Taxing Wealth in the Presence of Liquidity Constraints: Evidence from France*

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June 2024

Abstract

Real-world wealth taxes include income-based caps to make sure income-poor yet wealth-rich households do not have to sell illiquid assets. We show in the French context that these caps are binding mostly among households at the very top of the wealth distribution, who own liquid yet income-tax-deferred assets. These liquid assets typically amount to at least fifty times the yearly pre-cap tax. When the tax cap was temporarily removed in 2012, there was no subsequent surge in asset sales and decline in asset returns. When the wealth tax was cancelled in 2017, capped households' taxable income rose swiftly and massively, notably through higher capital gains, life-insurance earnings, and dividends. We conclude that caps at such levels as were observed in France do not serve their theoretical purpose of protecting illiquid assets. Rather, they reduce the proceeds from progressive wealth taxes, and make wealth taxes act as an additional income tax precisely on the population whose wealth is a better proxy for taxpaying ability than income.

JEL classification: E62, H25
Keywords: Wealth tax, wealth distribution, income distribution.

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1 Introduction

In the face of rising wealth inequality and declining progressivity of the income tax, there has been a renewed appetite for a wealth tax to complement existing tax systems (Saez and Zucman, 2019). Yet, wealth taxes have already been implemented in a dozen countries over more than a century, with mixed success (Saez and Zucman, 2022). A common reading of this experience is that wealth taxes generate concerns about liquidity (see e.g. Loutzenhiser and Mann, 2021; Scheuer and Slemrod, 2021) and are for this reason introduced with so many exclusions that their ability to generate revenue is questionable, often to the point that removing them is politically popular (OECD, 2018). In this paper, we analyze this trade-off between tax revenue generation and liquidity considerations for one of the most common wealth tax exclusions, which is that the combined income-and-wealth-tax bill is capped at a certain percentage of taxable income—what is often referred to as tax cap or tax ceiling. We consider the French context, where there have been reforms alternatively strengthening and weakening wealth tax caps, and for which there is detailed household registry data available.

In this paper, we present evidence on the behavioral responses to tax caps using two important French reforms—one which temporarily lifted the cap altogether and another which excluded financial wealth from the wealth tax base, restricting it to real estate equity wealth—and discuss the implications of our findings for optimal wealth taxes.

We start by discussing a simple framework of optimal wealth taxation in the presence of heterogeneity in returns and liquidation costs. We argue that when taxable income is rather inelastic, an income tax is likely to achieve the first best. On the other hand, when assets are perfectly liquid, i.e. they do not sell at a discount and can be sold in infinitesimal amounts, a wealth tax may also achieve the first-best. In the presence of both asset illiquidity and elastic capital income, neither wealth nor income taxation may be optimal on their own. This creates a motive for a wealth tax combined with an income-based tax cap. The optimal level of the cap is likely to increase in asset liquidity and in the elasticity of capital income. Connecting this simple framework to our empirical analysis, we posit that the tax cap is likely to be too low either when reported income increases after an income-capped wealth tax is removed or when there are neither asset sales nor declining wealth accumulation following a weakening of the cap.

We then run a detailed empirical analysis of wealth tax caps in the French context. First, we gather descriptive statistics on the population of French wealth taxpayers for whom the tax cap was binding. Using detailed data on households' asset composition, we find that capped households are among the richest in the French population and do not own particularly illiquid assets. In fact, these households are particularly invested in asset classes that are easy to liquidate but whose income taxation can be deferred. Because such assets are high on liquidity and generate highly elastic income, it is likely that the cap for these households is set at a suboptimally low level. At all levels of pre-cap wealth tax, capped and uncapped households hold similar amounts of liquid assets: these are always higher than fifty times the pre-cap wealth tax, and a hundred times the post-cap tax.

Second, we estimate the impact of a temporary removal of the wealth tax cap in 2012. Due to this reform, the proceeds from the wealth tax raised from previously capped households nearly doubled. We use a diff-in-diff design where control units are those households whose wealth tax liability relative to their income prior to the reform was quite high but substantially below the cap. We do not find that treated households sold assets and/or reduced their rate of wealth accumulation in order to meet the strengthened wealth tax demands for the 2012 fiscal year.

Third, we investigate the consequences on reported income of the removal of the wealth tax in 2017 for those households whose wealth tax was previously capped. We use a very similar diff-in-diff design as in the case of the first reform we investigate. We find that previously-capped households

report much more income once the wealth tax is abolished, and particularly those kinds of income that can be deferred: life-insurance proceeds, dividends, capital gains. Overall, these two results suggest that the French wealth tax cap, set between 75% and 85% of reported income, was too low for a large fraction of households benefiting from it.

Related literature and contribution. A number of papers have studied the behavioral responses to wealth taxes (e.g. Seim, 2017; Jakobsen *et al.*, 2020; Londoño-Vélez and Ávila-Mahecha, 2021; Brülhart *et al.*, 2022).[1] These papers are mostly interested in the elasticity of taxable wealth with respect to the marginal tax rate on wealth, i.e. by how much taxable wealth responds to changes in the tax rate on wealth. Closer to our setting, Jakobsen *et al.* (2020) exploits the presence of a tax ceiling in Denmark and used capped households as a control group in order to estimate the effect of a change in the marginal tax on wealth. We focus instead on how the *income* declared by households subject to the wealth tax ceiling reacts to the removal of this tax cap (through the removal of the wealth tax). As explained in section 3, we view the strength and composition of the income response to the end of the wealth tax as providing evidence on the extent to which households were able to time their income realization for the purpose of minimizing their overall tax burden in response of the tax ceiling.

Our paper makes three main contributions. First, we use administrative data on taxable wealth composition to document how pervasive liquidity constraints are among wealthy households affected by the tax ceiling ("capped households"), considering both the level of income and the liquidity of assets held. Second, we estimate how income declared by capped households respond to an abolition of the wealth tax. These results on the strength of behavioral responses by type of income, speaks directly the notion that some high income individuals are able to time or manipulate the realization of income in order to minimize their exposure to the wealth tax. Third, we interpret these results through a conceptual framework that allows to determine whether the ceiling is a useful tool in alleviating liquidity issues while retaining the favorable redistributive properties of wealth taxation.

Plan of the paper. The paper is structured as follows. We present the different data sources used in the paper in section 2. Section 3 introduces a discussion of the role of tax cap in optimal wealth tax cap design, highlighting the trade-offs created by asset liquidity issues on the one hand and taxable income elasticity on the other hand. Section 4 presents descriptive statistics on the population of wealth tax payers in France, and in particular the liquidity of their assets, and tests whether a sudden removal of the tax cap generated a substantial decline in assets. In Section 5, we detail our empirical strategy in order to identify the behavioral responses of taxable income to the wealth tax cancellation and discuss the results we obtain. Finally, we conclude in Section 6.

2 Data and institutional context

2.1 Data sources

Income tax returns (POTE). The French tax authority, the *Direction générale des finances publiques* (DGFiP) at the ministry of finances, produces every year a file called POTE including the complete detail of income tax declarations for each of the 37 million French tax units, i.e., the amount recorded

[1] See Advani and Tarrant (2021) for a recent review of the literature.

in each of the 3,000 items of the income tax return.[2] We have this information at our disposal for income from 2006 to 2021 (i.e., for income declared in years 2007 to 2022).

Wealth tax returns (ISF). The tax authority also produces a file from wealth tax returns which can be merged with a common identifier to the income tax returns.[3] Only tax units liable to the wealth tax report their taxable assets—with taxable assets above 1.3 million euros—, providing circa 350,000 tax units included every year. Taxable wealth includes all real estate and financial wealth until 2017. After the wealth tax base is reduced to real estate, liable households (approximately 150,000 households) declare only their real estate assets.

Information on payment, and therefore on eligibility to the tax cap, is available for all wealth taxpayers. However, since 2011, only those households with a wealth higher than 2.57 million euros have to fill in a detailed form on the value of their assets, while households below this threshold only declare the aggregate value of their taxable wealth.

2.2 The French wealth tax and its cap

The French wealth tax (ISF) was in place between 1988 and 2017 before being transformed in 2018 into a real estate wealth tax (IFI). The initial purpose of this tax on household wealth was primarily redistributive, as it was the only tax on the stock of capital that was both progressive and based on a broad definition of wealth, including real and movable assets while subtracting household debts.

It also had significant symbolic importance because it was a declarative tax to which only a minority of wealthy taxpayers were subject (approximately 358,000 liable households in 2017), whereas the other progressive tax, the income tax, affects a much larger portion of the French population (17 million liable households out of 38 million in 2017).

Upon the creation of the French Wealth Tax (ISF) in 1989, a mechanism for capping the tax was introduced. It aimed to limit the ISF amount when the sum of ISF, income tax (IR), and withholding taxes on IR reached 70% of the taxpayer's net taxable income[4]. This provision particularly benefited taxpayers who could easily reduce their taxable income without an effective reduction in their standard of living. In 1991, the cap was increased to 85% of income.

The principle of capping the wealth tax has thus been maintained since 1989, except for the year 2012. Indeed, the cap was initially eliminated by the 2011 ISF reform, introduced by the Fillon government in the amending finance law for 2011. The reform aimed to significantly reduce wealth tax rates, and the removal of the cap was accepted by the Constitutional Council[5]. In 2012, the newly-elected Ayrault government introduced an exceptional wealth contribution (CEF) in addition to the reformed wealth tax of 2011, which was implemented in mid-2012. The schedule used was that of the 2011 ISF, but no cap mechanism was provided for. However, the new wealth tax introduced from 2013 reintroduced the cap mechanism, limited to 75% of income. This exceptional cancellation of the cap provides an ideal experiment, which we analyse later in the paper.

[2] Form 2042 is the main source of information of the exhaustive POTE files.

[3] Form 2725 is the main source of information of the wealth tax files.

[4] The VII of Article 26 of Law 88-1149 of December 23, 1988, defines the cap mechanism.

[5] Article 1 of Law 2011-900 of July 29, 2011, amending the ISF by reducing the number of brackets and the applicable rates (0.25% for the bracket below 3 million euros and 0.50% above), while eliminating the cap mechanism. The Constitutional Council decision 2011-638 DC of July 28, 2011, validated the constitutionality of the absence of a cap mechanism.

Table 1: Shares of capped households, overall and by wealth bracket

	Total number of households	Share of capped households (%)	Share of capped households (%), weighted by: Wealth	Pre-cap wealth tax	Post-cap wealth tax	Life insurance
All wealth taxpayers	356,229	3.17	13.30	29.65	11.96	38.13
By wealth bracket						
– 1.3 to 2.57 M€	257,729	0.57	0.61	0.77	0.22	3.98
– 2.57 to 10 M€	91,426	6.25	8.77	12.97	6.88	14.85
– 10 to 50 M€	6,639	56.95	62.17	65.34	38.73	73.28
– above 50 M€	437	72.54	64.14	80.94	41.39	83.80

NOTES: This table shows the total number of tax households liable for Wealth Tax (ISF) in each taxable wealth bracket, and the share represented by capped households of the number of households liable for Wealth Tax, the Wealth Tax base, the pre- and post-capping amounts of Wealth Tax due, and life-insurance holdings.
SOURCES: ISF-IFI (DGFiP), POTE (DGFiP).

2.3 Comparison of capped and non-capped households

Quantitative relevance of the tax cap. Table 1 allows us to appreciate the quantitative significance of the cap on the entire population of taxpayers subject to the French wealth tax (ISF) in 2017, in general and at different levels of wealth. We observe that approximately 3% of liable households benefit from the cap, but collectively they represent 13.3% of the tax base and 30% of the revenues that would be raised in the absence of the cap (this portion reduces to around 12% after the cap is applied).

This substantial difference between the proportion of capped households and the share of the total tax they would need to pay without the cap mechanism suggests that these households are, on average, positioned very high in the wealth distribution. This is confirmed in the analysis by wealth bracket: about 57% of households with wealth ranging from 10 to 50 million euros benefit from the cap, and this proportion rises to 72.5% for those households whose wealth exceeds 50 million euros, and 64% of the tax base. The proportion of pre-cap taxes affected by the cap in this range reaches over 80%.[6]. The flip side of this strong concentration of the cap at the upper end of the wealth distribution is that this phenomenon is relatively rare for wealth below 2.57 million euros—the threshold below which households do not fill in a detailed wealth declaration. We exclude this population from our study due to lack of details on their wealth. Thus, between 1.3 and 2.57 million euros, only 0.57% of households are capped, representing 13% of capped households, while they make up 72% of wealth taxpayers.

We can also note, in the last column of Table 1, the very strong concentration of wealth held in the form of life-insurance among capped households. Beyond 50 million euros in wealth, capped households hold 64% of the total wealth, and nearly 84% of the life-insurance. In total, the share of capped households in life-insurance ownership is three times higher (38%) than the share of wealth they hold (13.3%). This affinity with life insurance of capped taxpayers may have to do with a search for safe and low returns, it may also have to do with the fact that capital income perceived via life insurance vehicles do not appear as taxable income up until such vehicles are subject to liquidation.

[6]It is worth noting that, as in the rest of this article, these figures do not include the few dozen households with taxable wealth exceeding 200 million euros, due to missing data.

Distribution of wealth, income and taxes. Table 2 presents summary statistics for the population subject to the French wealth tax who completed a detailed declaration for the 2017 tax year (with reference to income earned in 2016), based on their wealth tax cap status.[7]

The table has four subsections: it displays primary household characteristics, wealth values across different categories, income values, and tax rates. Several observations emerge from this table. First, the composition of households is very similar whether they are capped or not: households on average consist of around two tax units, and the main declaring individual has a median age of 69 years for non-capped households and 68 years for capped households. In terms of taxable wealth, capped households are significantly wealthier than non-capped households: the average wealth of capped households exceeds 13 million euros, while it reaches about 4.7 million euros in the population of non-capped households. This superiority in wealth level of capped households is reflected across all wealth categories. The difference is most pronounced in the life-insurance category, where the average amount is approximately 6 times higher for capped households (3 million euros). In terms of income, the observation is reversed: capped households have considerably lower incomes than non-capped households. The average taxable income of a non-capped household is slightly above 300,000 euros, whereas it only reaches 130,000 euros for capped households. Non-capped households have higher income across all income categories and at all levels of the distribution. Taxes related to taxable income (income tax and social contributions) are logically higher for non-capped households, but the effective rates of these taxes (i.e., the sum of these taxes divided by the taxable income) are of similar magnitude for both categories. The wealth tax over taxable income ratio before the application of the cap, however, is considerably higher for capped households. In fact, the pre-cap wealth tax owed is nearly 3 times as large as taxable income on average. This ratio is 1.3 for the median capped household. Nevertheless, the application of the cap brings the effective tax rates of capped households close to the maximum level: for the median household, taxes related to income represent 28% of the taxable income, to which is added a rate of 53.4% for the wealth tax, resulting in a total tax burden of 81%, which is close to the 75% cap rate. For non-capped households, the median rate is approximately 45%.

[7]Being required to complete a detailed declaration implies a significant level of wealth (over 2.57 million euros).Our comparisons between capped and non-capped households are therefore naturally conditioned on holding taxable wealth that places the taxpayer among the top 0.3% of the wealth distribution.

Table 2: Descriptive statistics on the sample according to their capping status (in 2017)

	Uncapped				Capped			
	Mean	Median	1st quartile	3rd quartile	Mean	Median	1st quartile	3rd quartile
# fiscal shares	2.076	2	1.250	3	1.874	2	1	2.750
Age ref. person	69.28	69	52	87	67.63	68	49	87
Wealth								
Gross wealth, k€	4727	3749	2836	7019	13929	8761	3671	26625
Taxable wealth, k€	4473	3536	2700	6663	13282	8494	3509	26091
Primary residence, k€	682	506	0	1457	978	630	0	2200
Other real estate, k€	1217	850	10	2665	1737	820	0	4313
Liquid assets, k€	1197	664	20	2763	4677	2068	63	11392
...incl. life-insurance, k€	557	0	0	1796	3192	208	0	8868
Listed securities, k€	1243	617	0	2942	4192	1139	0	10368
Controlled securities, k€	329	0	0	305	1394	0	0	1631
Other mov. assets, k€	434	60	5	1429	1811	108	7	4793
Debt, k€	-374	-108	-835	-27	-859	-154	-2095	-18
Income								
Taxable income	311400	138642	51483	531539	130812	60222	6921	282361
Business income	4787	0	0	3482	2358	0	0	668
Other indep. income	12350	0	0	0	2087	0	0	0
Capital gains	60388	0	0	12248	10118	0	0	5980
Other capital income	164533	53153	5284	258121	89839	23397	354	204121
Real estate income	43251	15298	0	117026	37695	1322	0	85275
Taxes								
Income tax (progressive)	79973	23967	2218	146319	32487	5638	261	72149
Income tax (flat-rate)	35980	16515	6352	58403	18668	7937	1984	38660
Pre-cap wealth tax	25821	17105	1881	48403	153417	78689	20515	338800
Post-cap wealth tax	25821	17105	1881	48403	49483	30590	902	107364
Prog. Income tax / TI	0.201	0.190	0.0289	0.380	0.178	0.129	0.0119	0.442
Flat Income tax / TI	0.132	0.126	0.0839	0.165	0.219	0.151	0.0929	0.406
Pre-cap wealth tax / TI	0.166	0.129	0.00794	0.391	3.724	1.279	0.519	8.957
Post-cap wealth tax / TI	0.166	0.129	0.00794	0.391	0.565	0.534	0.165	0.956
# obs.	91290				9817			

NOTES: This table contains descriptive statistics on the demographic characteristics, wealth composition, income and taxes of households, for the 2017 tax year, according to whether or not they benefited from the wealth tax cap.
SOURCES: ISF-IFI (DGFiP), POTE (DGFiP).

Overall, the evidence so far suggests that in France the wealth tax cap mostly benefited wealth-rich but capital-income-poor households with few liquidity constraints. In the next section, we investigate theoretically whether this is the population for whom a capped wealth tax is appropriate.

3 Conceptual framework

In this part, we develop a conceptual framework to interpret the potential responses to the two wealth tax reforms we investigate. We reason in a situation where households' efforts are directed towards generating an additional return on their wealth on top of a "baseline" return they earn without effort. Importantly, this "baseline" return is subject to substantial heterogeneity across households, in line with the recent empirical literature in household finance (Bach *et al.*, 2020).

In such a situation, an income tax will reduce households' optimal investment effort. As a result, a social planner with a pure Rawlsian objective will set a bounded optimal income tax rate such that it hits the peak of the Laffer curve. As is customary in the optimal taxation literature (Piketty and Saez, 2013), the lower the elasticity of capital returns to one-minus-the-income-tax-rate the higher the optimal rate. In this context, a wealth tax assessed on pre-investment-effort wealth will not reduce households' investment efforts. Rather, according to the "use it or lose it" argument (Guvenen *et al.*, 2023), a wealth tax may induce more effort to guarantee the taxpayer a minimal level of consumption. As a result, in a Rawlsian setting, the optimal wealth tax rate will keep growing up, until the point where it hits a liquidity constraint, i.e. where the taxpayer's net-of-tax income falls below a certain fraction of initial wealth. The greater the illiquidity of the asset, the more stringent this condition is: when wealth is fully liquid, it can be converted at no cost to offset the meager post-tax capital income; when wealth is instead very illiquid, significant liquidation costs prevent it from compensating the lack of post-tax capital income.

From the social planner's perspective, the choice between an income tax and a wealth tax therefore hinges on the relative importance of the positive elasticity of taxable income to one-minus-the-income-tax-rate, the negative elasticity of taxable income to one-minus-the-wealth-tax-rate and the liquidity of the assets. In this setting, a combination of an income and a wealth tax may dominate each kind of tax on a standalone basis. If the taxpayer has strongly illiquid assets, there is substantial heterogeneity in baseline returns and a significant elasticity of income to one-minus-the-income-tax-rate, it may be optimal to set an income tax in situations where the return is small (income is so small that "eating" the asset is very desirable, and the urge to consume is strong enough to generate some effort) and a wealth tax in situations where the return is big (consumption is quasi-starved so there must be steep incentives to make an effort, and there is enough income to make an asset sale unnecessary). This is precisely what a wealth tax with an income-based cap consists of.

How shall we then read the results of our estimation of the effect of the 2012 and 2017 wealth tax reforms in France? We start by the 2017 reform, which essentially consists for previously capped households of a stark reduction in the income tax rate they face. The question is whether these capped households initially had a low return due to low effort or low baseline return. If it is the former then the cap was likely initially set at a suboptimally low level. There will be grounds for such a conclusion if it turns out the return obtained by capped households suddenly increases once the capped-wealth-tax is removed, which indeed suggests a very substantial elasticity of taxable income to one-minus-the-income-tax-rate.

Such an analysis does not provide all that we need in order to decide on the optimal cap, which depends also on the elasticity of returns to the wealth tax and the degree to which assets may be liquidated. This is where the 2012 reform is particularly useful. It consists of a situation where an

uncapped wealth tax is imposed for a single year. Previously-capped households are suddenly subject to a very large payment, which could either lead them to exert more effort ("use it or lose it") or liquidate assets. The optimality of the cap depends on which of these two effects dominate: if returns appear to increase and there are no detectable liquidations, then the cap appears to be unnecessary and a pure wealth tax is warranted; if returns appear to decrease or there are substantial liquidations, then a cap appears to be necessary.

In the ensuing empirical analysis, we take those theoretical insights to work and start by investigating in a descriptive and causal fashion to which extent tax-capped households in France fit the situation whereby the introduction of a stringent cap on the wealth tax is warranted.

4 Liquidity constraints among capped households

This section analyzes the liquidity of wealth taxpayers, comparing capped and uncapped households. It starts with a description of the wealth composition of these two populations, and then provides quasi-experimental evidence from the cancellation of the wealth tax cap, which happened for a single year in 2012.

4.1 Wealth composition of capped and non-capped households

Classifying taxable wealth into broad categories. In this paper, the liquidity of an asset refers to the ability to sell the asset quickly at its current market price. Here, we explain how we proceed to identify such liquidity based on what is declared on French personal tax forms. For this exercise, we focus on the year of declaration for the wealth tax in 2017, which is the most recent year this taxation was in effect. As before, we narrow down our analysis to the sample of liable individuals who completed a detailed declaration. It is also worth noting that we consider the gross taxable wealth without any deductions, rather than the effective tax base, in order to reflect the true value of owned assets.

- **Liquid:**
  - **Liquidities:** This category includes cash holdings, current accounts, savings bank books, Treasury bills.
  - **Listed Securities:** This category includes listed shares held directly, as well as shares of investment companies with variable capital.
  - **Life-insurance:** This category includes life-insurance accounts.
- **Potentially liquid:**
  - **Other Movable Assets:** This category includes all other movable assets, i.e., the net amount of the box for other movable assets excluding life-insurance, the "mobilier forfaitaire". These assets include cars, jewels, horses, etc., and may have very diverse levels of liquidity.
  - **Other Real Estate:** This category contains secondary residences, as well as all undeveloped real estate and other rural properties.
- **Not liquid:**

– **Shares of controlled companies (non-liquid):** This category includes elements encompassing all shares and equity interests held in companies by individuals who have a role within these companies, have signed a shareholder agreement ("Pacte Dutreil"), etc. Here, they are assumed to be non-liquid due to their connection with the holder's role within the company or due to shareholding commitments.

– **Real Estate (main residence):** This category contains the main residence value, before deduction. While the asset in itself may be easy to sell, we consider it illiquid because of its current usage as the taxpayer's own residential unit.

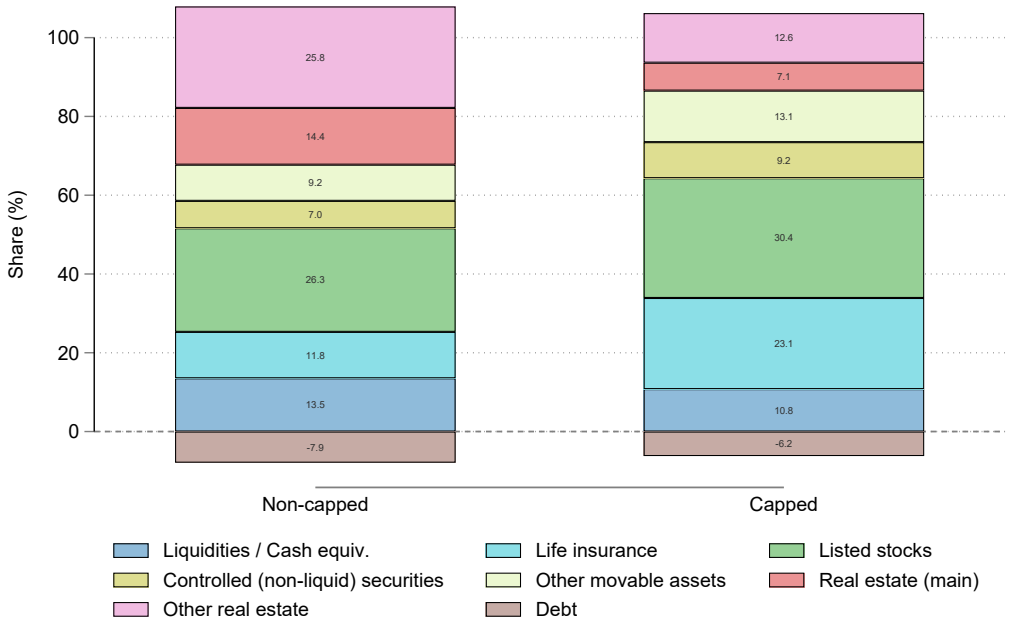
– **Liabilities:** This box contains the liabilities.

Composition. Figure 1 presents the share of each of the categories described above in the wealth of individuals subject to the wealth tax who declared a wealth exceeding 2.57 million euros in 2017, distinguishing between those who were subject to the cap (capped) and those who were not (non-capped). Several observations emerge from this figure. On one hand, real estate represents a more significant portion in the wealth of non-capped individuals than in that of capped individuals: it accounts for a total share close to 40% among non-capped individuals, compared to only 20% among capped individuals. Within movable assets, a substantial portion of the assets held by capped individuals is, in fact, highly liquid. For instance, liquid assets make up about 34% of the wealth of capped individuals, compared to 25% for non-capped individuals, and listed securities also constitute a higher proportion, at 30% for capped individuals versus 26% for non-capped individuals. This conclusion may appear surprising. On one hand, one might expect liquid movable assets to generate income (although life-insurance escapes this logic since income is only realized upon liquidation). On the other hand, the notion that the cap benefits households with less liquid and less divisible wealth seems to be widely challenged here.

Nonetheless, significant composition effects could be at play, potentially biasing this conclusion. Particularly, differences in the overall level of wealth between capped and non-capped individuals could be the source of this disparity in wealth composition, rather than the capped status itself. Figure A1 displayed in the Appendix illustrates the proportions of both liquid assets and listed securities for capped and non-capped individuals by wealth bracket. It confirms that the share of liquid assets in the wealth of capped individuals (blue circles) is consistently higher across all wealth categories compared to its counterpart among non-capped individuals (red diamonds), and even exhibits a substantial difference within the wealth range exceeding 100 million euros (nearly 30% compared to approximately 6% for non-capped individuals). The portion represented by listed securities is relatively more uniform between the two groups.

In Figure 2, we take a slightly different approach from the previous figures. We construct the ratio of declared liquid assets in 2017 to the amount of wealth tax payable by households, before the application of the cap, based on whether they are capped or non-capped. We then sort the population of households according to the amount of their pre-cap wealth tax and divide them into 30 equal parts. We also restrict ourselves to pre-cap wealth tax amounts exceeding 10,000 euros, to avoid extremely high and hard-to-interpret ratios. This ratio is intuitive as it can be interpreted as the number of years of wealth tax that the liquid assets held by the household cover. We observe, on one hand, that the levels are very similar between capped and non-capped households, which is expected given the relative proportions of liquid assets shown in Figure A1. We also note that the value of this ratio reaches an average of about 150 years of pre-cap wealth tax coverage at the lower end of the distribution, and decreases to around 50 years at the upper end of the distribution.

Figure 1: Asset composition of wealth taxpayers, by cap status

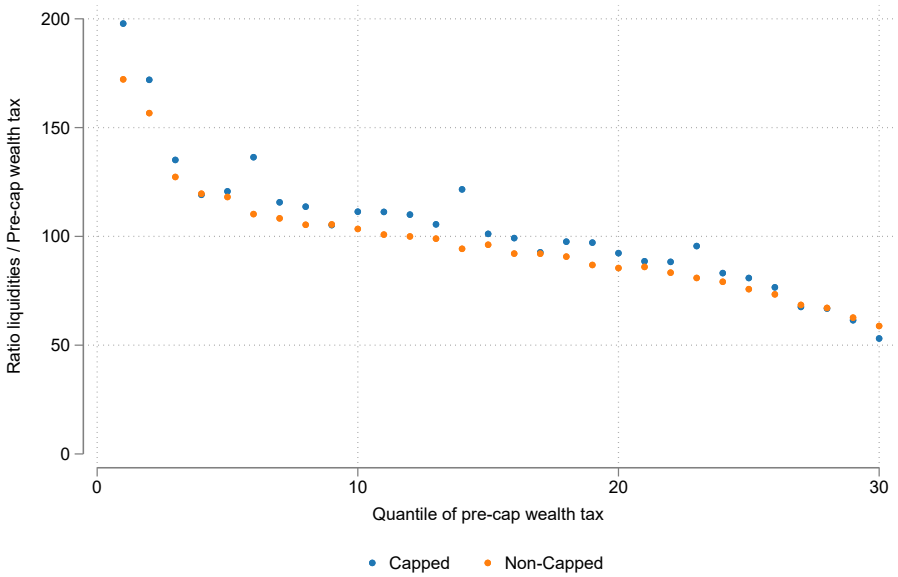


NOTES: This figure shows the composition of taxable wealth by asset category, distinguishing between households benefiting and not benefiting from the wealth tax cap. Values are expressed as a share of gross taxable wealth (debts are therefore represented as an asset with a negative value).
SOURCES: ISF-IFI (DGFiP), POTE (DGFiP).

In the appendix, we detail the distribution of this ratio by bins of pre-cap wealth tax among tax capped households in Figure A13. In particular, we compute the fraction of households whose ratio of pre-cap wealth tax to liquid wealth exceeds a given threshold. This allows us to assess whether, despite high average value even among small groups of households, there is still a non-negligible fraction of household who would be facing short-run liquidity constraint in the absence of the tax cap. Overall, we find that only 2% of capped households have a wealth tax coverage ratio of less than one, and less than 10% have a coverage ratio lower than ten, suggesting that an overwhelming majority of capped households could in fact pay the uncapped wealth tax without having to sell illiquid assets.

All of these descriptive elements lead to the following observation: the population of capped households appears to be more distinct due to their low incomes than to the structure of their wealth. In particular, these households have very high wealth, and a high proportion of this wealth is liquid. The question arises as to the cause of these low incomes, as they would generally correspond to extremely low yields on an otherwise liquid average wealth. Thus, as shown in Table 2, the median income of a capped household is approximately 60,000 euros, more than two times lower than that of a median non-capped household, even though the median wealth of capped households is more than twice that of non-capped households. Going further in our analysis requires investigating what happened at times of deep reform of the wealth tax cap.

Figure 2: Ratio of liquid assets held to pre-cap wealth tax amount



NOTES: This figure shows the ratio between a household's liquid assets and the wealth tax owed before capping as a function of wealth tax level. Households are sorted by wealth tax level (panel a, pre-cap; panel b, post-cap) and grouped into 30 brackets.
SOURCES: ISF-IFI (DGFiP), POTE (DGFiP).

4.2 Evidence from the 2012 cancellation of the cap

As explained in section 2, the wealth tax cap was canceled for a single year in 2012. We leverage this quasi-natural experiment to ask whether households that were suddenly uncapped faced an important drop in their taxable wealth (for instance because of a forced sale at a low price), and whether they had to sell assets.

4.2.1 Empirical approach.

To identify the effect of the sudden cancellation of the cap in 2012, we would ideally like to compare households that should have been capped in 2012 to households that were similar except that they would lie just below the cap threshold in terms of their total tax rate. Making such a comparison, we could interpret the change in effective wealth tax rate in 2012 across groups as having been caused by the uncapping, and changes in wealth changes or asset sales as being results of this one-off tax hike. Two difficulties however stand in the way of making such a comparison.

Identification challenges. The first difficulty is that, because the wealth tax cap was initially intended to be permanently removed, there was no box to declare it in the 2012 tax form. This omission means that the capping status for the year 2012 is unobserved. To address this, we need to use either a microsimulation procedure for all taxes involved in calculating the tax cap or a proxy based on the

capping status in previous years. A second difficulty is that the capping status of households is subject to severe reversion to the mean.

Construction of Treatment and Control Groups. In order to mitigate the mean reversion phenomenon, it is necessary to accurately approximate the status of households with respect to the wealth tax cap that would have taken place in 2012, while conditioning as lightly as possible on income evolution just before the reform. One way to approach the problem is to divide capped households from a given year into two groups: permanently capped households, whose income is consistently very low compared to their wealth,[8] and transient capped households, whose cap status is due to exceptionally low income in one or a few particular years. While the first group should be less sensitive to the definition of the treatment period and therefore contribute less to the mean reversion phenomenon, the second group will likely experience a mechanical increase in income right after the treatment definition window. Our definition of treatment and control groups therefore aims at focusing on the first group while excluding the second.

An important point to note regarding the cap is that the primary factor leading to the exceeding of 85% of taxable income in taxes is the wealth tax itself. Indeed, all other taxes rely heavily on bases that are closely related to taxable income. Accordingly, their sum relative to income is mechanically maintained below a threshold well below 85% (the top MTR at the income tax was 41%). On the other hand, the wealth tax is based on a different tax base, and a low income-to-wealth ratio can easily significantly increase the taxes-to-taxable income ratio. We leverage this characteristic of the cap, constructing treatment and control groups using only taxable income and the amount of wealth tax that is due. To dissociate income and taxes as much as possible, we create a "minimal" wealth / income ratio in the pre-treatment period. This ratio is calculated as the average wealth tax burden (pre-cap) owed between 2008 and 2011, divided by the maximum taxable income between 2007 and 2010 (the corresponding period in income years used to calculate the cap). Our analysis focuses on households for which the weight of the wealth tax has a high recurring impact with a minimum effective ratio of at least 30%. This ratio means that the wealth tax is structurally very heavy for these households and is less likely to reflect transitory income dynamics.

Among these households, we consider households as treated if the minimum effective wealth tax-to-income ratio exceeds 60%, and as controls if this same ratio is between 30% and 60%. This strategy has the advantage of comparing households where the wealth tax weight relative to income is structurally very high, and where the cap is not influenced by the exceptional realization of very low incomes. In practice, this selection allows us to eliminate a significant portion of households with exceptionally low income or exceptionally high wealth tax in a specific year. Additionally, to make sure that our measure of treatment is well measured, we restrict our sample to households which are observed in the data all years of the pre-reform period.

Specification. We present our estimating equation below:

$$y_{it} = \alpha_i + \lambda_t + \sum_{\substack{d=2008 \\ d \neq 2010}}^{2016} \beta_d \cdot D_{t,d} + \delta_t \mathbf{x}_i + \varepsilon_{it}, \tag{1}$$

where $T_i = 1$ for treated households and 0 otherwise and $D_{t,d} = 1$ if $t = d$ and 0 otherwise. The vector $\mathbf{x}_i$ contains a set of vector observed in pre-reform years interacted with year fixed effects. In

[8] This can be the case, for example, if they are able to control/retime their income or because they own assets with particularly low yields.

order to capture as finely as possible confounding factors that may imply differential trends across groups due for reasons independent of the wealth tax cap reform, we control for time-varying fixed-effects of vingtiles of wealth, deciles of age, geography (*départements*), and household composition (the pre-reform number of fiscal shares).

Note that for dependent variables constructed as ratios (i.e. normalized by pre-reform taxable wealth), we winsorize these variables at the 1st and 99th percentiles.

4.2.2 Results.

First stage. Figure 3 displays the results of the first-stage of our estimation studying the cancellation of the wealth tax. Panels a and b respectively show the results across treated and control group of the probability of being capped, as raw averages and as regression estimates. Similarly, we study the effective tax rate, which is displayed as raw averages in panel c, and as regression results in panel d. Panel a shows that the treated group has a stable probability of around 55% to be capped in each given pre-reform year, while households of the control group have a probability around 15% to be capped each year. In year 2012, both groups mechanically fall to a 0 probability, implying a differential change of around 33 percentage points, as shown in panel b. Panels c and d show similar results on the effective wealth tax rate (wealth tax over taxable wealth). It shows a one-year increase of the tax rate in 2012 in the treated group, which amounts to 1.3 euros of additional tax per 1000 euros of taxable wealth. Taken together, this suggests that the 2012 experiment led to an increase in the effective wealth tax rate of 0.4 percentage points, i.e. an increase by 70% compared to the effective tax rate prior to 2012.

In Figure A2 displayed in Appendix, we check that our results hold when the time window over which is built our minimum wealth to income ratio, used to assign households to the treatment or control group, is changed. It shows that our results are not caused by reversion to the mean, since an effect is always found on the exact year of the cap cancellation, whatever the time window we use.

Second stage. Based on the strong differences across both groups on the probability to be capped and the wealth tax payments, we study the consequences this exceptional tax increase had on wealth returns (yearly changes in wealth[9]) and on realized capital gains. The reason to study the change in wealth is that, if capped households are indeed illiquid, they may have to sell some assets quickly, meaning that they would obtain significantly less than the true value of these assets. If that is the case, we should see a differential change of their wealth within the treated group in 2012. Similarly, we should observe some sales declared at the income tax.

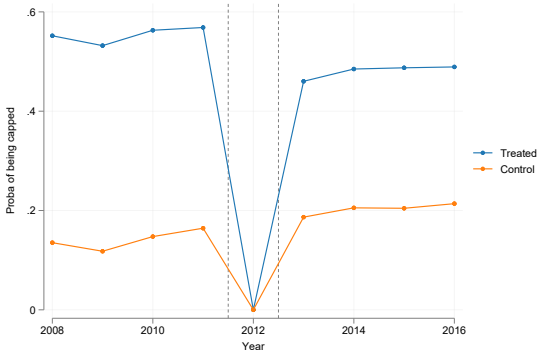
Figure 4 shows our estimations results on our two variables of interest: the yearly logarithmic change in wealth, capturing asset returns, in panels a and b, and the sales (the sum of capital gains and losses) normalized by wealth, in panels c and d. Panel a shows the raw average across groups of the yearly wealth change: while these changes are substantial, they are remarkably similar across groups. The regression results shown in panel b are a bit less conclusive, which is mosly due to the normalization being done in 2010, a year in which the change is slightly lower in the treated group than in the control group. Overall, we can reject the hypothesis that the exceptional lift of the cap generated a large negative change in wealth for the treated group.

[9] Strictly speaking, changes in wealth do not just include the effect of returns but also the effect of active saving behavior. However, we equate wealth changes with wealth returns in this diff-in-diff analysis because it's been shown in previous literature (Bach *et al.*, 2017) that active saving does not evolve very much in aggregate time series compared to asset returns.

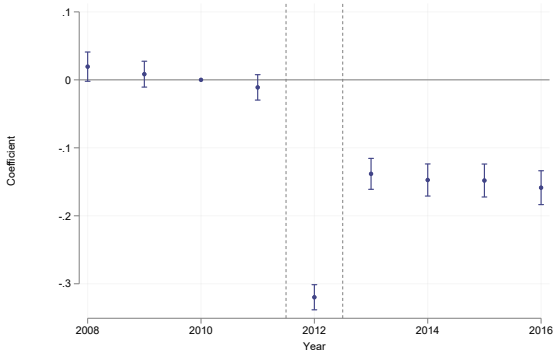
Figure 3: First-stage results on the 2012 cancellation of the cap

Probability of being capped

(a) Raw averages

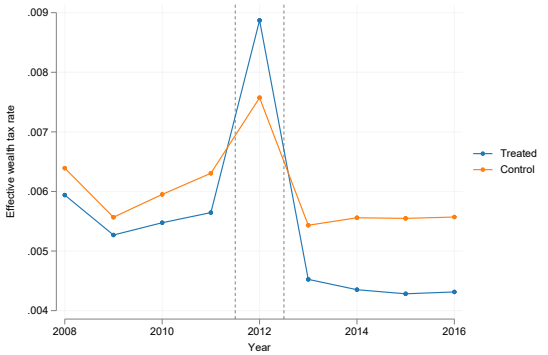


(b) Regression estimates

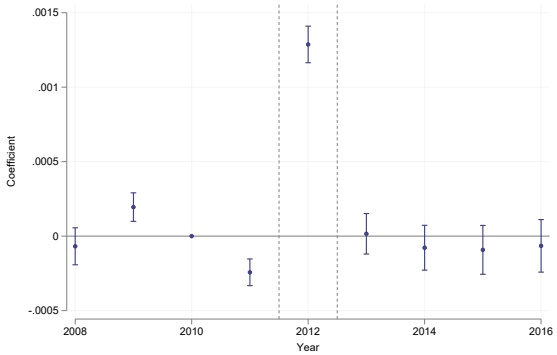


Effective wealth tax rate

(c) Raw averages



(d) Regression estimates



NOTES: This figure shows the yearly average across our treatment and control groups (panels a and c) and the diff-in-diff estimates (panels b and d), around the cancellation of the wealth tax cap in 2012. The variable studied in panels a and b is the probability to be benefit from the wealth tax cap. The variable studied in panels c and d is the wealth tax normalized by the 2011 taxable wealth. The regression coefficients are obtained by estimating equation (1), and include time-varying fixed-effects for pre-reform vingtiles of wealth, deciles of age, *departements* (fine geographical regions) and household composition (number of tax shares).
SOURCES: ISF-IFI (DGFiP), POTE (DGFiP).

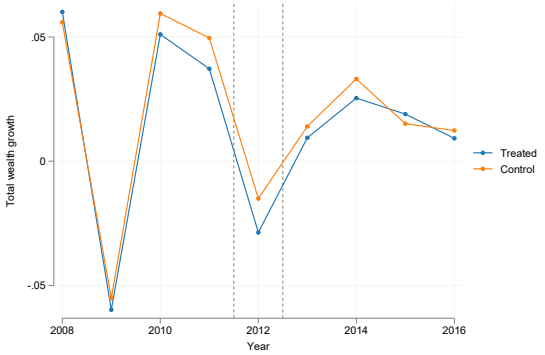
This conclusion is supported by panels c and d of Figure 4, which show the results on sales (capital gains and losses) normalized by 2011 taxable wealth. One can see that the series are very stable across groups over the period, a result which regression estimates confirm.

Overall, we can conclude from this section that the fears of asset illiquidity that would justify putting strong income-based caps on the wealth tax are not confirmed in the French case, and certainly not with a cap set between 75% and 85% of taxable income. It remains to be seen however whether such a cap is not only unnecessary but in fact detrimental to tax revenue raising, which is what we investigate in the next section.

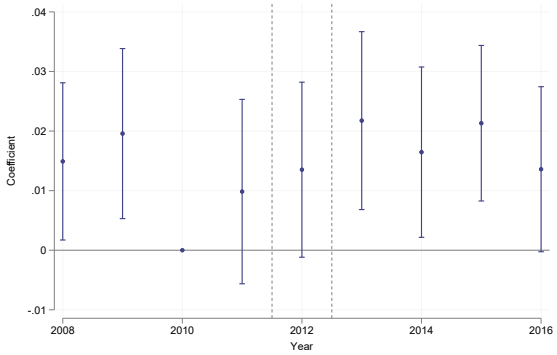
Figure 4: Effects of the 2012 cancellation of the cap on wealth changes and sales

Yearly wealth change (dlog)

(a) Raw averages

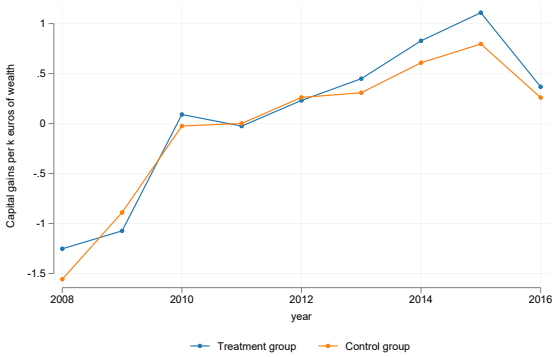


(b) Regression estimates

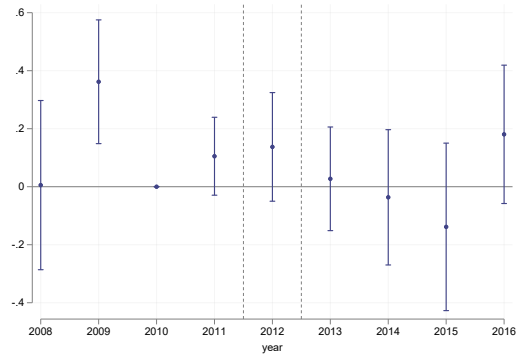


Capital gains over wealth

(c) Raw averages



(d) Regression estimates



NOTES: This figure shows the yearly average across our treatment and control groups (panels a and c) and the diff-in-diff estimates (panels b and d), around the cancellation of the wealth tax cap in 2012. The variable studied in panels a and b is the yearly wealth tax change (dlog). The variable studied in panels c and d is the sum of capital gains and losses normalized by the 2011 taxable wealth. The regression coefficients are obtained by estimating equation (1), and include time-varying fixed-effects for pre-reform vingtiles of wealth, deciles of age, *departements* (fine geographical regions) and household composition (number of tax shares).

SOURCES: ISF-IFI (DGFiP), POTE (DGFiP).

5 Behavioral responses of income to the wealth tax cancellation

The wealth tax reform that took place in France in 2017 is likely to have had a specific effect on households that were subject to the wealth tax cap. Indeed, among wealth tax payers, "tax capped" households experienced a particularly strong decline in the marginal tax rate applied to their income. The tax cap implied a higher MTR (75%) as any additional euro of income would result in a 75 cents increase in the overall tax burden—through an increase in the denominator of the tax-cap formula. The ISF/IFI 2017 reform, by reducing the wealth tax base to real estate assets, significantly lowered taxable wealth, and resulted in lower tax burden for households with a large holding of financial assets.

This mechanically led to a large reduction in the number of households affected by the cap, who in turn experienced a large decline in MTR on their income.

As mentioned above, the effects of the reforms in terms MTR reduction are strong, and particularly so for some types of income that have benefited from additional contemporaneous reduction in tax rates. Concomitantly to the wealth tax reform, the government reintroduced a flat tax with a rate of 30% on capital income.[10] The combined effect of the two reforms thus reduced the applied rate for these incomes from 75% to 30% for capped households opting for the flat-tax in 2018.

In this section, we estimate the extent to which capped households—i.e. households previously considered by the wealth tax as wealth rich but income poor—react in terms of incomes and assets to a reform lowering their wealth tax burden and resulting in a large decline in the MTR on their income. Studying the elasticity of taxable income for this specific group is particularly interesting, as both the implicit yield on their wealth and their portfolio composition suggest they may have been favoring assets generating tax-deferred income to avoid taxes, and may therefore be able to manipulate their income to a large extent.

5.1 Empirical approach

We want to understand how capped households react to a sudden decline in their wealth tax burden. Our empirical approach involves a *difference-in-differences* which will essentially compare of wealth taxpayers who would have been subject to the cap as of 2018 had the ISF/IFI reform had not taken place, with wealth taxpayers who would not have benefited from the cap in any case.

However, similarly to the case of the 2012 reform discussed in the previous section, due to the absence of declarations after 2017 regarding taxable wealth, we do not have a direct observation of households that should have been capped but were not, and those that would not have been capped regardless. A more detailed description of how we address these identification issues is therefore necessary.

Identification Challenges. A natural approach to approximate the status of households in relation to the reform is to simply compare households that were capped in the previous year or years (*treated households*) to a group of households that were not capped in the previous year(s) (*control households*). However, this approach has a significant flaw in the context we are analyzing: defining a household's treatment status with respect to the reform based on its previous years' cap imposes a condition on the ratio of taxes to income. Implicitly, this compares income dynamics between two groups of households constructed based on their pre-treatment income, differentiating households with particularly low income compared to their taxes. This procedure may present a major flaw if the analyzed income variables are subject to strong mean reversion—which they are. The condition imposed on particularly low incomes through the construction based on past capping implies an increase in income once the condition is relaxed, i.e., in the year of the reform. This could thus be mistakenly interpreted as a causal effect of the reform. We present an alternative group construction strategy, akin to an intent-to-treat design, aimed at minimizing this issue. Even with this alternative strategy, we remain extremely careful about potential reversion to the mean and submit our results to tests allowing to spot what may be triggered by simple reversion to the mean.

Construction of Treatment and Control Groups. In order to mitigate the mean reversion phenomenon, it is necessary to accurately approximate the status of households with respect to the wealth

[10] See Bach *et al.* (2021) for a detailed description of the reform.

tax cap that would have taken place in 2017, while conditioning as lightly as possible on income evolution just before the reform. One way to approach the problem is to divide capped households from a given year into two groups: permanent capped households, whose income is consistently very low compared to their wealth,[11] and transient capped households, whose cap status is due to exceptionally low income in one or a few particular years. While the first group should be less sensitive to the definition of the treatment period and therefore contribute less to the mean reversion phenomenon, the second group will likely experience a mechanical increase in income right after the treatment definition window. Our definition of treatment and control groups therefore aims at focusing on the first group while excluding the second.

An important point to note regarding the cap is that the primary factor leading to the exceeding of 75% of taxable income in taxes is the wealth tax itself. Indeed, all other taxes rely heavily on bases that are closely related to taxable income. Accordingly, their sum relative to income is mechanically maintained below a threshold well below 75% (the top MTR at the income tax is 45%). On the other hand, the wealth tax is based on a different tax base, and a low income-to-wealth ratio can easily significantly increase the taxes-to-taxable income ratio. We leverage this characteristic of the cap, constructing treatment and control groups using only taxable income and the amount of wealth tax that is due. To dissociate income and taxes as much as possible, we create a "minimal" wealth / income ratio in the pre-treatment period. This ratio is calculated as the average wealth tax burden (pre-cap) owed between 2012 and 2016, divided by the maximum taxable income between 2011 and 2015 (the corresponding period in income years). Our analysis focuses on households for which the weight of the wealth tax has a high recurring impact with a minimum effective ratio of at least 20%. This ratio means that the wealth tax is structurally very heavy for these households and is less likely to reflect transitory income dynamics.

Among these households, we consider households as treated if the minimum effective wealth tax-to-income ratio exceeds 50%, and as controls if this same ratio is between 20% and 50%. This strategy has the advantage of comparing households where the wealth tax weight relative to income is structurally very high, and where the cap is not influenced by the exceptional realization of very low incomes. In practise, this selection allows us to eliminate a significant portion of households with exceptionally low income or exceptionally high wealth tax in a specific year.

Treatment Year. An important question pertains to the actual calendar year in which the reform is expected to start to yield effects. Indeed, the reform was a key element of candidate Macron's program during the 2017 presidential election campaign. Accordingly, the limitation of the wealth tax base to its real estate component was thus widely foreseeable starting around April-May 2017. It was intended to be applicable for the 2018 wealth tax year (i.e., wealth as of January 1, 2018). However, as the cap is determined based on income from the previous year (n-1), the anticipation of the reform could thus impact income as early as 2017.

Nevertheless, certain income sources required time before being realized: specifically, dividends necessitate the closing of an accounting period before being decided upon, and the vast majority of companies were only able to increase distributions once the 2017 fiscal year was closed, that is, in 2018 (Bach *et al.*, 2021). Therefore, an effect on dividends is expected from 2018 onward. However, potential earlier effects may exist for income sources that can be accessed more rapidly, such as capital gains or income derived from life insurance payouts.

[11] This can be the case, for example, if they are able to control/retime their income or because they own assets with particularly low yields.

Empirical Specification. We estimate a double fixed-effects model in order to measure, in a difference-in-differences framework, the effects of the reform on the treatment group. To make potential mean reversion effects easier to detect, we normalize the coefficients by the level of the year 2015, rather than the last pre-reform year (2016). The basic specification for household i in period t is as follows:

$$y_{it} = \alpha_i + \lambda_t + \sum_{\substack{d=2013 \\ d \neq 2015}}^{2019} \beta_d \times D_{t,d} \times T_i + \mathbf{x}_i \delta_t + \varepsilon_{it}, \tag{2}$$

where T_i is a binary variable for treatment and $D_{t,d} = 1$ if $t = d$ and 0 otherwise. The controls included in the vector **x** are the same as for equation (1), namely vingtiles of wealth, deciles of age, geography (*départements*), and household composition (the pre-reform number of fiscal shares).

Winsorization. Constructing a ratio between various income variables and the total reported income ("Revenu Fiscal de Référence" or "RFR", also referred to as total taxable income or TI in what follows) has the drawback of creating very high values when the RFR is very low. These outlier values can then heavily influence the average and artificially inflate the results. To guard against such effects, we normalize all ratio variables to the 1st and 99th percentiles, which effectively assigns the value of the 1st percentile to all values below it, and the value of the 99th percentile to all values above it.

5.2 Descriptive statistics

Table A1 shown in Appendix, provides summary statistics on the estimation sample, and is very similar to Table 1, which compares the composition of wealth and income between those subject to the cap and those not subject to the cap. In the estimation sample however, the number of households subject to the cap is substantially lower than the number of capped individuals who complete a detailed declaration, which is due to our definition of treatment and control groups, which are not a partition of the universe of wealth taxpayers. The income variables appear relatively similar between the treated and control groups in terms of their level, especially regarding their TI. This means that we are comparing relatively similar groups in terms of total income, but consequently quite different in their levels of wealth, as shown in Table 1.

An important element to note is that a quarter of capped households have an average taxable income lower than 50 euros before the reform, meaning nearly negligible taxable incomes. Since we will use the average pre-reform RFR as the denominator to measure the extent of income variations caused by the reform, we provide all the main results using taxable wealth as the denominator rather than taxable income.

5.3 Main results

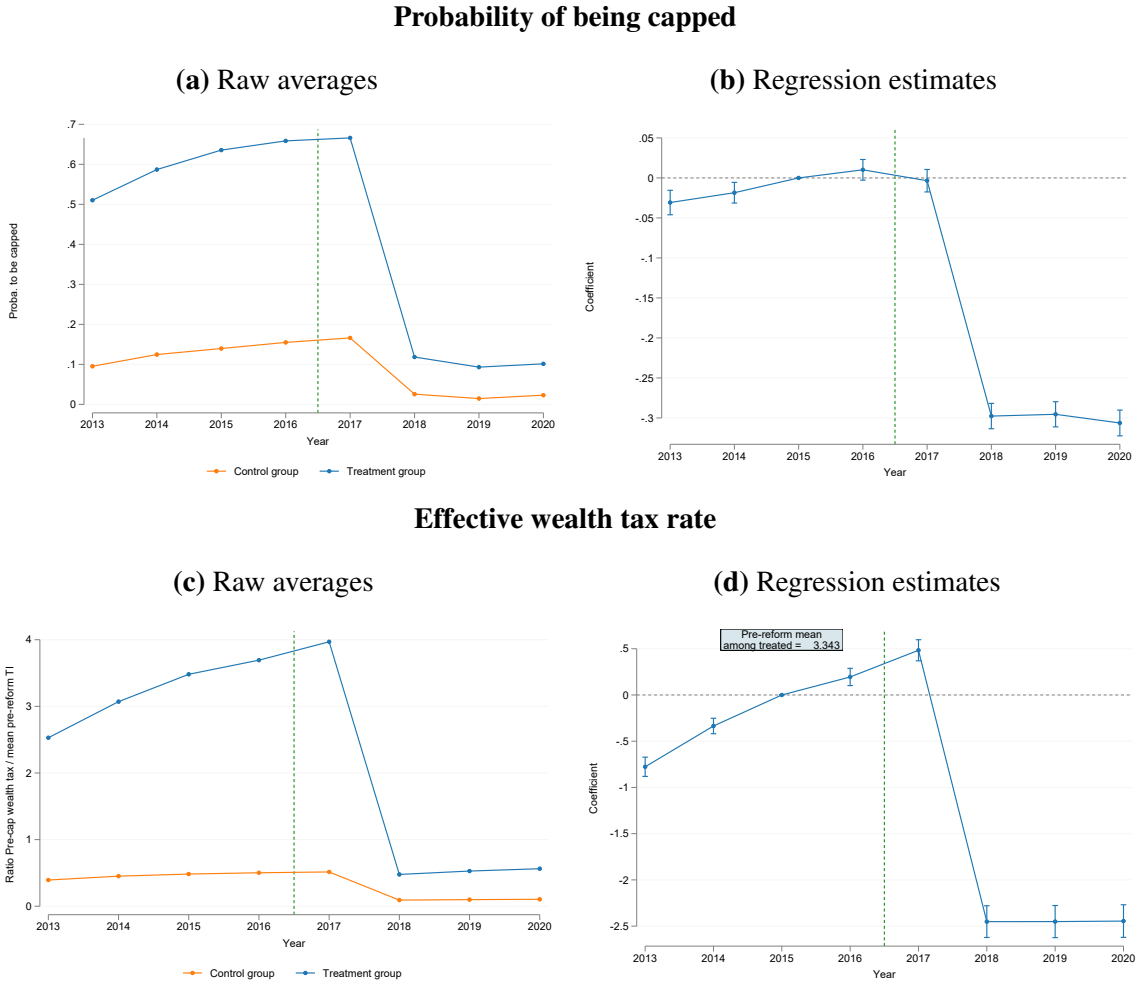
For all the amount variables we analyze, we adopt a normalization relative to the pre-reform taxable income. This reference taxable income is constructed as the average taxable income over the period 2013–2016.

5.3.1 First Stage: Effect on the Likelihood of Being Capped

The construction of our treatment and control groups is not directly based on being capped or uncapped prior to the reform. Accordingly, a first test consists of comparing the evolution of the likelihood of being capped between the two groups before the reform in order to capture the magnitude of

the shock induced by the elimination of the wealth tax cap in 2017. Figure 5 shows the evolution of the probability of being capped each year within each group (panel a), and the pre-cap wealth tax amount relative to the reference taxable income (panel c). In panel (a), we see that this probability is stable before the reform in the treatment group, hovering around 60% of households, and is also stable but low in the control group, at around 15%. This probability drops almost to zero after 2017 for the control group, and to around 10% for the treatment group. The differential effect of the reform between the two groups is thus about an additional 35 percentage point decrease in the likelihood of being capped for the treatment group. Panel (c) of the figure shows that the pre-cap wealth tax amounted to approximately half of the reference taxable income in the control group prior to the reform. This ratio is about 3.5 in the treatment group. Around the reform, this ratio declines 3 times more among treated group relative to control households. Panel (b) and (d) show the estimated coefficients.

Figure 5: Evolution of capping status and pre-capping tax rate around the reform, by treatment group



NOTES : This table presents the annual average per group (treatment and control) of the probability of being capped (panel a), and of the amount of wealth tax before application of the cap relative to the reference taxable income. The treatment group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 greater than 50 %. The control group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 of between 20 and 50 %.

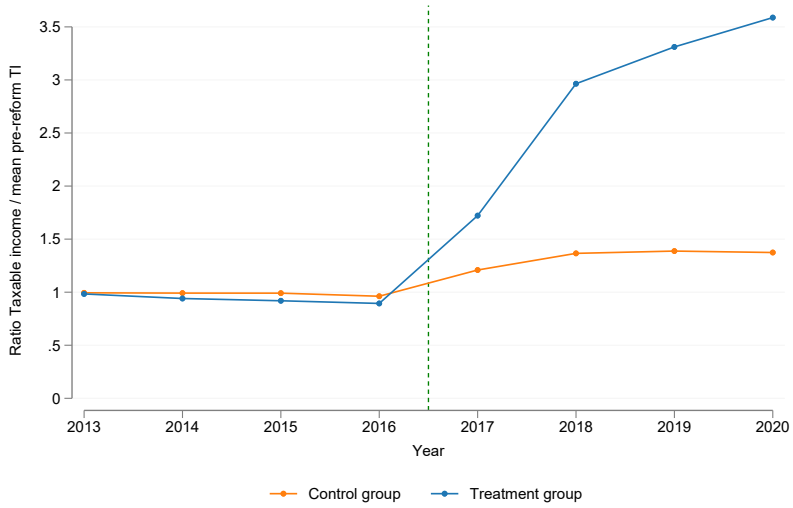
SOURCES : ISF-IFI (DGFiP), POTE (DGFiP).

5.3.2 Main outcomes

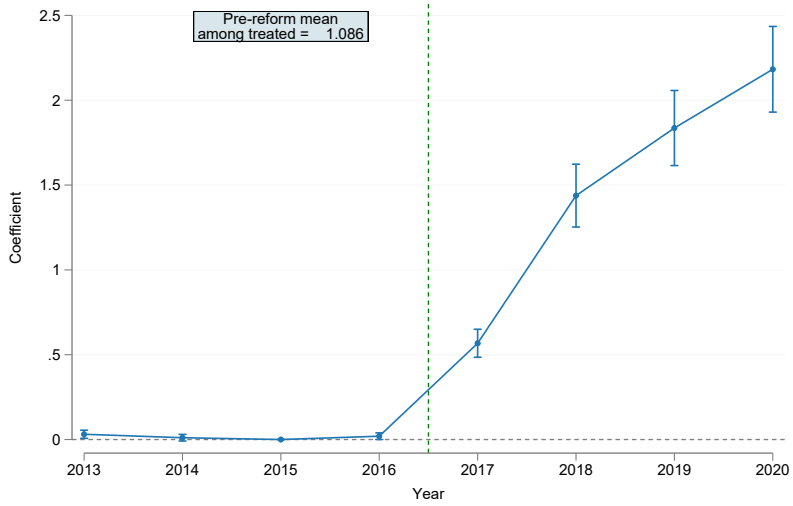
Response on taxable income. Figure 6 presents the response of total taxable income (TI) relative to the average pre-reform household taxable income. For both groups, a very stable evolution is observed around a ratio of 1 for the TI / reference TI. However, a substantial increase in income is observed for the treated households starting from 2017, reaching around 3 times the reference taxable by the end of the period, while the taxable of control households only increases to around 1.3 times the reference TI.

Figure 6: Evolution of taxable income (norm. by value in the reference year) around the reform

(a) Annual averages



(b) Regression coefficients



NOTES : This figure shows the annual average per group (treatment and control) of the taxable income normalized by its value in the reference year (panel a), and the associated regression coefficients (β_d in equation (2)). The treatment group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 greater than 50 %. The control group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 of between 20 and 50 %.

SOURCES : ISF-IFI (DGFiP), POTE (DGFiP).

Return to the mean and sensitivity to the choice of treatment Definition Period. Our definition of treatment is based on the ratio of wealth tax to taxable income prior to the reform. This type

of assignment can lead to an issue of mean reversion—if it is based on a transitory, mean-reverting component of the income process for instance. We assess the sensitivity of our results to the choice of period for the definition of the treatment.

Figure 7 presents similar estimates to figures 5 and 6, defining the treatment over alternative periods to the 2012-2016 period. In all cases, it can be observed that the probability of being capped declines (panel a) and the income increases significantly from 2017 (panel b). This suggests that our way of defining the treatment effectively limits the phenomenon of reversion to the mean mentioned earlier, in the sense that the timing of the estimated effects is not sensitive to the window used to define treatment. We see that both the first stage and the second stage become smaller when using earlier periods for treatment definition.

We now present the results of the estimation of equation (2) for the different categories of underlying income to TI: dividends, life-insurance income, capital gains, labor and replacement income (as well as, in appendix, rental income, deductible expenses, other capital income, pass-through business income).

Reaction of dividends Figure 8a presents the results for dividend payments. It can be observed that dividends increase in the control group, notably due to the implementation of the PFU (Bach *et al.*, 2021). Dividends thus rise by 5 points of pre-reform income, from a baseline of 12%, implying a 40% increase.

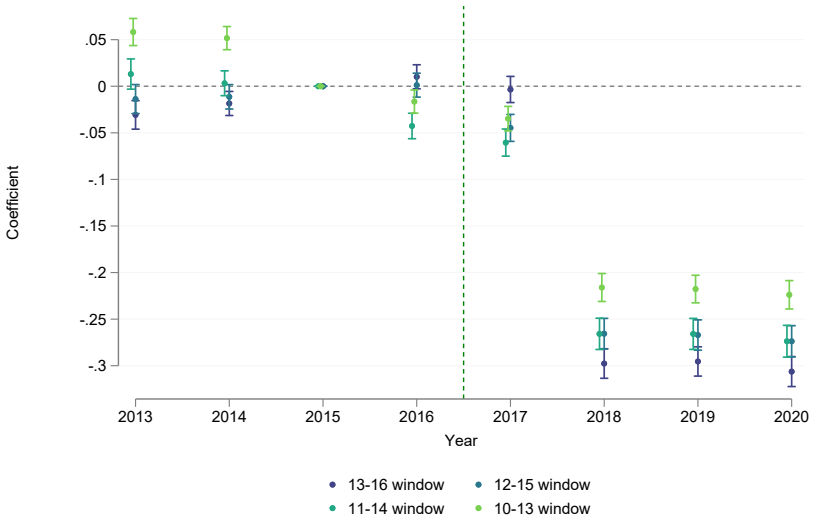
We further explore the responses of dividends through distributional regressions, using as the dependent variable the probability that dividends exceed various thresholds. Figure A3 in the Appendix presents the relative evolution between the two groups of the probability that dividends exceed 10,000, 100,000, and 1 million euros. The trends are fairly consistent between the groups for all thresholds before the reform, and the probability of exceeding each threshold increases significantly in 2018 and persists thereafter. Surprisingly, the increase in percentage points is quite similar in 2018 and 2019 for all thresholds, even though the initial averages of these variables are quite different. This means that the approximately 1 percentage point increase in the probability of receiving more than 10,000 euros in dividends corresponds to an initial probability of 11.8%, thus constituting an approximately 10% increase from the initial probability. On the other hand, the probability of receiving more than 1 million euros in dividends increases by 0.6 percentage points, but relates to an initial average of 0.2% of households reaching this threshold, indicating that the probability of reaching such a threshold has tripled due to the reform. Overall, we see that while the average effect of the reform on dividends is modest, the effect seems larger in the upper tail of the distribution, consistent with the notion that the frequency of responses might be rare but that conditional on reacting, dividend increases tend to be substantial.

Reaction of realized life-insurance income Figure 8b presents the estimated coefficient on realized life-insurance income around the transformation of the ISF into IFI. Once again, a relatively parallel evolution is observed between the two groups before the reform, with a slight deviation between 2015 and 2016. Subsequently, starting from the year of the reform, there is an extremely significant increase in life-insurance income among the treated households with an estimated coefficient of +20 pp, representing almost a doubling of the baseline level .

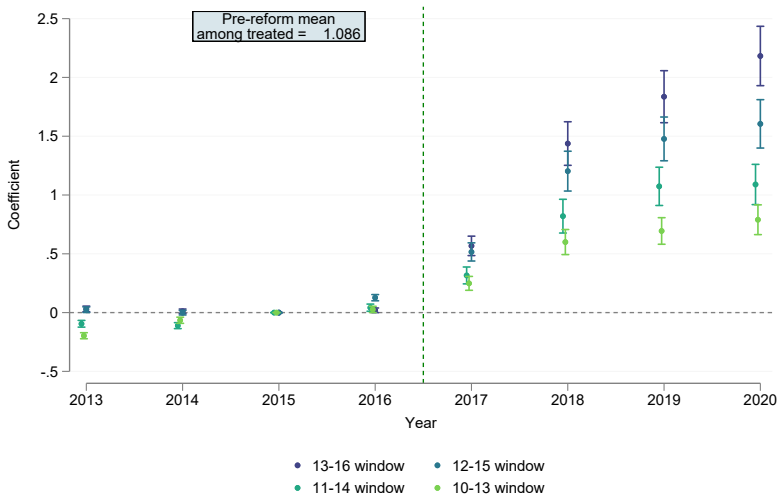
We also study the probability that life-insurance income exceeds different thresholds of realized life-insurance income. Figure A4 in the Appendix presents the estimation results. Unlike dividends, it can be observed that higher thresholds here are associated with weaker effects, indicating that the

Figure 7: First and second stage regression coefficients, varying the time window for treatment definition

(a) Probability to be capped



(b) Taxable income (norm. by pre-reform TI)

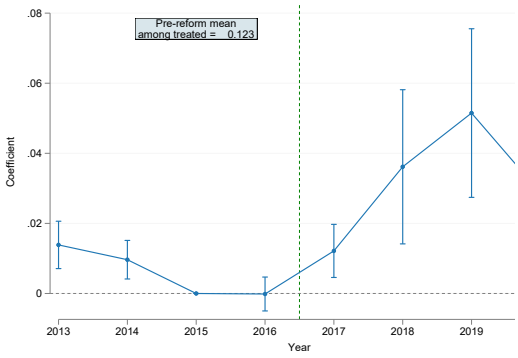


NOTES: This figure shows the regression coefficients (β_d in equation (2)) using as the dependent variable the ratio of pre-capping wealth tax (panel a) or taxable income (panel b) relative to the reference taxable income. In the first version presented, the treatment group is made up of households with a "minimum" ISF/income ratio between 2012 and 2016 greater than 50 %, and the control group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 between 20 and 50 %. The other versions presented use the 2012-2015 and 2012-2014 periods as the income window.

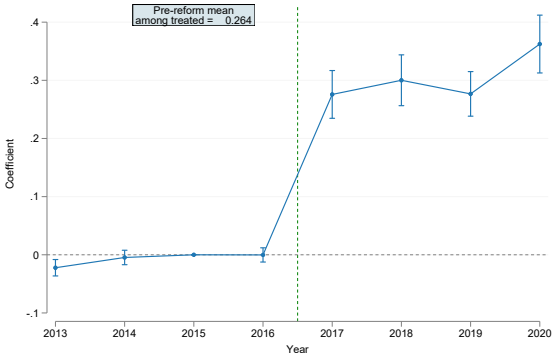
SOURCES : ISF-IFI (DGFiP), POTE (DGFiP).

Figure 8: Evolution of other income categories in relation to the reference taxable income around the reform

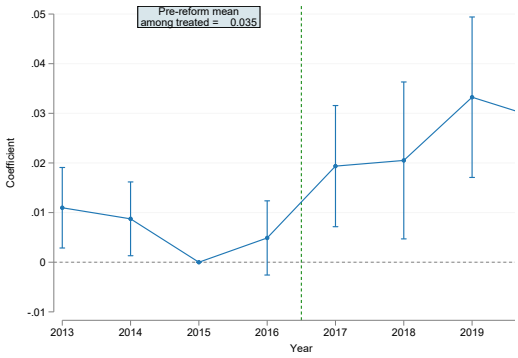
(a) Dividends



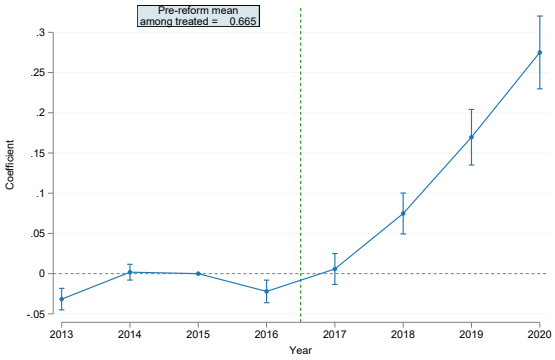
(b) Life-insurance income



(c) Capital gains



(d) Labor and pension income



NOTES: This figure shows regression coefficients (β_d in the equation (2)) using as dependent variables other dividends (panel a), life-insurance income (panel b), capital gains (panel c), and labor and pension income (panel d), all normalized by the average pre-reform taxable income. The treatment group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 greater than 50 %. The control group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 of between 20 and 50 %.

SOURCES : ISF-IFI (DGFiP), POTE (DGFiP).

average effect on life-insurance income is not as strongly influenced by shits in the upper tail of the distribution.

Reaction of Capital Gains Figure 8c presents the evolution of capital gains realized each year by each of the two groups. It is worth noting that the underlying consumption associated with these capital gains can be much higher than the figures we show, as we measure the capital gains, not the sales proceeds, often after significant deductions. The two groups are very similar during the period preceding the reform in terms of trends. A subsequent increase is then observed in the year of the reform with a magnitude greater by about 3 percentage points of the average TI among the treated individuals.

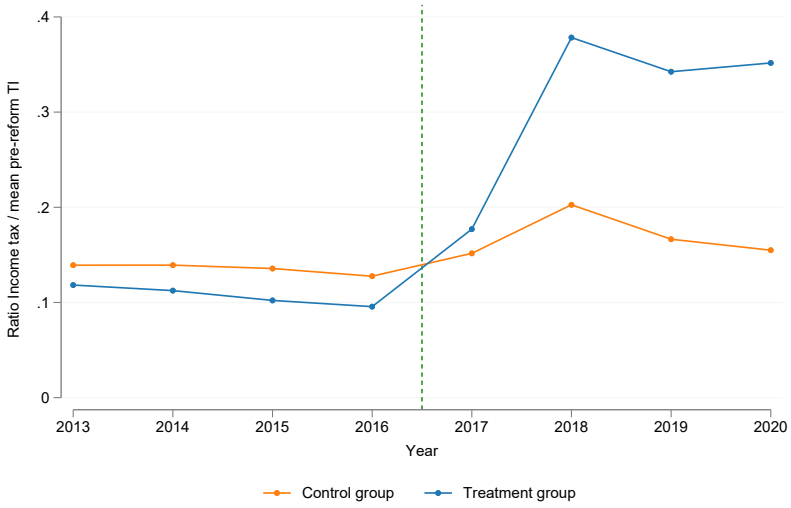
Reaction from wages and pensions We also study the reaction of wages and pensions, which is presented in Figure 8d. It should be noted that while households are only likely to act on their wage incomes, the population we are studying is relatively older, and thus we include retirement pensions in this category to avoid small differences in the probability of retirement affecting the average values of wage incomes. We find that an effect of about 20 pp which is roughly a +30% in comparison with the pre-treatment period. Because many French entrepreneurs are wage-earners in their own company, this wage reaction may also reflect an opportunistic wage increase once the MTR declines.

Reaction of other types of income. Finally, Figure A7 in Appendix presents the estimation coefficients corresponding to the reactions of other income categories around the reform. Notably, we study income obtained from real estate, for instance through rental, reacted to the tax reform. Differential trends between the groups are observed as early as 2016 for rental income, i.e., before the reform could have affected the groups. This makes it difficult to causally interpret the evolution of these incomes, even though their evolution is quantitatively significant over the period relative to the TI. One important point to note, however, is that the average of these incomes among the treatment group is strongly negative, indicating that rental incomes were used before the reform as a means to reduce the taxable reference income of these households through recorded deficits. We observe either an absence of effect or differential trends between the groups. It should be noted, however, that except for other capital incomes, whose pre-reform average is relatively high (but constitute a category that is challenging to grasp due to changes in the tax declaration form), the other categories have coefficients and pre-reform associated averages that are of very low magnitude, and therefore they are of second order in explaining the reaction of the total TI.

Impact on income tax revenue The reform has effectively consisted in a reduction in the MTR on taxable income and might have led some to believe it would have involved a substantial decline in tax revenue. Yet because, as we just showed, there has been a very strong positive behavioral response of the income tax base to the tax cut, it is possible that personal tax revenue has in fact increased thanks to the reform. This is what we investigate in Figure 9, which presents the evolution of the ratio of income tax paid to income reported pre-2017. It shows that the reform led to a large increase, rather than a decrease, in personal tax revenue. Income tax payments increased in the treated group by 21 points of initial income in the treated group compared to the control group. This amounts to a tripling of income tax revenue following the large decline in MTR from 75% to 33%. Given that the underlying increase in reported income may simply come from opportunistic retiming of income it remains to be seen whether this reform will be self-financing in the long-run. Yet, this certainly means that the

budgetary cost of the wealth tax cap was in France much larger than suggested by static analysis of the difference between wealth tax due pre- and post-cap.

Figure 9: Evolution income tax paid, around the reform



NOTES: This figure shows the average annual taxable income per group (treatment and control). The treatment group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 greater than 50 %. The control group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 of between 20 and 50 %.

SOURCES : ISF-IFI (DGFiP), POTE (DGFiP).

6 Conclusion

In this paper, we show that the wealth tax cap is mostly binding among households at the top of the wealth distribution of the wealth tax payers. We further show that they own liquid yet income-tax-deferred assets. Exploiting the cancellation of the wealth tax in 2017, we show, in a diff-in-diffs setup, that these households quickly generated taxable income out of those financial assets. We also show that when the wealth tax cap was temporarily suspended in 2012, they did not turn those assets into income in order to pay the tax. We conclude that in our setting caps reduce the proceeds from wealth taxes precisely when wealth would be a better proxy for taxpaying ability than income. The results suggest that the cap system that was put in place was likely too coarse and should have included in its definition of personal income asset yield items that appeared to be particularly suggest to manipulation such as life insurance yields and, more largely speaking, all kinds of earnings retained in easily-controlled investment vehicles. The question remains whether a cap set at a much higher level for a longer period would eventually have led to detrimental asset liquidations.

References

ADVANI, A. and TARRANT, H. (2021). Behavioural responses to a wealth tax. *Fiscal Studies*, **42** (3-4), 509–537.

BACH, L., BOZIO, A., FABRE, B., GUILLOUZOUIC, A., LEROY, C. and MALGOUYRES, C. (2021). Follow the money! Why dividends overreact to flat tax reforms.

—, CALVET, L. E. and SODINI, P. (2017). From saving comes having? disentangling the impact of saving on wealth inequality. *Disentangling the Impact of Saving on Wealth Inequality (December 16, 2017). Swedish House of Finance Research Paper*, (18-8).

—, — and — (2020). Rich Pickings? Risk, Return, and Skill in Household Wealth. *American Economic Review*.

BRÜLHART, M., GRUBER, J., KRAPF, M. and SCHMIDHEINY, K. (2022). Behavioral responses to wealth taxes: Evidence from switzerland. *American Economic Journal: Economic Policy*, **14** (4), 111–150.

GUVENEN, F., KAMBOUROV, G., KURUSCU, B., OCAMPO, S. and CHEN, D. (2023). Use it or lose it: Efficiency and redistributional effects of wealth taxation. *The Quarterly Journal of Economics*.

JAKOBSEN, K., JAKOBSEN, K., KLEVEN, H. and ZUCMAN, G. (2020). Wealth taxation and wealth accumulation: Theory and evidence from denmark. *The Quarterly Journal of Economics*, **135** (1), 329–388.

LONDOÑO-VÉLEZ, J. and ÁVILA-MAHECHA, J. (2021). Enforcing wealth taxes in the developing world: Quasi-experimental evidence from colombia. *American Economic Review: Insights*, **3** (2), 131–148.

LOUTZENHISER, G. and MANN, E. (2021). Liquidity issues: solutions for the asset rich, cash poor. *Fiscal Studies*, **42** (3-4), 651–675.

OECD (2018). *The Role and Design of Net Wealth Taxes in the OECD*. OECD.

PIKETTY, T. and SAEZ, E. (2013). Optimal labor income taxation. In *Handbook of public economics*, vol. 5, Elsevier, pp. 391–474.

SAEZ, E. and ZUCMAN, G. (2019). *The triumph of injustice: How the rich dodge taxes and how to make them pay*. WW Norton & Company.

— and — (2022). Wealth taxation: lessons from history and recent developments. In *AEA Papers and Proceedings*, American Economic Association 2014 Broadway, Suite 305, Nashville, TN 37203, vol. 112, pp. 58–62.

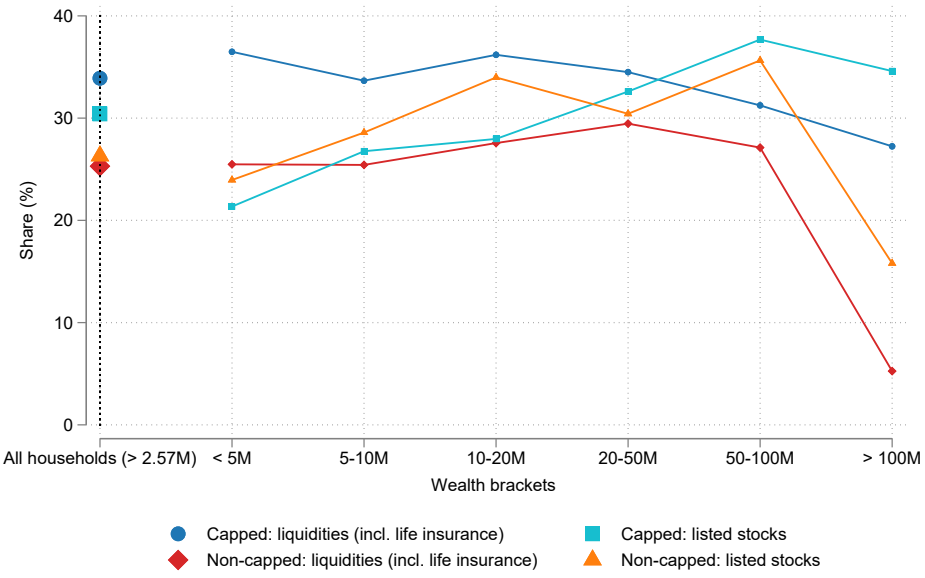
SCHEUER, F. and SLEMROD, J. (2021). Taxing our wealth. *Journal of Economic Perspectives*, **35** (1), 207–230.

SEIM, D. (2017). Behavioral responses to wealth taxes: Evidence from sweden. *American Economic Journal: Economic Policy*, **9** (4), 395–421.

ONLINE APPENDIX

A Additional Figures and Tables

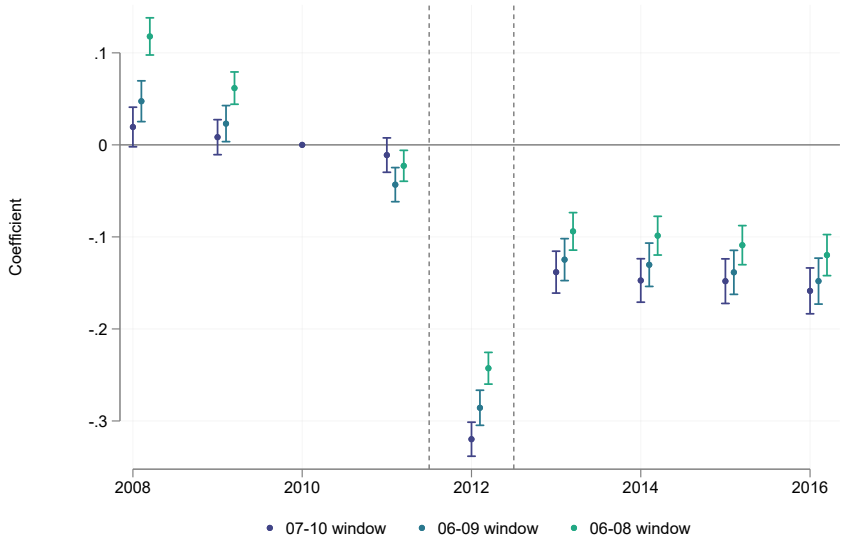
Figure A1: Share of liquid assets in the wealth of wealth tax payers, non-capped and capped, by wealth bracket



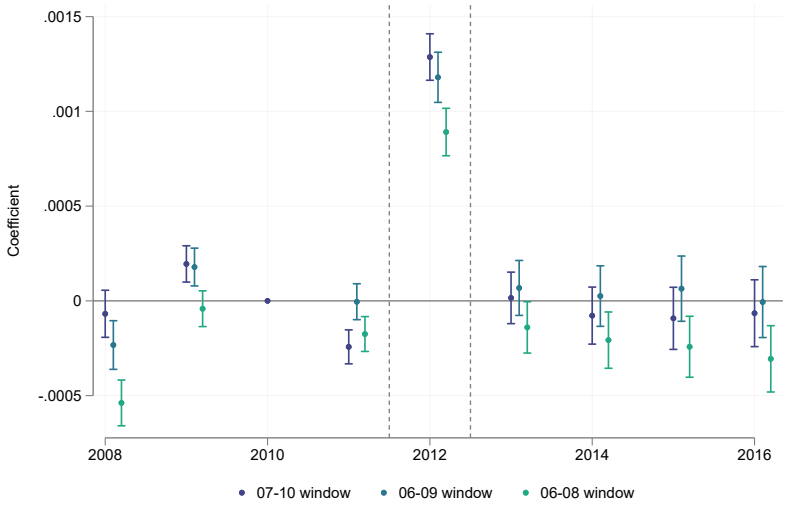
NOTES: This figure shows, by taxable wealth bracket, the proportion of total taxable wealth represented by liquid assets (including life-insurance, i.e. boxes CF and CO on form 2725), and listed securities, according to whether or not households benefit from the ISF ceiling. The dark-blue circles measure the share of liquid assets for those with a ceiling, and the red diamonds measure the share for those without a ceiling. The light blue squares measure the share of listed securities for those with a ceiling, and the orange triangles this share for those with a ceiling.
SOURCES: ISF-IFI (DGFiP), POTE (DGFiP).

Figure A2: First stage regression coefficients for the 2012 reform, varying the time window for treatment definition

(a) Probability to be capped



(b) Effective wealth tax rate



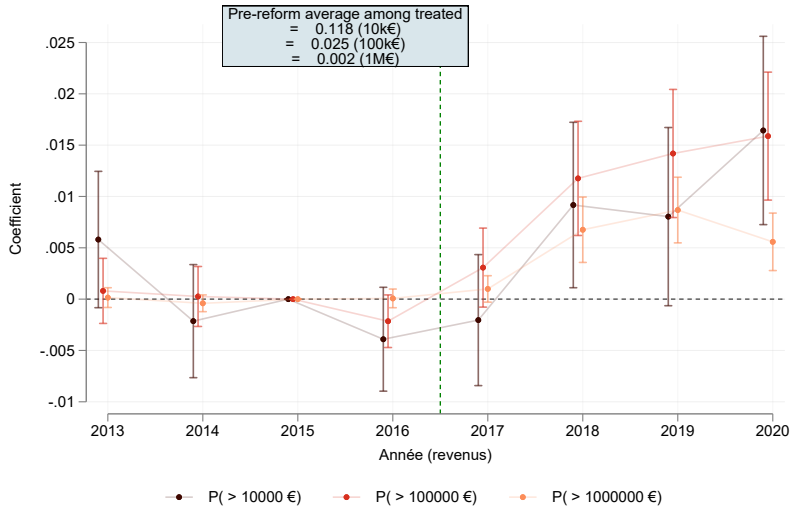
NOTES: This figure shows the regression coefficients (β_d in equation (2)) using as the dependent variable the probability of being capped (panel a) or the effective wealth tax rate (panel b). In the first version presented, the treatment group is made up of households with a "minimum" ISF/income ratio between 2007 and 2010 greater than 60 %, and the control group is made up of households with a "minimum" wealth tax/income ratio between 2007 and 2010 between 30 and 60 %. The other versions presented use the 2006-2009 and 2006-2008 periods as the income window.
SOURCES : ISF-IFI (DGFiP), POTE (DGFiP).

Table A1: Summary statistics on the estimation sample depending on their treatment status (averages over the period 2013–2016)

	Control Group					Treatment Group				
	Mean	Standard Deviation	Median	1st Decile	9th Decile	Mean	Standard Deviation	Median	1st Decile	9th Decile
Taxable Assets (Million Euros)	4.892	6.457	3.481	1.637	8.800	10.180	15.683	5.513	1.497	21.864
Total Gross Income	100129	186891	56101	12087	205153	70611	134867	28458	65	173864
Dividends	18173	114612	194	0	31412	11884	77235	5	0	14111
Capital Gains	2679	141458	0	0	6834	8746	736305	0	0	3305
Life Insurance Income	6899	45529	0	0	13337	8376	41614	0	0	17530
Income Tax	22804	71310	3025	52	50476	13905	46785	1541	0	34136
Share of Capped Households	0.129	0.335	0	0	1	0.598	0.490	1	0	1
Number of Tax Households			18094					5738		
Observations			72376					22952		

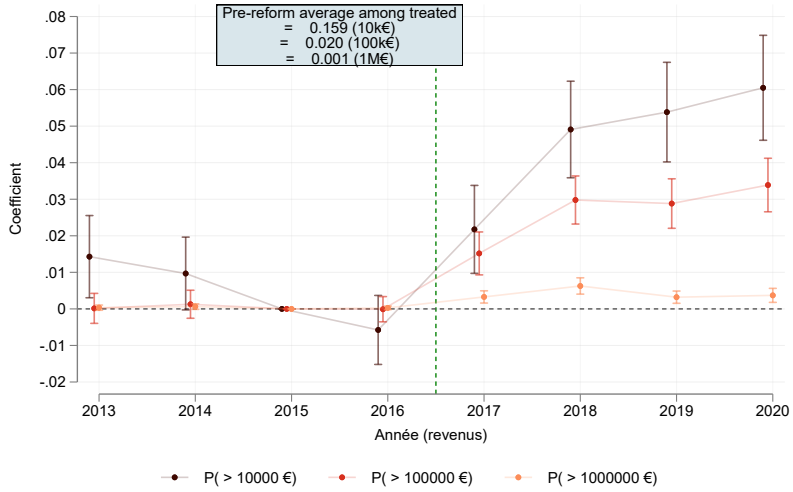
NOTES : Ce tableau présente des statistiques descriptives sur les variables utilisées comme variables dépendantes dans l'estimation en différence-de-différences, selon l'appartenance au groupe de traitement ou au groupe de contrôle. Le groupe de traitement est constitué des foyers ayant un ratio "minimal" d'ISF / revenu entre 2012 et 2016 supérieur à 50 %. Le groupe de contrôle est constitué des foyers ayant un ratio "minimal" d'ISF / revenu entre 2012 et 2016 compris entre 20 et 50 %. L'échantillon de foyers fiscaux est cylindré et le nombre d'observations indiqué correspond au nombre d'observations avant la réforme.
SOURCES : ISF-IFI (DGFiP), POTE (DGFiP).

Figure A3: Regression coefficients for the probability of exceeding different dividend thresholds under the 2018 reform



NOTES: This figure shows the associated regression coefficients (β_d in equation (2)), using as dependent variables the probabilities of exceeding different dividend amounts (10 000 € in brown, 100 000 € in red, 1 million € in orange). The treatment group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 greater than 50 %. The control group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 of between 20 and 50 %.
SOURCES : ISF-IFI (DGFiP), POTE (DGFiP).

Figure A4: Regression coefficients for the probability of exceeding different thresholds of realized life insurance income around the 2018 reform

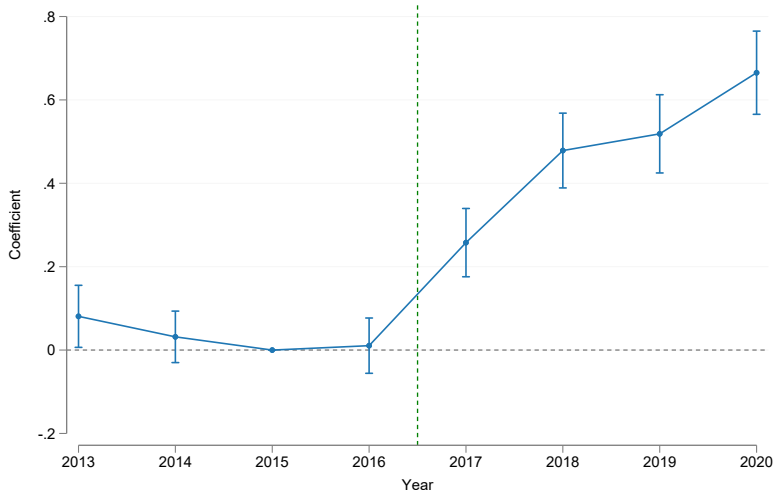


NOTES: This figure shows the associated regression coefficients (β_d in equation (2)), using as dependent variables the probability of exceeding different amounts of realized life insurance income (10 000 euro in brown, 100 000 euro in red, 1 million euro in orange). The treatment group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 greater than 50 %. The control group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 of between 20 and 50 %.

SOURCES : ISF-IFI (DGFiP), POTE (DGFiP).

Figure A5: Regression coefficients around the 2018 reform, log of taxable income

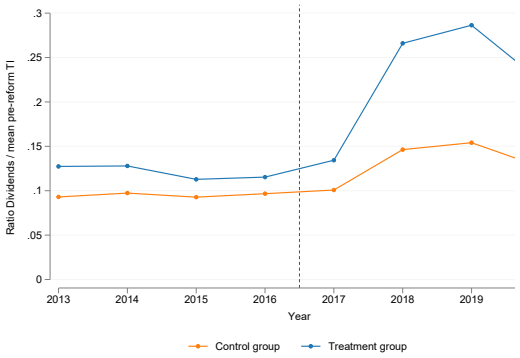
(a) Regression coefficients



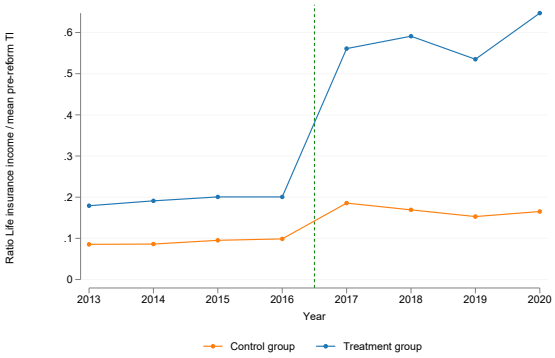
NOTES : This figure shows the regression coefficients (β_d in equation (2)) using the log of taxable income as our dependent variable. The treatment group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 greater than 50 %. The control group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 of between 20 and 50 %.
SOURCES : ISF-IFI (DGFiP), POTE (DGFiP).

Figure A6: Evolution of other income categories in relation to the reference taxable income around the reform, raw averages

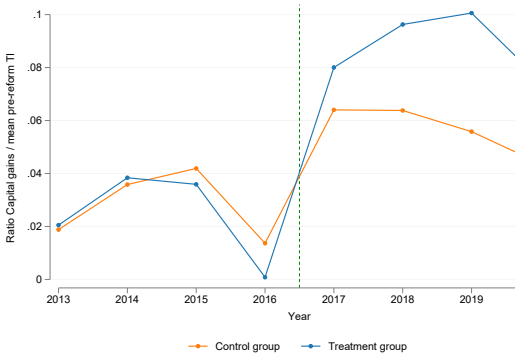
(a) Dividends



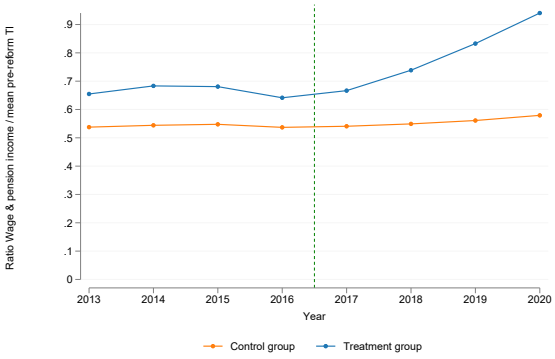
(b) Life-insurance income



(c) Capital gains



(d) Labor and pension income

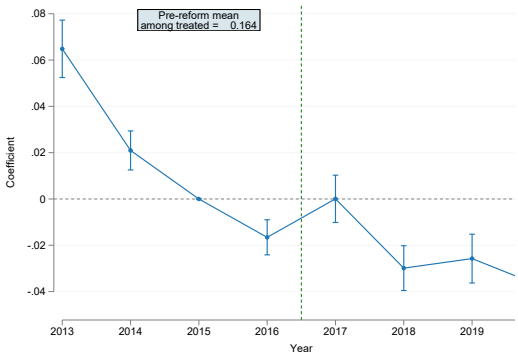


NOTES: This figure shows regression coefficients (β_d in the equation (2)) using as dependent variables other dividends (panel a), life-insurance income (panel b), capital gains (panel c), and income tax paid (panel d), all normalized by the average pre-reform taxable income. The treatment group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 greater than 50 %. The control group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 of between 20 and 50 %.

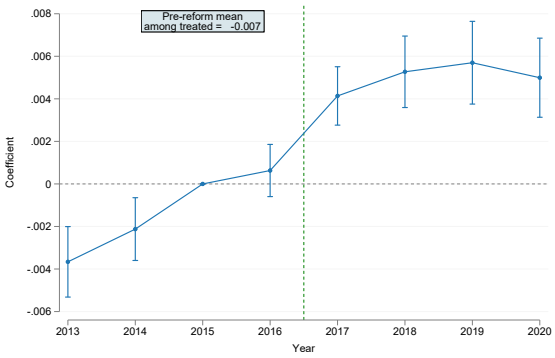
SOURCES : ISF-IFI (DGFiP), POTE (DGFiP).

Figure A7: Evolution of other income categories in relation to the reference taxable income around the reform

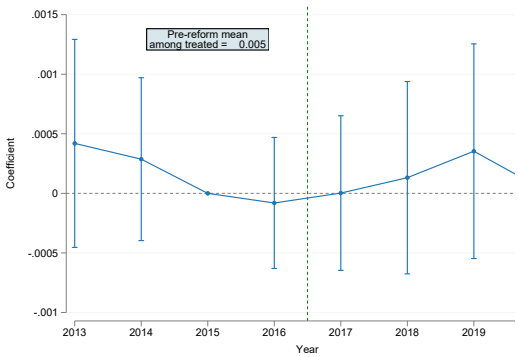
(a) Other capital income



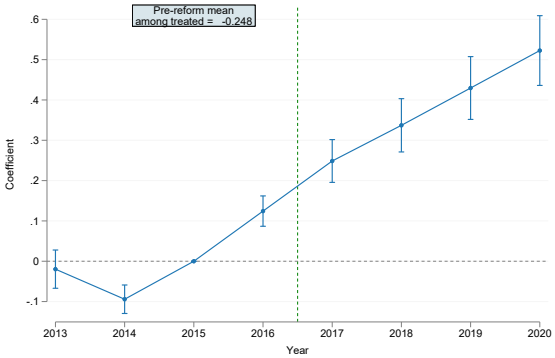
(b) Business income—BIC



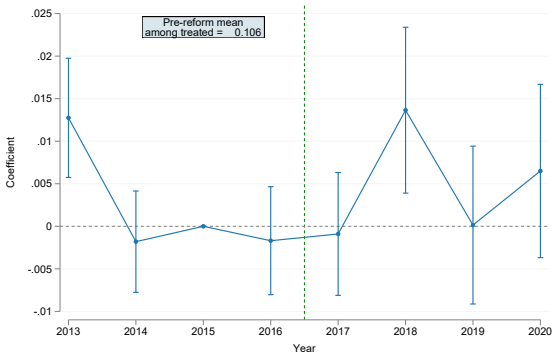
(c) Non commercial business income—BNC



(d) Property income



(e) Deductible expenses

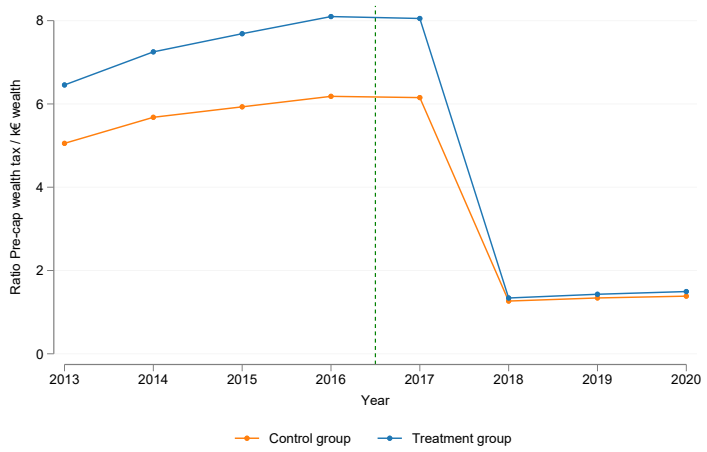


NOTES: This figure shows the annual average per group (treatment and control) of taxable income relative to the reference taxable income (panel a), and the associated regression coefficients (β_d in the equation (2)) using as dependent variables other capital income (panel a), business income—BIC (panel b), non-commercial business income—BNC (panel c), and deductible expenses (panel d). The treatment group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 greater than 50 %. The control group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 of between 20 and 50 %.

SOURCES : ISF-IFI (DGFiP), POTE (DGFiP).

Figure A8: Evolution of capping status and pre-capping tax rate around the reform, by treatment group

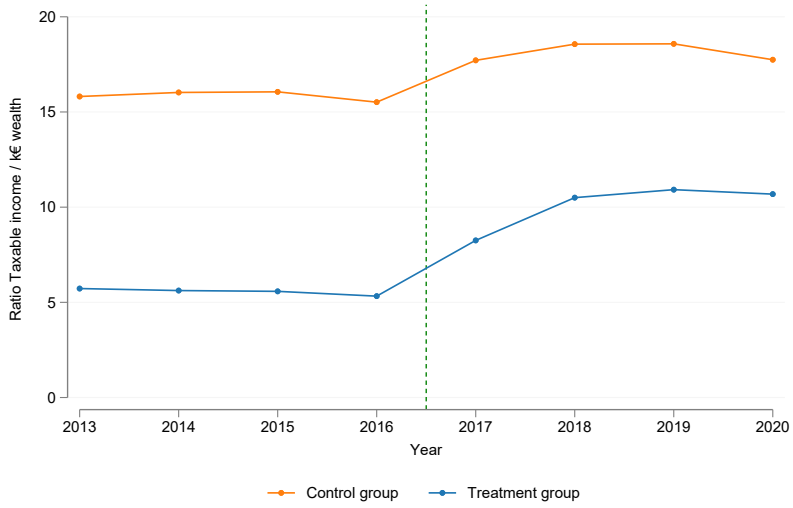
(a) Pre-cap wealth tax relative to taxable wealth



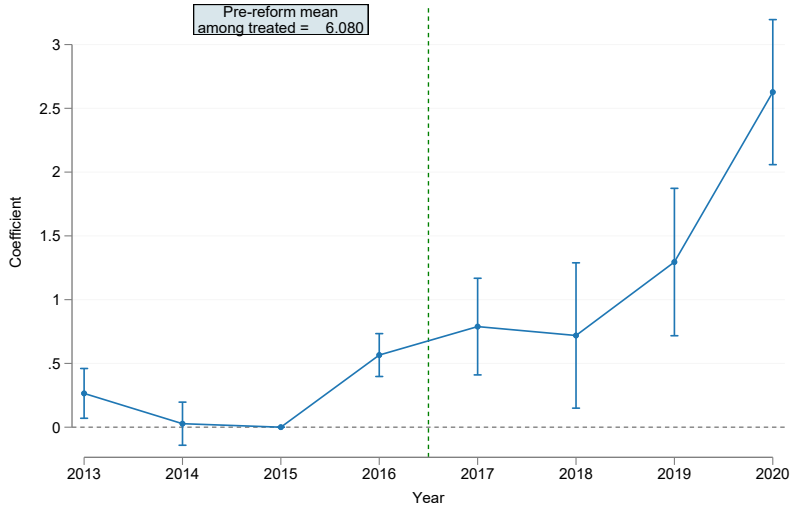
NOTES : This table presents the annual average per group (treatment and control) of the amount of wealth tax before application of the cap relative to the reference taxable wealth. The treatment group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 greater than 50 %. The control group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 of between 20 and 50 %.
SOURCES : ISF-IFI (DGFiP), POTE (DGFiP).

Figure A9: Evolution of taxable income (norm. by taxable wealth in the reference year) around the reform

(a) Annual averages



(b) Regression coefficients

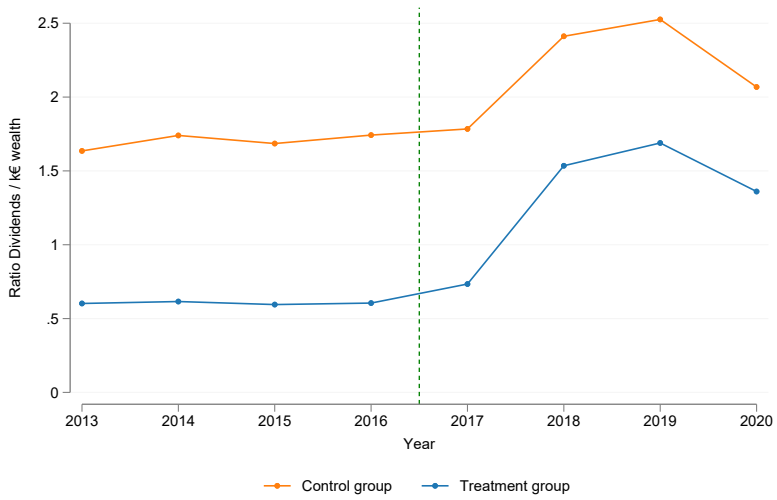


NOTES : This figure shows the annual average per group (treatment and control) of the taxable income normalized by taxable wealth in the reference year (panel a), and the associated regression coefficients (β_d in equation (2)). The treatment group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 greater than 50 %. The control group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 of between 20 and 50 %.

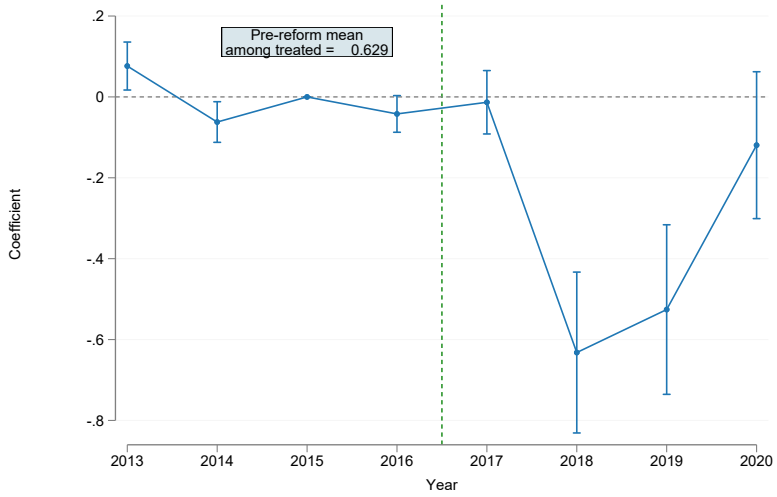
SOURCES : ISF-IFI (DGFiP), POTE (DGFiP).

Figure A10: Evolution of dividends in relation to the reference taxable wealth around the reform

(a) Annual averages



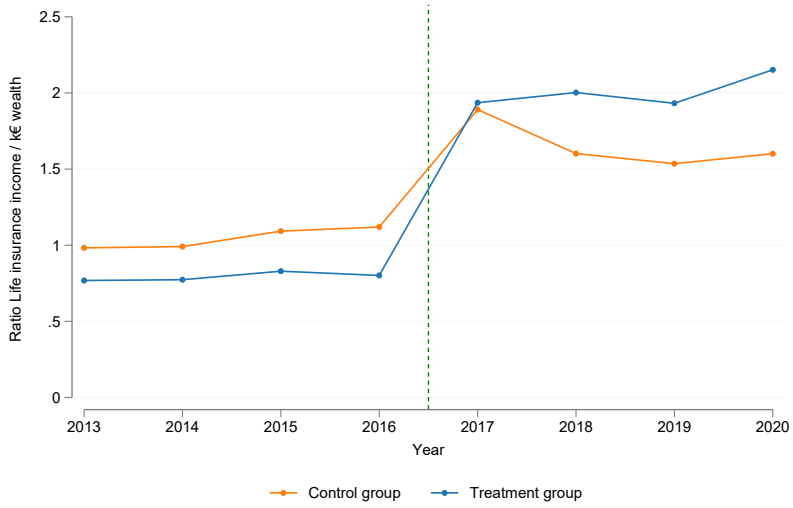
(b) Regression coefficients



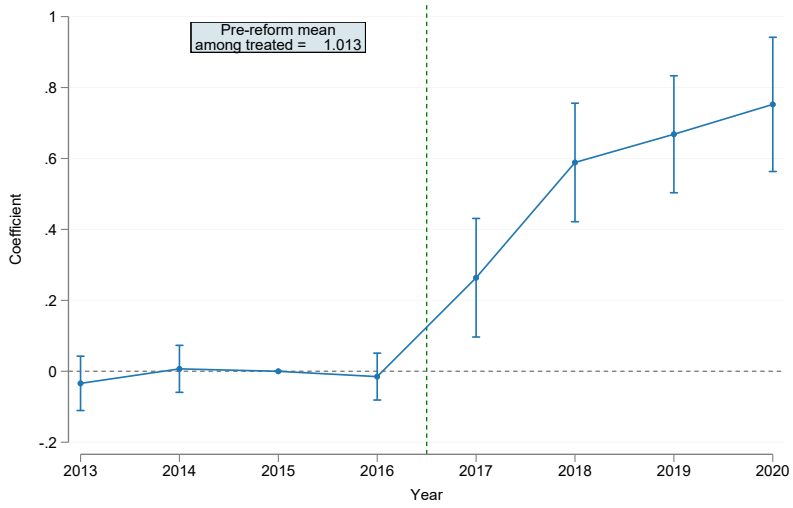
NOTES : This figure shows average annual dividends per group (treatment and control), relative to the reference taxable income (panel a), and the associated regression coefficients (β_d in equation (2)). The treatment group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 greater than 50 %. The control group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 of between 20 and 50 %.
SOURCES : ISF-IFI (DGFiP), POTE (DGFiP).

Figure A11: Evolution of realized life-insurance income in relation to the taxable wealth, around the reform

(a) Annual averages



(b) Regression coefficients

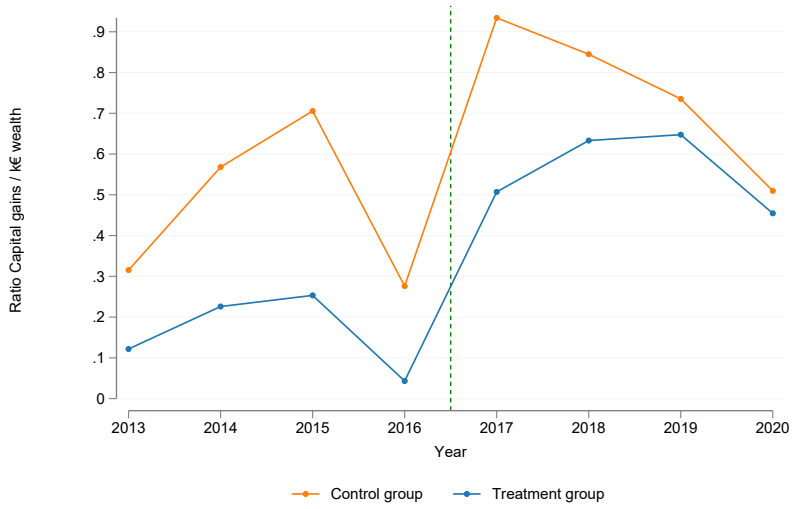


NOTES: This figure shows the annual average per group (treatment and control) of realized life-insurance income compared to the reference taxable wealth (panel a), and the associated regression coefficients (β_d in equation (2)). The treatment group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 greater than 50 %. The control group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 of between 20 and 50 %.

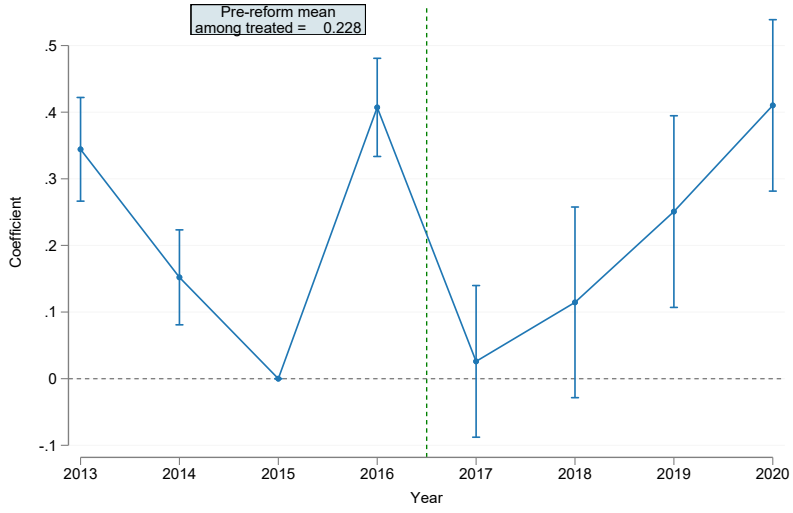
SOURCES : ISF-IFI (DGFiP), POTE (DGFiP).

Figure A12: Evolution of capital gains on securities in relation to the taxable wealth around the reform

(a) Annual averages

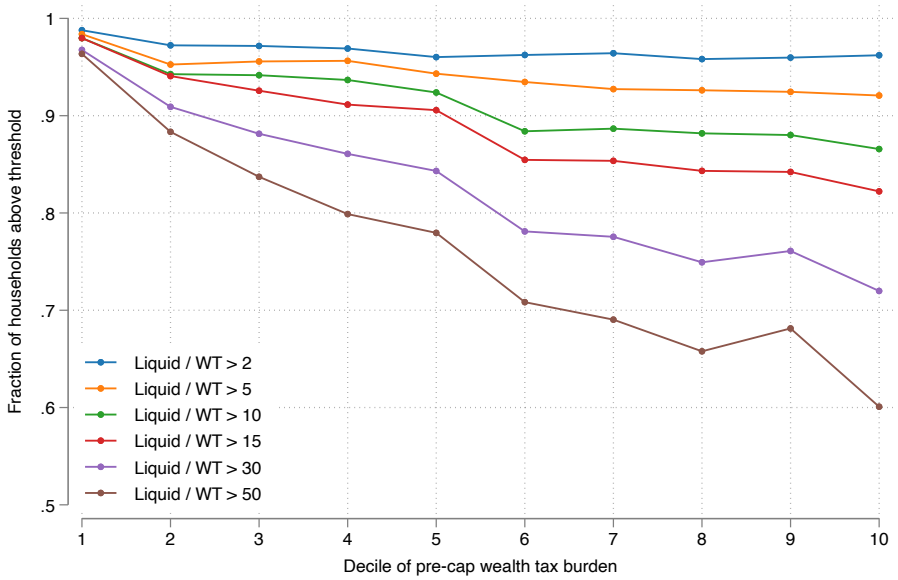


(b) Regression coefficients



NOTES: This figure shows the average annual capital gains per group (treatment and control) relative to the reference taxable wealth (panel a), and the associated regression coefficients (β_d in equation (2)). The treatment group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 greater than 50 %. The control group is made up of households with a "minimum" wealth tax/income ratio between 2012 and 2016 of between 20 and 50 %.
SOURCES : ISF-IFI (DGFiP), POTE (DGFiP).

Figure A13: Distribution of liquid assets held to pre-cap wealth tax amount



NOTES: This figure shows, for capped households, the fraction of households with a ratio of liquid assets to pre-cap wealth tax above a given threshold as a function of wealth tax level. Capped households are sorted by wealth tax level and grouped into 10 brackets.

SOURCES: ISF-IFI (DGFiP), POTE (DGFiP).