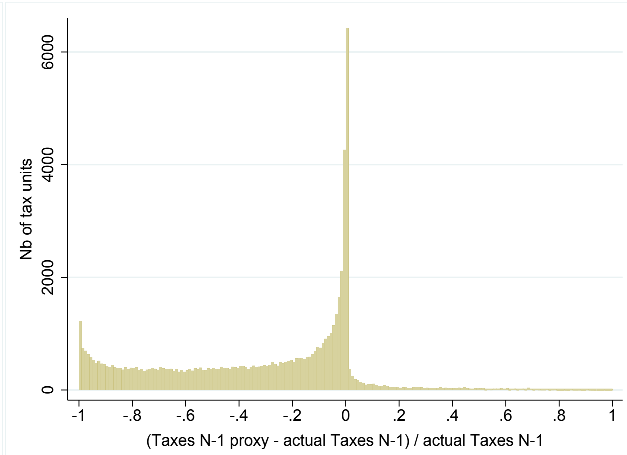


Appendix 10: Performances of our proxies

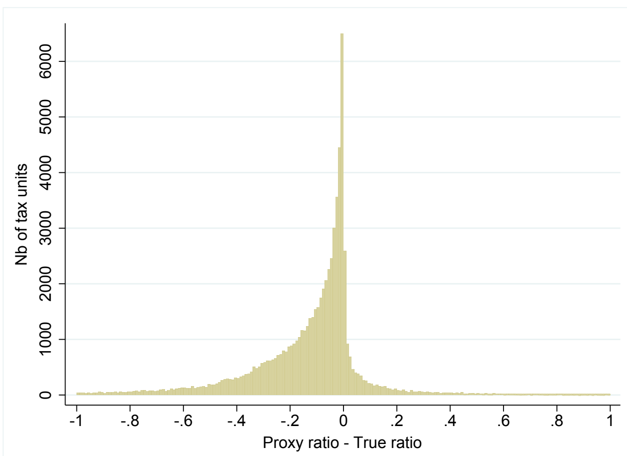
A10.a $\tilde{Y}_i$ proxy



A10.b $T_Y(\tilde{Y}_i)$ proxy



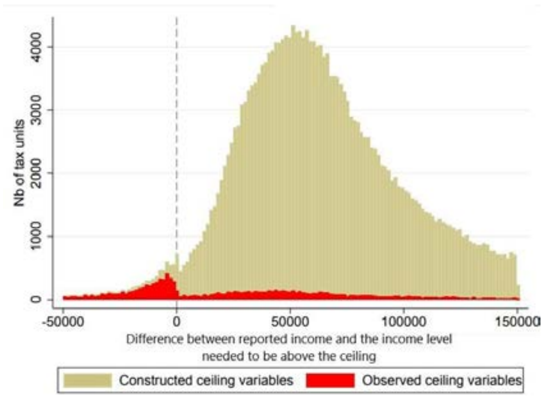
A10.c Taxes-to-income ratio proxy



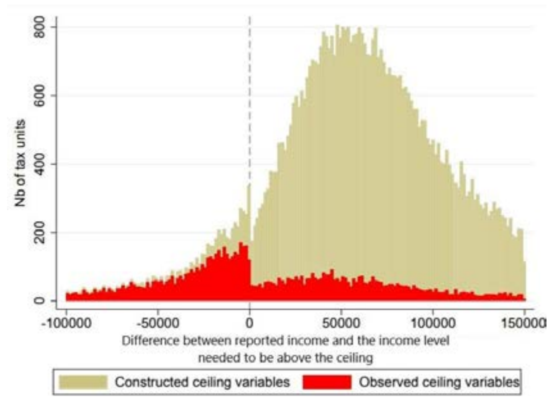
Note: These figures show histograms with respect to the difference between reported ceiling variables and the proxies we obtain using income tax returns for the years 2011 and 2013-2017 combined

Appendix 11: Proxy distribution of households

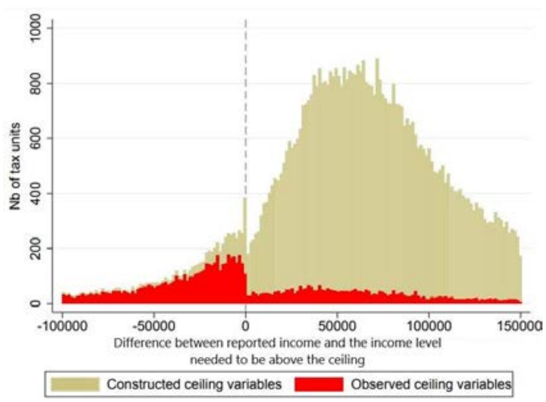
A11.a 2011



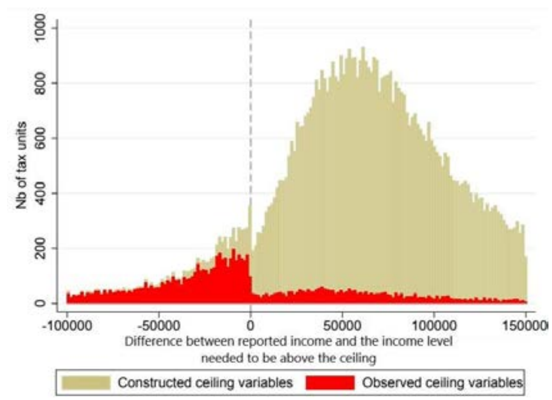
A11.b 2013



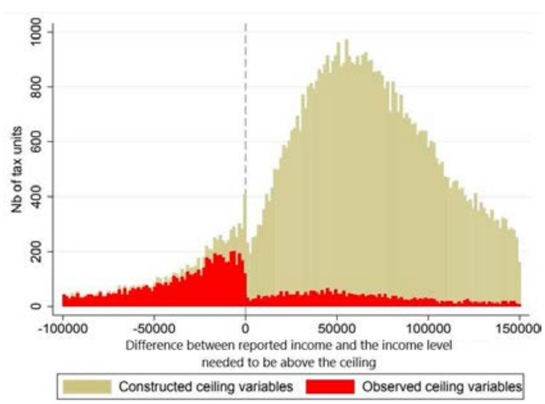
A11.c 2014



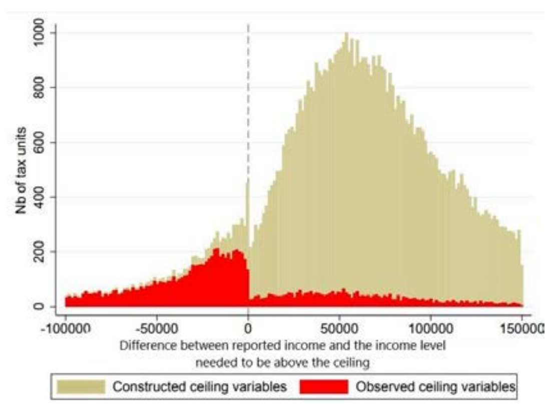
A11.d 2015



A11.e 2016

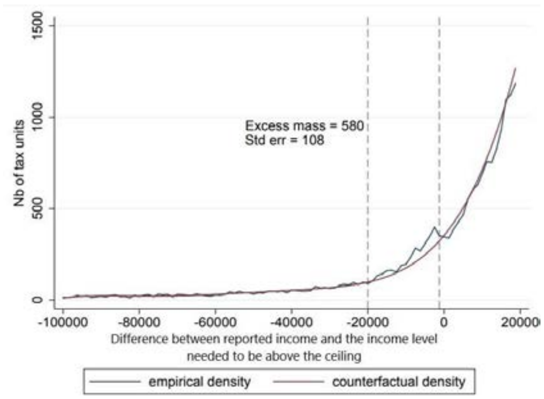


A11.f 2017

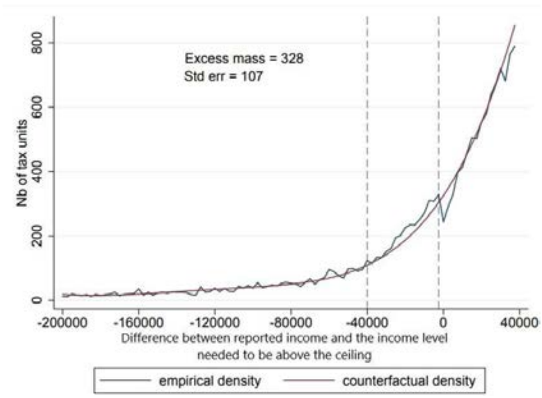


Appendix 12: Estimates of excess mass above the ceiling threshold

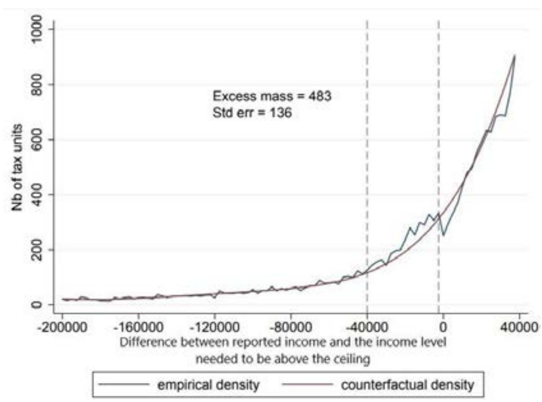
A12.a 2011



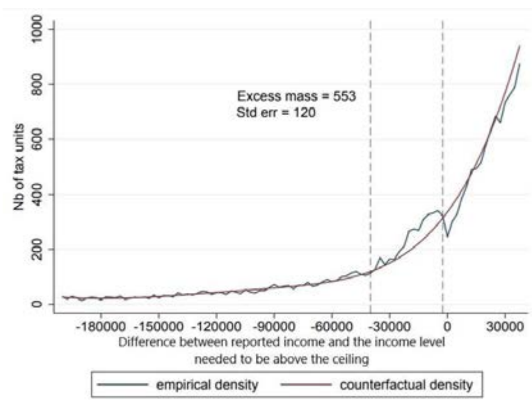
A12.b 2013



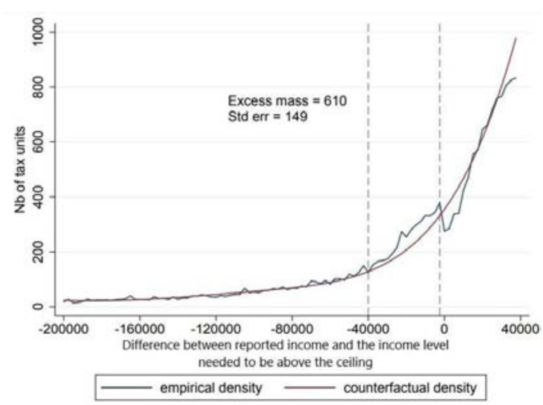
A12.c 2014



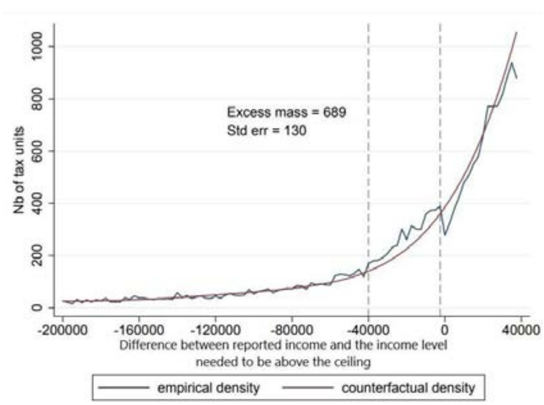
A12.d 2015



A12.e 2016

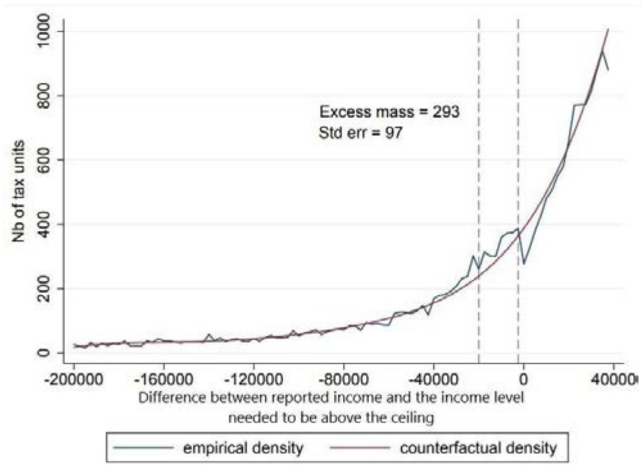


A12.f 2017

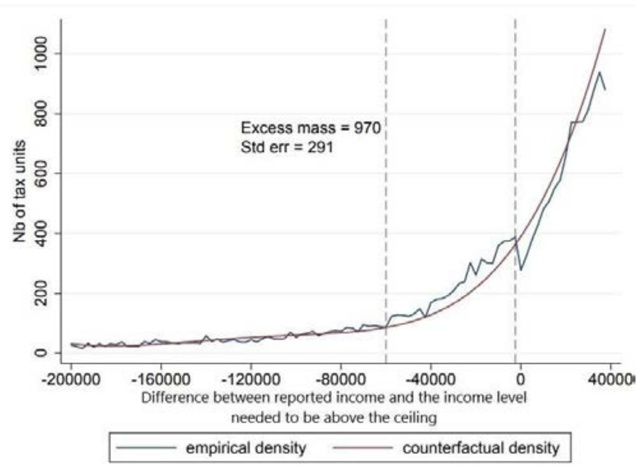


Appendix 13: Excess mass estimates with different lower bounds + first round estimates without Chetty et al. (2011) adjustment, 2017

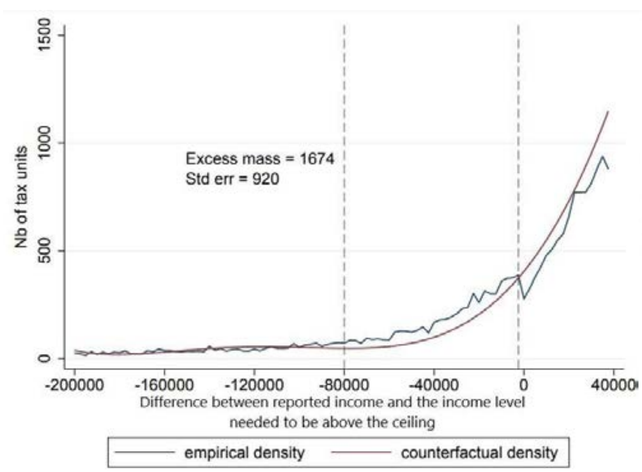
A13.a $\underline{R} = -20,000$



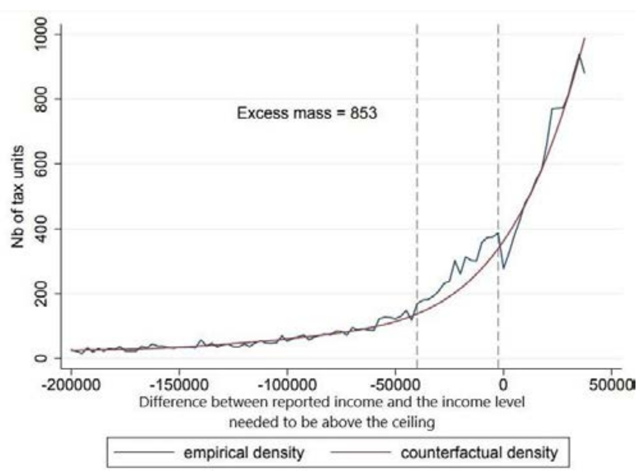
A13.b $\underline{R} = -60,000$



A13.c $\underline{R} = -80,000$

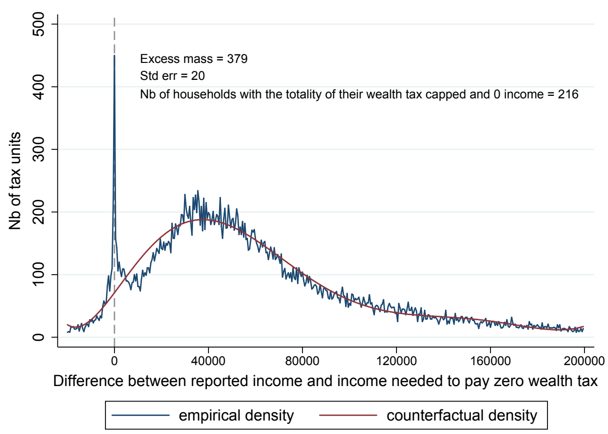


A13.d First round estimates without Chetty et al. (2011) adjustment

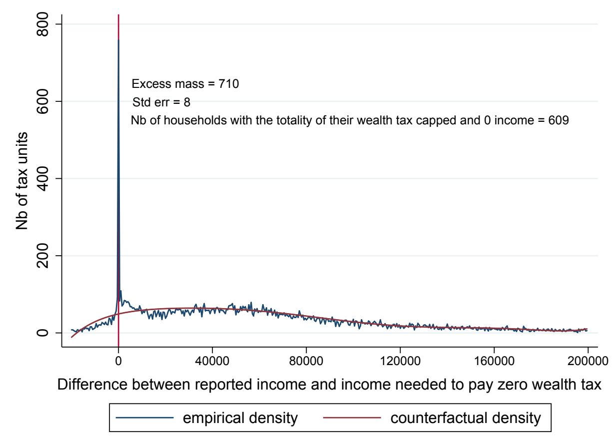


Appendix 14: Bunching estimates at the point where households pay exactly zero wealth tax

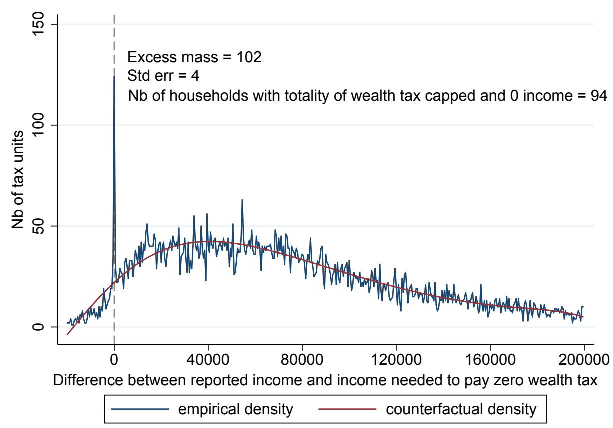
A14.a 2010



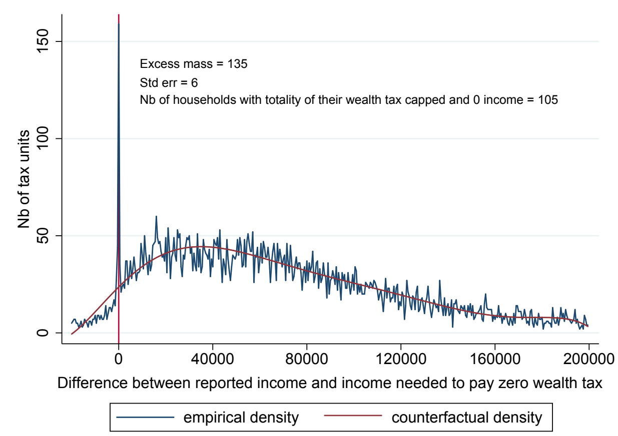
A14.b 2011



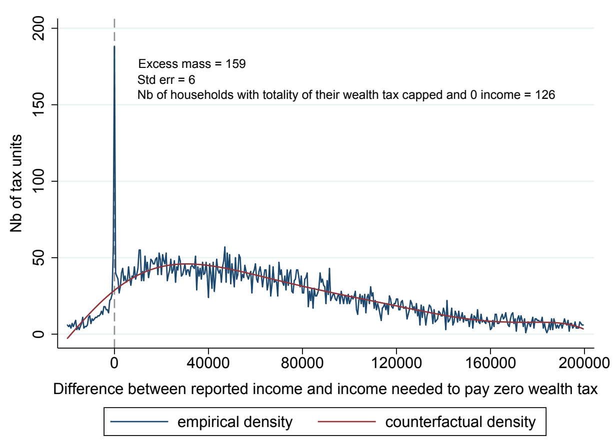
A14.c 2013



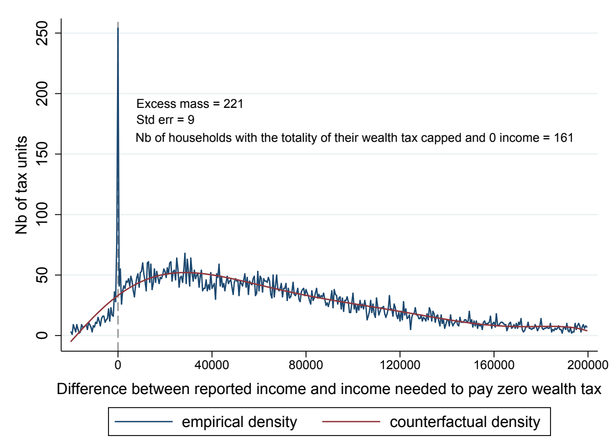
A14.d 2014



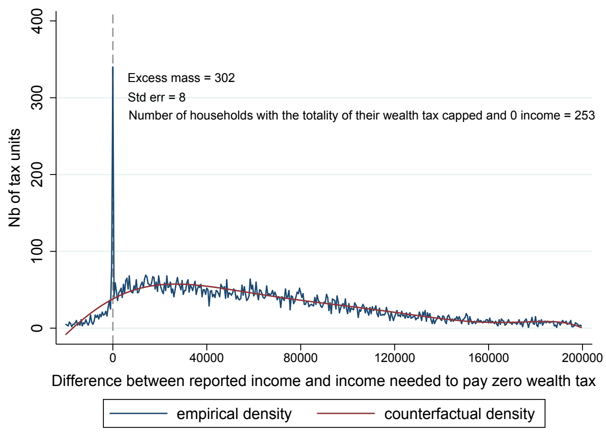
A14.e 2015



A14.f 2016



A14.f 2017



Excess mass = 302
Std err = 8
Number of households with the totality of their wealth tax capped and 0 income = 253
Nb of tax units
0
100
200
300
400
0
40000
80000
120000
160000
200000
Difference between reported income and income needed to pay zero wealth tax
empirical density
counterfactual density